ComAct

Community
Tailored Actions
for Energy Poverty
Mitigation

Overview report on the energy poverty concept

Energy poverty in the privately-owned, multi-family environment

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Abbreviations

2M indicator	Share of energy expenditure in income indicator
BPIE	Building Performance Institute Europe
CEE	Central and Eastern Europe
CIS	Commonwealth of Independent States – former Soviet states
ESCO	Energy service contracting
EU	European Union
HFH	Habitat for Humanity
HOA	Home-owner association
HVAC	Heating, cooling, and air conditioning
LABEEF	Latvian Baltic Energy Efficiency Facility
LIHC	Low income high cost
LTRS	Long-term renovation strategy
M/2 indicator	Hidden energy poverty indicator
MFAB	Multi-family apartment building
NECPs	National Energy and Climate Plans
NGO	Non-governmental organisation
REELIH	Residential Energy Efficiency for Low-income Households project
RRF	Recovery and Resilience Facility
SILC	Survey on Income and Living Conditions (Eurostat)
UK	United Kingdom

ComAct Community Tailored Actions for Energy Poverty Mitigation

Table of Contents

Executive summary

Energy poverty as a concept has a long tradition, and energy subsidies for low-income households have been a major part of social policy in West and Central and Eastern Europe (CEE) as well as former Soviet Republics (CIS). Due to different political and economic circumstances, such as the higher homeownership rate in multi-family apartment buildings (MFABs) and the worse performing building stock, energy poverty rates in Eastern Europe and the CIS are much higher than in Western Europe.

The European Union (EU) provides a good framework and guidance on how to include energy poverty as a concept and measures to fight it in its regulation for the National Energy and Climate Plans (NECPs), and also in the Renovation Wave. There are financial mechanisms and dedicated funds for building renovation, and money is earmarked within the Recovery and Resilience Facility, but the implementation in Member States so far is not sufficient to alleviate energy poverty.

In this report we have taken a deep dive into five countries – Hungary, Lithuania, Bulgaria, North Macedonia and Ukraine – to look at their energy poverty rates, how the energy-poor are identified, and what programmes are in place to support them. Furthermore, we have identified existing financial schemes from all over Europe, which have proven to help alleviate energy poverty in multi-family apartment buildings. Key findings on the differences in their energy poverty concepts are:

- The definition and use of indicators for identifying energy poverty are very different across the countries, and therefore cover different target groups. This shows that the fight against energy poverty has a strong political character.
- Existing definitions use the household as a unit. Building-level energy poverty definitions would be useful (what makes a MFAB energy-poor?) to identify energy-poor buildings, which would be helpful in developing targeted building-level energy efficiency interventions and policies for MFABs.
- The fact that energy poverty has an income and an energy aspect means that tackling the problem requires complex interventions in different policy areas which have an impact on each other.
- Apart from high energy poverty levels, the CEE and CIS regions also have other things in common: underheating is widespread due to low income, solid fuels such as wood are used for heating (which are not part of common energy poverty statistics), and the vast majority of dwellings are privately owned with insufficient financial subsidies available for building renovation.
- One indicator cannot capture all relevant aspects of energy poverty; and target groups are different depending on the indicator. Therefore, we suggest that multiple indicators are combined.
- Cooling is becoming an increasingly important issue as the climate crisis worsens. Living in a dwelling which is not comfortably cool should be recognised as a primary indicator.
- In CEE and CIS countries, issues around privatisation and liberalisation fundamentally influence energy markets and affordability. Price subsidies and price regulations have in the past contributed to the affordability of energy, but at the same time they hinder energy efficient interventions.

None of the implementing countries has an actual definition of energy poverty, which makes it difficult to define the target groups. Key takeaways from the research on the five countries are:

- Bulgaria has the highest share of energy-poor households among EU Member States. According to different indicators about 10-35% of the population is energy-poor, while only 3.6% get a heating allowance. The current renovation programme has no income components.
- Hungary has a relatively low level of energy poverty compared to the other pilots (5-10%). Energy poverty is concentrated in rural areas, and family houses are more affected due to their low energy efficiency. However, MFBAs have very specific problems (such as a large variety of apartment owners) that make renovation more challenging from an organisational point of view. Hungary uses the term 'vulnerable consumer' for policymaking, which is tied to social status. There are no socially targeted renovation subsidies available.
- Lithuania has the second highest energy poverty level at 10-26%. MFABs in urban areas are more affected by energy poverty in comparison to single family houses in rural areas. There is no official definition but in practice there are some measures like heating allowances and socially targeted renovation schemes which aim at alleviating energy poverty.
- North Macedonia already includes energy poverty in some strategic documents and has policies targeting vulnerable energy consumers. The rate of energy-poor households is approximately that of Lithuania and Bulgaria. Although the condition of buildings is worse in rural areas, the problem of energy poverty is much more severe in urban areas due to the affordability of energy.
- Ukraine has a large energy poverty problem since the phase-out of its very high energy subsidies during the last five to six years. There are subsidy schemes, but as there is a large energy-poor population and the building stock has very low energy performance it is difficult to target these schemes at the most vulnerable consumers.

In a final step the report identifies and evaluates financial tools which are already in place and specifically target energy-poor households. The main findings were:

- Although heating subsidies and social tariffs help reduce the worst effects of energy poverty for energy-poor households during the winter months, it is no long-term solution to get these households out of energy poverty. The beneficiaries often only form a small share of the total amount of energy-poor households, which is partially caused by the narrow definition of energy-poor or vulnerable customer applicable in these instruments.
- The budgets for instruments aiming for structural renovation are significantly higher than those aimed at promoting energy audits, disconnecting protection, informing or raising awareness. The volume of the budget is important to achieve results and realise the potential health, social and energy efficiency benefits that can be achieved through energy poverty instruments.
- Few of the financial instruments analysed consistently achieved deep renovation.
- The accessibility of instruments for the energy-poor is closely related to the presence or absence of grant elements for vulnerable building owners.
- The transferability of energy poverty instruments depends on factors like the availability of funding, the existing national regulatory framework, the structure of the national building stock, housing tenure structures, decision-making procedures in home-owner associations, and energy poverty rates.
- Policy instruments effectively combatting energy poverty include financial support for structural building renovation as well as auditing, and information and awareness-raising measures targeted at the household.

