

# Energy poverty in the European Union: landscapes of vulnerability

Stefan Bouzarovski\*



Energy poverty can be seen as situation in which a household lacks a socially and materially necessitated level of energy services in the home. In the context of the European Union (EU), its causes and consequences largely coincide with those of the more narrowly defined notion of 'fuel poverty', which has attracted a significant amount of public attention, scientific research, and state policy in Ireland and the UK. Outside of these two countries, however, EU energy poverty scholarship, debates, and policies are embryonic. From the limited amount of research that has been published to date, it is possible to conclude that the condition is predicated upon high energy prices, low household incomes, inefficient buildings and appliances, and specific households energy needs. It is particularly widespread in Eastern, Central, and Southern Europe, where it tends to affect groups who are already vulnerable to income poverty. Recent years have seen a conceptual shift in the mainstream theorization of domestic energy deprivation, onto more complex and nuanced issues of household needs, built environment flexibility, and social resilience. © 2013 The Authors. *WIREs Energy and Environment* published by John Wiley & Sons, Ltd.

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## INTRODUCTION

Until recently, the suggestion that significant parts of the population may be suffering from a distinctive form of poverty because of being unable to access adequate energy services in the home was a nonissue among politicians and academics in much of the European Union (EU). The United Kingdom and the Republic of Ireland were the only two EU states where the material existence and political voice of the 'fuel poor' were widely recognized in public debates, policies, and research. During the past few decades, both of these countries have developed a range of safety nets to support households who struggle to pay their energy bills, while offering various assistance schemes (led by the state, charitable organizations, and businesses) to invest in the energy efficiency of residential housing, especially among low-income households.

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\*Correspondence to: stefan.bouzarovski@manchester.ac.uk

School of Environment and Development, University of Manchester, Manchester, United Kingdom

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Yet recent years have seen the rise of a growing public awareness that issues of domestic energy deprivation are present throughout the EU, with households in Eastern, Central, and Southern European countries being seen as particularly vulnerable. The problem of poor energy services in the home is gaining increasing attention among public advocacy groups and decision-makers at various scales and sites of governance. Yet aside from a handful of studies with a limited conceptual and methodological scope, much of the policy on the subject is being formulated in the absence of systematic and detailed scholarly research. What is more, the limited amount of academic work that already exists tends to be focused on a handful of traditionally visible groups, such as older people and rural dwellers; urban populations (especially those in compact inner-city areas) and more precarious social groups such as immigrants and private renters have received less attention.

Before proceeding toward more detailed research, however, there is a need for taking stock of current knowledge on domestic energy deprivation across Europe. It is also necessary to identify, in a comprehensive manner, the mechanisms through which the emergence of inadequate domestic energy services in the home is connected to broader

governance practices and infrastructural assemblages. This requirement is heightened in light of the pressing concerns of climate change and energy security, which, it can be argued, are indirectly related to the rise and articulation of dynamics of energy poverty in the home: There is evidence to suggest that efforts to move toward low carbon or domestically procured sources of energy supply may drive up the cost of services supplied to households, and change the nature of energy provision in structural terms.<sup>1</sup>

The text that follows is aimed at addressing these issues. Using evidence from relevant papers, books, and reports, in addition to the results of official European panel surveys, I provide some initial insights into the extent and nature of domestic energy deprivation across the EU. The paper overviews the existing knowledge on energy poverty in Europe, while introducing some additional and more recent evidence, in order to pinpoint the main geographical locations and sociodemographic groups at risk from the condition. Particular attention is paid to the wider systemic forces that produce the lack of adequate energy services in the homes of Western, Central, Eastern, and Southern European households. The ways in which governance practices predicate and frame this condition are discussed alongside housing stock matters, to emphasize need for a more comprehensive treatment of the issue in scientific and policy practice.

Aside from the introduction and conclusion, the paper is divided into three sections. At the beginning, I explore the conceptual underpinnings of academic and policy debates surrounding energy poverty. One of my key arguments pertains to the lack of terminological agreement about the linguistic descriptors used to capture the condition: *inter alia*, the expressions ‘fuel poverty’, ‘domestic energy deprivation’, ‘energy precariousness’, and ‘energy poverty’ have each been employed for this purpose. This is one of the reasons why I have decided to use all of these constructs interchangeably in the paper, as different phrases describing the same set of circumstances: the inability of a household to access socially and materially necessitated levels of energy services in the home. The second section of the paper moves onto the background factors leading to this predicament; it distinguishes between research that has been undertaken at the European scale, versus scholarly and policy-orientated work that has been geographically embedded in national or local contexts. The third section of the paper interrogates the social and spatial implications of energy poverty, by identifying the groups, places, and spaces deemed vulnerable to a lack of adequate energy services in the home.

## DEFINING ENERGY POVERTY IN THE EU: KEY DEBATES

The conceptual nexus between energy and poverty has long been riddled with definitional discord. For a long time, politicians and scientists alike failed to recognize that a unique set of issues existed at the intersection of these two domains. A government minister in the UK infamously claimed that ‘people do not talk of “clothes poverty” or “food poverty” and I do not think that it is useful to talk of “fuel poverty” either’ (Ref 2, p. 58). The establishment of a clear ‘fuel poverty’ definition in the British academic and decision-making polity<sup>3</sup> can therefore be considered a pioneering achievement: Not only did it necessitate the creation of new state policy, but it also opened the path for scientific debate over the causes, components, symptoms, and consequences of domestic energy deprivation that mattered when stipulating what the condition entails.

For many years, the official interpretation of fuel poverty in the UK—where this condition is principally seen as the inability to purchase affordable warmth—had proven remarkably resilient despite being challenged in various fora.<sup>4,5</sup> Fuel poverty in the UK is currently described as a situation in which a household needs to spend more than 10% of its total income (before housing costs) on all fuel used to heat its homes to an acceptable level. Two aspects of this definition are especially significant, not the least in terms of the amount of controversy they have attracted: First, ‘needing to spend’ refers not to actual expenditure, but to a hypothetical level that is closely related, *inter alia*, with the thermal energy efficiency of the dwelling; Second, ‘acceptable level’ is taken to mean that the home is heated in line with the standards recommended by the World Health Organization (WHO)—18°C for bedrooms and 20–21°C for living rooms.<sup>6</sup>

Recently, the basic principles of this definition have been challenged by a government-sponsored review undertaken by John Hills<sup>7</sup> at the London School of Economics. This extensive investigation, involving multiple stages of consultation with experts and advocacy organizations, concluded that the existing UK definition has made the fuel poverty measure too sensitive to movements in gas and electricity bills as well as ‘the precise assumptions made for what are seen as adequate temperatures for people to live at, and the incomes reported to a survey that is mainly not focused on income measurement (Ref 7, p. 8). It proposed that the government should adopt a new indicator about the extent of fuel poverty, which would consider households poor

if (1) their 'required fuel costs' are above the median level for the entire population; and (2) spending that amount would leave them 'with a residual income below the official poverty line' (Ref 7, p. 9). However, this approach attracted a significant amount of controversy, as it is expected to lead to a significant reduction in the projected number of fuel poor households, against a background context where the government has 'cut overall support reaching the fuel poor in England by 26 per cent and cut the energy efficiency budget reaching fuel poor homes, the most effective long term solution for tackling fuel poverty, by 44 per cent' (Ref 8, p. 2). These debates reflect a broader unease in the academic and policy community, concerning the methods and approaches for measuring the extent of energy poverty (Box 1).

In addition to the notion of 'fuel poverty'—and as noted above—a raft of similar, but not entirely identical, concepts have been used to describe this condition in other settings; including, *inter alia*, notions of 'energy precariousness',<sup>9</sup> and 'energy deprivation',<sup>10</sup> as well as more narrow terms that refer to some of its symptoms, such as 'cold homes', 'energy non-payment', or 'energy disconnection'.<sup>9,11,12</sup> Further complicating the situation is the existence of a distinct body of research on 'energy poverty' in the developing world. Starting from the fact that an estimated 1.5 billion people in the global South currently have no access to electricity—while 3 million have no choice other than traditional biomass for cooking and heating—such work has mainly been focused on investigating and ameliorating the consequences of inadequate access to 'modern' energy services, as a result of the lack of adequate energy infrastructure. This means that one of the most common scientific understandings of 'energy poverty' is one that focuses not on issues of fuel affordability, but rather explores which factors determine the quality and type of energy services received in the home.<sup>13,14</sup>

In recent years, various scholars have started to argue that reducing the scope of analysis onto a limited set of circumstances (such as energy costs, nonpayment, or health problems) has obscured the broader social, economic, and cultural implications of a household's inability to access adequate energy services in the home. The failure to perceive the complex set of interdependencies between energy and poverty under a common conceptual umbrella, it has been claimed, has prevented scientists and policy makers from seeing the causes of domestic energy deprivation in an integrated manner. Academics working in this vein have emphasized the importance of issues of justice—in terms of procedure, distribution, and recognition—in understanding the

### BOX 1: MEASURING ENERGY POVERTY: A CHALLENGING TASK

The difficulties associated with defining energy poverty fade in comparison with the complexities involved in measuring its incidence and nature. This has traditionally been an extremely challenging task in light of the specific nature of the problem: it is private (being confined to the domestic domain), temporally and spatially dynamic (it varies over time and in different geographical settings), and culturally sensitive (expectations of energy service are subjective and socially constructed). Nevertheless, three main methods have been used in this context:

- examining the level of energy services in the home (heating, lighting, refrigeration, cooling, etc.) via direct measurement, and comparing the obtained values to a given standard;
- analyzing how patterns of household energy expenditure across the population vary in relation to preset absolute and relative lines;
- compiling the subjective impressions of households about the level of energy service reached in the home.

The first approach has not been used on a large scale within the EU because of the technical impracticalities and ethical issues associated with it. Adding to this are the difficulties of defining adequate energy service standards, due to, in part, cultural specificities: it is known that a home normally considered well-lit and warm in one geographical context may not be seen as such in another.<sup>16</sup> However, national statistical agencies across the EU do gather expenditure data via household budget surveys; combined with census data and information compiled through other research studies, this has allowed experts to identify the social groups and spatial locations suffering from disproportionately high energy costs. Subjective data relevant to energy poverty are also collected by national statistical agencies, as well as Eurostat's Statistics on Income and Living Conditions (SILC) survey, which was preceded between 1994 and 2001 by the European Community Household Panel (ECHP). The two surveys contain a self-reported indicator about the share of population that is 'unable to keep the home adequately warm' that provides the only directly relevant and internationally comparative tool for judging the extent of energy poverty at the EU scale. Both SILC and ECHP also contain a range of objective data about dwelling quality and the material conditions of households, which means that self-reported views of thermal comfort can be cross-referenced against other built environment and economic strain indicators. However, the quality of these datasets has often been put into doubt by experts working in the field.<sup>22</sup>

energy-poverty nexus, as well as the technically and temporally precarious nature of access to energy services *per se*.<sup>15,16</sup> Taking into account recent advances in research on social resilience and complex systems,<sup>17</sup> therefore, an ‘energy vulnerability’ framework is being increasingly used to understand such issues. At the same time, insights from the ‘capabilities’ approach<sup>18</sup> and relative poverty<sup>19</sup> have been added to the equation, so as to conceptualize ‘energy poverty’ as a situation in which the level of domestic energy services does not allow for participating in the lifestyles, customs, and activities that define membership of society.<sup>20</sup>

In the EU context, energy poverty and vulnerability considerations were integrated within Directives 2009/72/EC and 2009/73/EC of the European Parliament and the Council, concerning common rules for the internal market in electricity and natural gas supply. Among other points, the directives required member states to adopt a definition of ‘vulnerable customers’. In response to broader difficulties surrounding the identification of this group (see Box 1), the European Economic and Social Committee (EESC) proposed the adoption of a EU-wide definition of energy poverty and the harmonization of existing statistics in order to rigorously assess ‘the energy poverty situation in Europe’. While emphasizing that the number of households affected by this condition could increase, the EESC underlined the need for setting up a European Energy Poverty Monitoring Centre, which could fit within an existing body such as the Agency for the Cooperation of Energy Regulators’. A European Commission report, published at the end of November 2010, also dealt with energy poverty, while recommending that consumers’ interests should be taken into account in energy policy making.<sup>21</sup>

## DRIVING FORCES OF ENERGY POVERTY IN THE EUROPEAN CONTEXT

Comparatively speaking, the majority of evidence about the underlying causes of energy poverty has been generated by studies undertaken in the UK and the Republic of Ireland. Academic research on ‘fuel poverty’ produced in these two states has uncovered that this condition is brought about, in the main, by the interaction of low household incomes with thermally inefficient homes.<sup>10,21,23–25</sup> It has been underlined that the residents of inefficient dwellings are forced to purchase less affordable energy services than the rest of the population because such homes are more expensive to heat. In relative terms, energy ser-

vices are also less affordable to income-poor households, as such families will have lower amounts of disposable funds for such purposes. But the fact that fuel poverty is coproduced by energy efficiency and low incomes means that not all income-poor households will also be fuel-poor. Additionally, the extensive nature of fuel poverty in the UK and Ireland—itsself a product of the two countries’ specific inequality patterns and housing stock structure—has allowed for an additional range of factors relevant to the rise of fuel poverty to be identified by researchers. This has included patterns of housing tenure, the nature of heating systems as well as sociodemographic circumstances such as household size, gender, class, or education.<sup>10,26–29</sup>

Scientists exploring the contingencies of energy poverty in these two countries have often emphasized the deleterious health consequences of living in inadequately heated homes,<sup>17,30</sup> and the relationship between domestic energy deprivation and thermal efficiency interventions.<sup>31–33</sup> It has also been highlighted that energy poverty decreases the quality of life, and influences social attainment.<sup>34</sup> Authors working in this vein have argued that ‘raising incomes can lift a household out of poverty, but rarely out of fuel poverty’ (Ref 3, p. xv), as residential energy inefficiency is the main reason for fuel poverty, and low-income households have to buy expensive warmth. Some researchers have pointed out that the spatial distribution of fuel poverty is highly sensitive to the way in which household incomes are measured. They have claimed that regardless of the operational definition and measurement approach, households who need to spend more than 10 per cent of their income on energy on heating are generally not the same households as those in fact reporting difficulty in doing so.<sup>35</sup>

## Energy Poverty in Continental Europe: Multisited Studies

The amount and depth of energy poverty-relevant research decrease rapidly once the focus is shifted onto continental Europe. Nevertheless, the generic causes of domestic energy deprivation in this context can be inferred from the limited amount of work that already exists. Similar to the UK and Ireland, it is generally accepted that energy poverty in continental European countries arises out of a combination of low incomes and inefficient homes: As pointed out by the EESC, ‘energy poverty is caused by a combination of three factors: low income, inadequate building quality, and high energy prices’. However, the specific energy needs of a household—expressed via demographic circumstances such as household size,

gender, occupation, or class—have also been shown to play a role.<sup>20,29,36</sup> Of no less significance is the nature of housing tenure and heating system, as they may limit the energy efficiency interventions and fuel switching measures that can reduce energy costs.<sup>37,38</sup>

Non-UK and Ireland-based scholarship about the energy and poverty nexus in multiple European countries includes an analysis of housing, fuel poverty, and health in the European context, using data from the ECHP.<sup>39</sup> The study was based on a consensual approach,<sup>1</sup> which, ‘unlike traditional forms of measuring relative poverty . . . does not rely on the opinions or scientific postulates of academics or experts’ (Ref 39, p. xii). It combined objective housing data with ‘indicators of socially perceived necessities’ to demonstrate, *inter alia*, the central role of inefficient homes and poorly designed—or absent—heating systems in the production of energy poverty. Linked to it was an 14 country exploration of excess winter mortality<sup>40</sup>: a seasonal increase in deaths that can be commonly attributed to ‘cold strain from both indoors and outdoors’ (Ref 41, p. 784). It linked information about thermal efficiency standards and mortality patterns with ‘longitudinal datasets on risk factors pertaining to climate, macroeconomy, health care, lifestyle, socioeconomics, and housing’ (Ref 41). The results of this investigation established that ‘those countries with the poorest housing (Portugal, Greece, Ireland, the UK) demonstrate the highest excess winter mortality’ (Ref 41, p. 788); socioeconomic well-being was also shown to play a role.

Also worth noting is the publication of a WHO-led investigation of ‘housing, energy and thermal comfort’ in eight European countries, plus Kazakhstan and Kyrgyzstan. Using a range of independently gathered data, many of the country case studies within this inquiry established that seasonal winter mortality was a problem across Europe. Its conclusions underlined that ‘inadequate housing’ is the fundamental problem in this context. The authors also argued against a pan-European definition of ‘fuel poverty’, emphasizing that it may be ‘more appropriate to give guidance on the factors to be taken into account in developing a national definition’ (Ref 25, p. 10).

Among the most widely cited pieces of research in this domain are the results of the ‘European Fuel Poverty and Energy Efficiency’ (EPEE) project, which used three indicators from the SILC dataset (‘ability to pay to keep one’s home adequately warm’, ‘leaking roofs, damp walls/floors/foundation, or rot on window frames/floors’, ‘arrears on utility bills’) to evaluate the extent of fuel poverty in Belgium, Spain, France, Italy, and the UK. These data were then cross-

referenced with information from other demographic indicators in SILC, as well as national surveys about the level of household incomes, as well as the nature of the housing stock and heating system. The study emphasized that one in seven households in Europe is in or at the margins of ‘fuel poverty’,<sup>42</sup> locating the causes of the condition within the familiar context of low household incomes, insufficient heating and insulation standards, and high energy prices.

Moving further East, the World Bank also sponsored an investigation of heating strategies among the urban poor in Croatia, Latvia, Lithuania, Moldova, as well as Armenia, Kyrgyzstan, and Tajikistan.<sup>43</sup> Even though this inquiry did not use an explicit ‘energy poverty’ lexicon, it did offer a broad-level investigation of household energy consumption and heating patterns in the selected countries. Having illuminated the wider relationship among heating, poverty alleviation, and environmental quality issues, the research provided a series of policy suggestions about the necessary steps to design policies that will enable the provision of ‘clean heat’ in ‘fiscally-sustainable ways’ (Ref 43, p. 23). It should be noted that the study builds on previous World Bank-led work in the region.<sup>11,12,44</sup> Working along similar lines, but with a stronger focus on social policy issues was an exploration of the social safety nets for energy price increases used by Bulgaria, and Romania, in addition to Armenia and Kazakhstan.<sup>19</sup> Having established that ‘energy costs are the highest monthly expense after food for most low-income households in the region’ (Ref 45, p. vii), the study examined the poverty alleviation role played by three types of mechanisms: fuel assistance payments, energy efficiency improvements in low-income residences, and ‘progressive’ tariff structures. It concluded that social protection instruments at the energy-poverty nexus were most effective if they provided a well-targeted and meaningful level of assistance, and were implemented via stand-alone and easily manageable mechanisms. The results of this work were echoed in a report on power sector affordability in South East Europe, which, having undertaken a series of analyses, found that many South East European countries have not yet developed adequate social safety mechanisms to protect energy poor consumers’ (Ref 46: p. 2).

Operating at a broader geographical scale but in more narrow conceptual terms, a working paper published by the European Bank for Reconstruction and Development examined how ‘energy burdens’ (the share of household income devoted to energy) would change across 27 postsocialist countries in Eastern and Central Europe (ECE) and the Former Soviet Union (FSU) in a situation where ‘all utility prices

are raised steadily to reach full cost recovery levels by 2007' (Ref 47, p. 15). Having noted that 'it is surprising how little we still know about the consumption patterns and well-being of low income households' (Ref 47), its authors claimed that 'delaying tariff adjustments may not be an effective way of mitigating the social impact of tariff reform' (Ref 47, p. 19).

In their entirety, such studies confirm that one of the key driving forces of energy poverty in the Eastern European context have been energy price increases undertaken after the fall of communism, so as to bring electricity and gas tariffs—formerly subject to indirect subsidies by the state—up to cost-recovery levels. Work in ECE and FSU has thus revealed a series of 'pervasive geographies' of energy poverty arising from the failure of the state to respond to price increases with adequate social welfare support and energy efficiency investment.<sup>20,37,38</sup> Having provided an in-depth examination of the spatial and institutional aspects of energy poverty in two such countries—the Republic of Macedonia and the Czech Republic—this work has highlighted the significant difficulties faced by disadvantaged households in the region. It has also demonstrated that, in addition to affordability and energy efficiency issues, important dimensions in the rise of energy poverty include the nature of household energy needs, as well as the fact that some demographic groups are 'trapped' in housing arrangements<sup>48</sup> and heating systems that do not allow for switching toward less expensive and more comfortable ways of providing energy services.

Work focusing on the relationship between a household's awareness of climate change issues, on one hand, and energy efficiency retrofits, on the other, has also provided a range of energy-poverty relevant insights.<sup>49</sup> Most importantly, it has highlighted that the 'poor conditions of apartment buildings and the feeling of being cold or uncomfortable' play a key role in driving energy-related renovations in privately owned dwellings. Energy poverty relevant evidence can also be found in a study of 'the effects of energy reforms on the probability of households experiencing deprivation, defined as difficulty in paying the bills' (Ref 50, p. 253). Authors working in this vein provide a range of statistical analyses of EHCP and SILC data for Denmark, Belgium, France, Ireland, Italy, the Netherlands, Spain, Austria, Finland, Luxembourg, Norway, and Sweden. Their conclusions highlight that 'unbundling vertically integrated activities in the electricity sector and reducing public ownership in the gas sector are both correlated with higher probability of experiencing deprivation' (Ref 50, p. 262). More recently, academics have once again used a statistical analysis of SILC data to explore the relation-

ship between self-reported energy poverty-relevant indicators and other sociodemographic and spatial variables.<sup>51</sup> In addition to housing quality and income, their results indicate that energy hardship may also be predicated on factors such as geographical location, with rural households being particularly vulnerable in this context. They highlight that 'a policy of retrofitting energy efficiency measures in the domestic housing stock could have the multiple benefits of addressing Europe 2020 targets, improving the housing stock, while also reducing fuel poverty' (Ref 51, p. 33).

### In-Depth Research at the National and Local Scale

It is worth noting that research relevant to the causes and consequences of domestic energy deprivation has also been produced in relation to the circumstances of particular countries. One of the most influential debates in this regard commenced with a highly publicized paper on the welfare effects of raising household energy prices in Poland.<sup>52</sup> Its empirical analysis was based on data from the 1993 Polish household budget survey, 'which contains information on the expenditures of 16,044 Polish households, surveyed between January and June 1993' (Ref 52, p. 55). Examining the expenditure patterns of households in five equivalent income quintiles led the authors to conclude that 'not only did the better off spend a larger absolute amount on energy than the poor, they also consumed a larger proportion of their expenditures as energy' (Ref 52). A similar analytical approach was used in research of the extent to which 'electricity tariff increases in Ukraine hurt the poor' (Ref 53, p. 855), whose authors recommended that price increases up to levels comparable to those in OECD countries 'should only be realized in steps' (Ref 53).

The results of these studies have been favorably received in policy circles; the fact that their findings chimed in with the neoliberal agenda for energy sector unbundling and privatization pursued throughout Europe—and particularly in the East—during the past 15 years has allowed them to be widely cited in the literature on energy sector reform. Even though the use of elasticities and consumer surplus to estimate social welfare in conditions of 'very high price increases' has been problematized by some,<sup>54</sup> many policy discussions of the distributional consequences of energy restructuring have widely cited the finding that implicit energy price subsidies benefit the 'rich' more than the 'poor'.<sup>37</sup> This particular statement has become stylized knowledge applicable to the entire

postsocialist context, although the data in question refer only to two specific countries.<sup>55</sup>

Also focused on issues of energy affordability as they relate to price increases is an investigation of the distributional effects of regulatory reforms in the Italian water and energy utility sectors.<sup>56</sup> Using a range of regional, demographic, and climatic indicators, its authors have constructed an affordability index for public utility consumption, so as to overcome the absence of an official fuel poverty definition in Italy. Their findings, which are based on statistical modeling of large datasets from the Italian family budget survey, indicate that ‘in the period considered, reforms in the water, natural gas, and electricity markets were not accompanied by exacerbated affordability issues in Italy (Ref 56, p. 162).

Recent years have seen the publication of several studies using an explicit energy poverty framework in the design of research methods and approaches. A United Nations Development Programme-supported investigation in Serbia and Montenegro provided an integrated and comprehensive take on the relationship between energy, poverty, and environmental problems. It introduced access considerations to the equation, by distinguishing indicators relevant to the provision of energy services—including fuel consumption and the use of household energy appliances—and measures of the sufficiency of energy services, such as space heating, ventilation, domestic hot water, and cooking.<sup>15</sup>

Other ECE states have also been the subject of scientific attention in the field of domestic energy deprivation. The expansion of energy poverty in Bulgaria has been documented using interview and national household survey data, and with reference to EU and national policies;<sup>21</sup> part of the context for such work stems from the fact that in addition to having some of the highest rates of households reporting inadequate domestic thermal comfort in the SILC survey, this country has also implemented extensive energy privatization and liberalization reforms during the past 15 years.<sup>2</sup> Developing the theme of housing and heating ‘entrapment’ in the Hungarian case, researchers have highlighted ‘the importance of a household’s physical and institutional settings for the likelihood of fuel poverty’ (Ref 57, p. 7). This largely refers to the legacies of inefficient housing constructed during ‘heavily subsidized energy prices and connected to an outdated energy supply system’ (Ref 57).

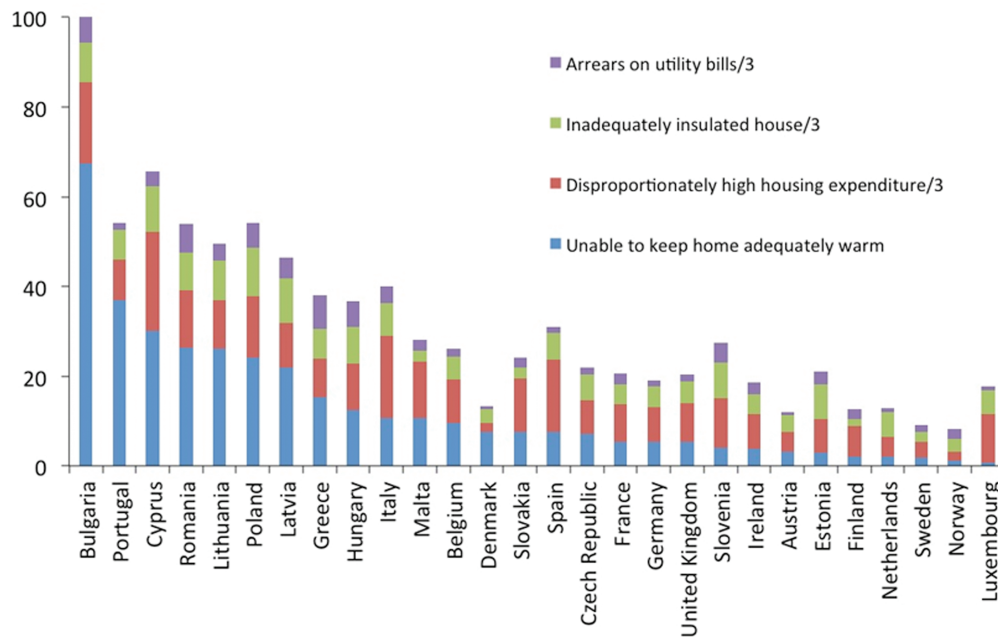
Significant forays are also being made into scientific understandings of the underlying causes of energy poverty in various Southern European countries, where the condition has received almost no academic attention to date. This includes insights into

the causes and patterns of energy poverty in Spain;<sup>58</sup> such work has demonstrated the existence of a close link between unemployment and energy poverty, in addition to establishing that existing social safety nets are failing to provide adequate assistance to energy poor populations. A recent study in the Greek capital Athens has uncovered the links between low incomes and energy efficiency by establishing that ‘low income people are more likely to be living in old buildings with poor envelope conditions’ (Ref 59, p. 893). Operating on a vastly different—but no less relevant—scale, research of energy-saving interventions in this country’s mountainous areas has led the author to conclude that ‘utilizing locally produced biomass and applying energy-saving measures can bring households below the energy poverty limit’ (Ref 60, p. 284).

Central and Western European countries are also beginning to attract interest. An exploration of the everyday strategies that are employed by Austrian households in order to alleviate domestic energy deprivation has revealed that ‘energy-inefficient windows, buildings and housing sites are the cause of heavy burdens’ (Ref 61, p. 7) for this group. Conceptualizing processes of targeting, identification of households, and implementation as three interdependent steps<sup>62</sup> has highlighted the complex errors of inclusion and exclusion implicated in the design of France’s nascent fuel poverty policy. The rapidly increasing amount of public attention and state funding attracted by the energy poverty predicament in this country has been accompanied by the expansion of scientific research devoted to the issue, especially in terms of the relationship between vulnerability patterns and support policies.<sup>63</sup> Several recent contributions indicate that energy poverty is even present in countries like Germany, where rates of social inequality and inefficient housing are at record low levels.<sup>64,65</sup>

## PATTERNS OF ENERGY POVERTY: DIVERSE REALMS OF VULNERABILITY

I now turn to the social and spatial patterns of domestic energy deprivation across Europe, which, as evidenced by some of the work reviewed above, are highly geographically variable and locally contingent. General insights about the geographic extent of energy poverty in the EU can be gleaned from published SILC data. Based on the consensual approach,<sup>4</sup> the information generated by the subjective measure on ‘inability to keep the home warm’ can be combined with more objective data about the shares of each country’s population facing disproportionately high



**FIGURE 1** | A composite fuel poverty indicator based on the shares of populations in different EU countries facing selected energy poverty-related problems, with the values of the three 'objective' measures divided by 3 (2003–2009 average). Created using data from Eurostat's Statistics on Income and Living Conditions (SILC) survey.

housing burdens, living in low quality dwellings or having arrears on utility bills. Dividing each of these objective indicators by 3 (as they do not necessarily demonstrate energy poverty themselves), and adding them to the more direct subjective measure referring to the level of domestic heating, offers broad information about Europe's spatial patterns of energy poverty (Figure 1).

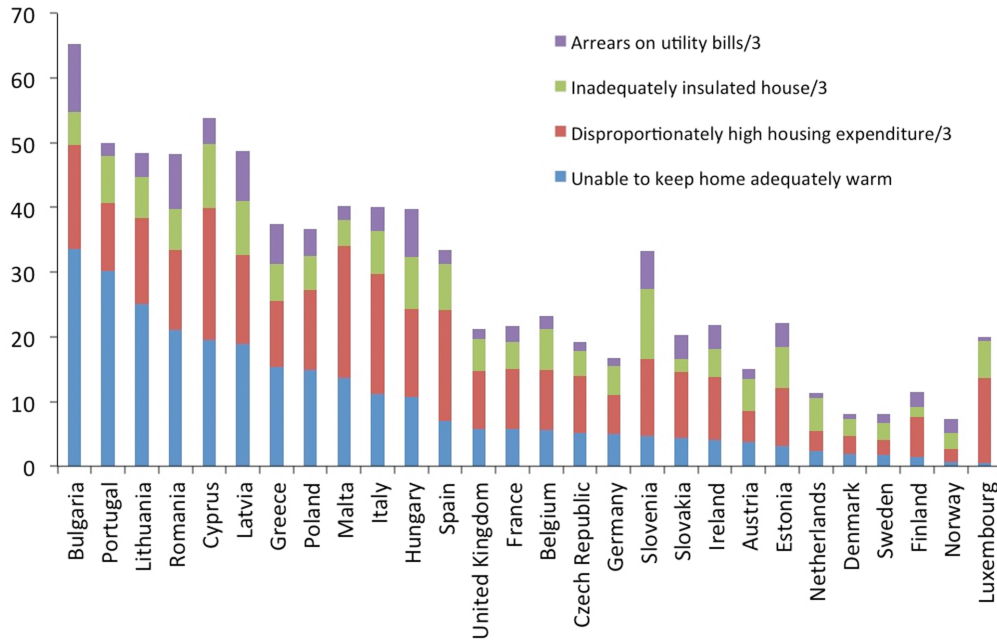
The highest shares of populations with insufficient self-reported domestic warmth are concentrated in the part of the EU that is constituted by the post-socialist states of ECE (also referred to as the EU-10), especially Bulgaria. In such countries, the share of the population reporting inadequately heated homes has been 20.0%, whereas the value of the composite fuel poverty indicator is 44.5%. This is against EU-wide averages of 12.8 and 31.7%, respectively. Also scoring high according to the same criteria are the eight EU countries that border the Mediterranean sea, where 16.6% of the population has reported being 'unable to keep their home adequately warm', whereas the composite fuel poverty indicator reaches 43.58%. Exploring the same indicators for the most recent available year (2010 in most cases) reveals similar results, with the shares of populations unable to keep their homes adequately warm in the EU-10 and Mediterranean countries registering at 14.8 and 14.6%, respectively. The values of the composite fuel poverty indicator are 40.1 and 39.5% in this case

(see Figure 2). Most notably, there has been a surprisingly large (and somewhat doubtful) halving of the percentage of Bulgarian respondents who have stated that they live in poorly heated homes.

Although cultural differences may partly explain the disproportionately high prevalence of self-reported inadequately heated homes in Eastern and Southern Europe, there is little doubt that energy poverty is objectively present in these parts of the continent to a much higher extent than elsewhere. The structural causes of energy poverty in the two regions, however, are markedly different.

ECE states have provided fertile ground for the expansion of energy poverty due to the unique combination of cold climates, above-average rates of inefficient residential buildings, insufficiently developed and/or decaying infrastructure, high rates of income inequality, and systemic issues in the management of energy, social welfare, and housing operations. The socialist centrally planned economy left behind an energy sector that was entirely state-owned and -run, with indirect cross-subsidies from industry to the residential sector creating a pricing structure whereby household energy tariffs were set at below cost-recovery levels.<sup>30</sup> Consequently, most countries in the region undertook dramatic price increases in order to remove such subsidies, while unbundling and privatizing energy companies so as to open up the industry to competition.<sup>13,22,66,67</sup>

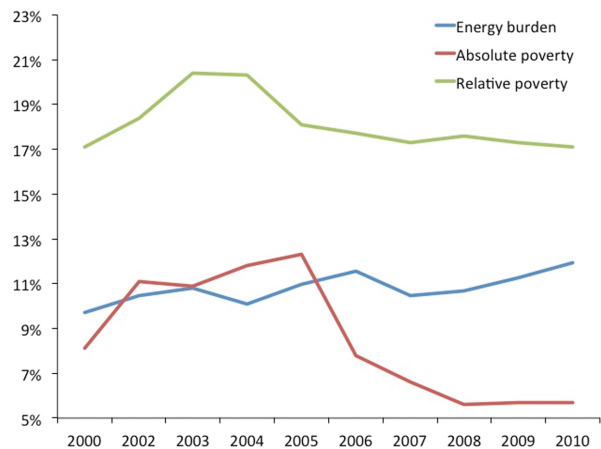




**FIGURE 2** | Values of the energy poverty indicators described in Figure 1 for 2010 (extrapolations from 2009 data have been made in cases where 2010 data are not available). Created using data from Eurostat’s Statistics on Income and Living Conditions (SILC) survey.

During the postsocialist transition, however, most governments were unable to provide adequate social assistance and energy efficiency investment to protect vulnerable households from energy price increases. This meant that many families had no option other than to cut back on their energy purchases. The concurrent rise in income inequality and overall poverty, alongside the initial lack of concerted efforts to improve the energy efficiency of rapidly decaying housing stocks and energy infrastructures, has created a situation whereby energy poverty now includes large parts of the population.<sup>19,37,47</sup> In Poland, for example, the average ‘energy burden’ (the share of energy expenditure within total household expenditure) has been steadily increasing between 2000 and 2010, even though both absolute and relative poverty have fallen during the same period. This suggests that energy affordability problems are widespread among the population, and that the expansion of economic prosperity is failing to relieve the pressure of rising energy costs on household budgets (Figure 3).

The high prevalence of energy poverty in Mediterranean countries has been attributed to the lack of adequate heating systems, as well as the overall poor quality of residential dwellings, which has resulted in insufficient thermal insulation. In 2004, it was reported that only 12, 8, 6, and 16% of Greek households had, respectively, cavity wall insulation, double-glazing, floor insulation, and roof insulation in their homes.<sup>39</sup> The situation was worse in Portu-



**FIGURE 3** | Changes in the energy burden versus relative and absolute poverty in Poland between 2002 and 2010. Created using data from Central Statistical Office, Household Budget Surveys in 2010.

gal, where the corresponding figures were 6, 3, 2, and 6%. Nearly a quarter of Portuguese households had stated that they had rotten window frames, whereas a third revealed that they had patches of condensation on the indoor walls of their home (both of these conditions are considered good indicators of poor energy efficiency). Moreover, the same study found that 16, 19, and 11% of households in, respectively, Greece, Portugal, and Spain are suffering from leaking roofs, indicating the absence of adequate roof insulation. An additional problem in Mediterranean states

is posed by the need for cooling. According to SILC data, 30% of the population in the eight states bordering the Mediterranean Sea has reported that they are unable to keep their homes adequately cool in summer. Almost two thirds of such households are considered income poor, whereas 70% of them are above 65 years of age.

Countries such as the Republic of Ireland, the UK—and to a lesser extent Belgium and France—constitute a third geographical realm with above-average rates of energy poverty in the EU. For example, it has been reported that the indoor damp, itself a very strong indicator of energy poverty, is particularly prevalent in these countries.<sup>4</sup> For the reasons outlined above, the Republic of Ireland and the UK have developed a wide range of measures to combat the problem: in the UK, the Warm Homes and Energy Conservation Act, effective November 2000, has resulted in the implementation of an unprecedented set of policies for fuel poverty reduction, embodied in the 2001 UK Fuel Poverty Strategy. According to this document, fuel poverty reduction targets should be achieved by eliminating fuel poverty among ‘vulnerable’ households (older persons, sick, and disabled households and families with children) by 2010, expanding to all households by 2016. Still, as a result of increasing energy prices, the proportion of all households experiencing fuel poverty has been on the rise in recent years.<sup>3,4</sup>

The large-scale geographic variations discussed above mean that energy poverty is particularly concentrated in Southeastern Europe, where millions of households are likely to be suffering from a lack of adequate domestic energy services. Conventionally vulnerable groups such as ‘pensioners, unemployed, low income households’ have been particularly hard-hit, especially in the states that have not yet developed ‘adequate social safety mechanisms’ to protect energy-poor consumers.<sup>46</sup> The limited extent of certain types of networked energy infrastructures (particularly gas)

means that, in addition to inefficient residential stocks and affordability issues, energy deprivation is also predicated upon the spatial and technical limitations associated with switching toward more affordable fuel sources in the home.<sup>15,20,37,38</sup> The demise of district heating systems—associated with spiraling supply costs and vicious cycles of disconnection,<sup>68</sup> and coupled with rapidly rising electricity prices—has meant that some parts of the population have had no option other than using fuelwood for heating. This is particularly evident in Bulgaria, where switching toward this source of energy has a clear income dimension.<sup>21</sup>

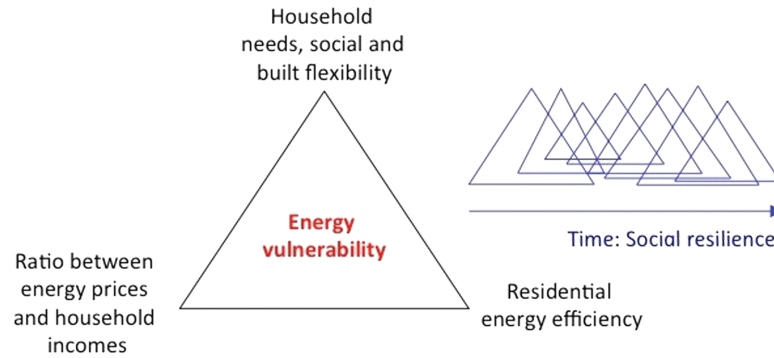
Overall, the academic literature has found above-average rates of energy and fuel poverty among older people, families with children, and households with disabilities, long-term illness, or infirmity.<sup>26,29,36,37,69</sup> In the Irish context, for instance, ‘over half of elderly households endure inadequate ambient household temperatures during winter’ (Ref 4: 329). The EPEE project has also identified as vulnerable populations those out of work or in poorly paid jobs, and those dependent on social security benefits.<sup>69</sup> Earlier, it has been established that the group most susceptible to persistent energy poverty in the EU-15 is single parents, followed by lone pensioners.<sup>30</sup> It has also transpired that households living in multifamily apartment blocks are more likely to be suffering from energy poverty if they live in Northern as opposed to Southern Europe, partly due to income differentials. Tenure has also shown to be an important predictor of energy poverty, with households living in rental homes more vulnerable to the condition (Ref 30).

The height of the energy burden is often a good predictor of the sociodemographic groups suffering from energy poverty. In Poland, for example, disproportionate expenditure on energy is correlated to household size among pensioners, with lone pensioners facing particular difficulties (Table 1).

**TABLE 1** | Energy Burdens Among Polish Households According to Household Size and Occupational Profile in 2010

Household Members	Average	Employed			Self-Employed	Pensioners
		Manual	Nonmanual	Farmers		
1	14.4%	14.0%	9.2%	–	–	17.8%
2	12.5%	13.1%	8.8%	15.5%	9.7%	16.1%
3	10.8%	12.3%	9.0%	13.8%	9.6%	14.3%
4	10.8%	12.1%	8.9%	12.4%	10.8%	14.3%
5	12.3%	12.5%	10.6%	12.0%	11.8%	14.2%
6+	12.0%	13.0%	10.6%	10.5%	11.5%	13.6%

Above-average energy burdens are indicated with grey shading (source: Central Statistical Office, *Household Budget Surveys in 2010*).



**FIGURE 4** | Components of a conceptualization of energy poverty via a vulnerability lens.

Above-average rates of energy expenditure can also be found in the case of all households headed by ‘manual’ workers and farmers. On average, large households are more likely to suffer from this condition compared with medium-sized households. Similar trends can be found across other Eastern European states.<sup>21,52,69</sup>

## CONCLUSION

There is little doubt that energy poverty is a pervasive problem across the EU, and is likely to expand in coming years as a result of anticipated energy price increases. For a long time, however, systematic research on issues of domestic energy deprivation in the much of the EU was scarce, especially in the countries of ECE and the Mediterranean where this condition is likely to be most pronounced. This means that, other than the UK and the Republic of Ireland—which have a long tradition of academic scholarship and policy frameworks to address the issue—energy poverty measures in the rest of the EU are nascent, and lack a rigorous scientific basis. Understanding the causes, content, and consequences of energy poverty is all the more pertinent in light of the increasing policy attention that is being paid to the issue within various EU institutions.

The complexities of the energy-poverty nexus in Europe are somewhat obscured by the existence of a relatively well-established definition of ‘fuel poverty’ in the UK and Ireland, where the problem is officially reduced to the lack of affordable energy for heating. To an extent, this reflects the narrow conceptualization of the issue in much of the relevant academic literature, where the causes of energy poverty have often been situated within the triad of incomes, prices, and energy efficiency to date. However, more recent scholarship has shown that the physical and institutional arrangements underlying built environment formations and everyday household practices

are just as important in this context. Thus, allowing households to access energy at a materially and socially necessitated level is just as much a question of ensuring an adequate match between housing types, heating systems, and household needs, as it is about incomes and energy efficiency. In broader terms, therefore, we are witnessing a conceptual shift in the mainstream theorization of domestic energy deprivation, away from the present narrow focus on poverty, access and energy efficiency, onto more complex and nuanced issues of household needs, built environment flexibility and social resilience (see Figure 4).

The reviewed evidence also indicates that the driving forces of energy poverty are themselves embedded in locally specific social, political, and environmental circumstances. For example, even though countries with colder climates would be expected to exhibit a greater incidence of energy poverty, the size of the population affected by domestic energy deprivation is estimated to be the lowest in Scandinavia; conversely, it has reached record levels in Southern Europe, where higher rates of income poverty and poorly insulated homes are clearly playing a determining role, in addition to the fact that many dwellings lack satisfactory heating systems. Similarly, despite possessing some of the highest energy prices in Europe, the incidence of energy poverty in Germany is judged to be significantly lower than that in, for example, Bulgaria, where energy prices are comparatively modest. In the case of the latter, however, the underlying causes of the problem reside in the poor affordability of gas, electricity, and heat services and the inadequate energy efficiency of the residential sector.

On the practical side, there are significant opportunities to address the issue via demand-side energy efficiency policies—mainly in the form of deep building retrofits and appliance market transformations. Such measures are clear win-win solutions in the case of energy poverty, as they can also assist

the broader process of poverty alleviation. Given the major social and geographical differences in the incidence of energy poverty within the EU, it can be argued that these policies are best delivered at the regional scale. A possible approach to achieve such a goal might be the development of a regional-level indicator of energy poverty, whose value might then be

tied to EU assistance for residential energy efficiency. Given the scarcity and fragmentation of scientific evidence regarding the constituent dynamics and regional distribution of energy poverty, the execution of an EU-wide review such as the one conducted by Professor John Hills in the UK might be beneficial in this regard.

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