Introduction

Energy poverty is becoming increasingly recognised as a crucial problem in Europe. The phenomenon is highly uneven, with the Central and Eastern European (CEE) region and the former Soviet Republic countries (CIS region) reporting the most energy-poor people [1]. There are important differences between these two large European regions, which have a common past, but knowledge of the energy poverty situation is still very low. The driving factors for energy poverty are household incomes, the energy efficiency of buildings and appliances, and energy markets; coupled with much weaker social systems than in Western Europe.

The ComAct – Community Tailored Actions for Energy Poverty Mitigation – project therefore focuses on energy poverty and regional specificities in these countries. One of the important features is that due to the very high homeownership rates, the traditional renovation schemes shaped by Western European experiences – where energy-poor people typically rent their homes – are hardly applicable here. A new approach is needed, as there are a significant number of people in CEE living in their own apartments who need support to renovate their homes. Widely available deep renovation of residential buildings can be an outstanding tool in the fight against energy poverty as well as climate change, two major interlinked challenges. ComAct contributes to the development of supporting schemes that make energy-efficiency interventions affordable for vulnerable people, and thus reduce the high energy poverty level in the CEE and CIS region while providing healthy and sustainable living conditions.

The main goals of this report are to:

- Give an overview on the concept and measurement of energy poverty, with a special focus on its applicability in the CEE and CIS regions;
- Present the energy poverty situation in the five pilot countries of the ComAct project: Bulgaria, Hungary, Lithuania, North Macedonia and Ukraine;
- Give an overview of the EU legislation and current developments regarding energy poverty; and
- Assess existing financial support programmes against energy poverty.

At the time of writing this study, the most recent data available for the authors was mostly from before the Covid-19 pandemic. It should be noted that the social and economic consequences of the pandemic are thought to have influenced energy poverty levels. First, the economic crisis and growing unemployment led to decreased incomes in many households. Second, the pandemic arguably increased energy usage in residential homes, because people spent more time at home and many activities relied on digital communication. As these trends are not reflected in our results, the energy poverty numbers presented here may be considered conservative estimates. Covid-19 may also influence relevant policy fields in the countries studied. Where this has already been the case, it is noted in the document.

The study has been written by BPIE and MRI, and is based on an extensive literature review and desk research. The authors also relied on the knowledge of the partners from the five pilot countries.

1. Generic energy poverty concept

The concept of energy poverty is receiving growing attention in Europe – at least on the level of scientific discourse and in strategic documents of EU Member States. The benefits of studying energy poverty (as identified by the REELIH project) are listed below [2]:

- Contribute to the visibility of the problem of energy poverty for decision-makers
- Understand and define the different aspects and layers of energy poverty that can help elaborating energy poverty strategies
- Highlight the need for combining energy policies and other policy fields, such as social, housing or health policy.

1.1. Dilemmas and challenges regarding the definition of energy poverty

Energy poverty does not have a universal definition, however, the description used by the REACH study can be considered common in the pertinent literature [3]. According to this, '*[a]n energy-poor household is one that has a difficulty, or sometimes inability, to be able to afford its basic energy needs needed for indoor activities, such as heating, cooling, cooking, and lighting*'. The term 'fuel poverty' is often used interchangeably with energy poverty. Fuel poverty is more frequently used in English and Irish literature, and sometimes it includes not only domestic energy sources but also the energy used for transportation. In some cases, the usage of 'vulnerable consumers' is intertwined with energy poverty (see e.g. ASSIST Consortium's Vulnerable Consumers and Fuel Poverty Report [4]). However, 'energy poverty' has become the most common term to describe domestic energy deprivation in Europe [5].The bulk of the literature addresses three major causes of energy poverty:

- High energy prices
- Low household income
- Poor energy efficiency of buildings and appliances.

In some cases, it is compounded by further issues in the energy sector, such as the lack of a sufficient energy service level in a particular area.

Based on this definition and the underlying causes it is important to realise that two major aspects of energy poverty must be considered simultaneously [6]:

- Quality aspect: providing a proper level of heating, cooling, and lighting.
- Affordability aspect: providing the proper energy services at affordable prices.

Consequently, if the energy costs for the household are affordable but the energy service level is low (e.g. the indoor temperature is too low during winter) we have to consider a household as energy-poor, while a household is also energy-poor if sufficient energy is provided but at an unaffordable price.

Many think that energy poverty is practically equal to income poverty, and there is no reason to create a specific approach towards it. However, if we acknowledge that poverty is one of the main reasons for energy poverty, we must be aware that without specific interventions to reduce energy consumption and improve energy infrastructure, energy poverty will not be tackled sustainably and will lock its recipients into receiving subsidies for life. Thus, energy poverty should be a combined matter of energy and social policies.

Furthermore, the fact that energy poverty lies at the intersection of different sectors increases the importance of the concept, but it also leads to specific challenges from a policy perspective. As Bouzarovski *et al.* point out, there is a 'need for concerted policy action to address energy poverty, through a combination of measures in the energy, social, housing and health sectors' (p6) [1]. Figure 1, taken from a 2015 Insight Report, gives an overview of the main drivers and layers of the issue [7]:

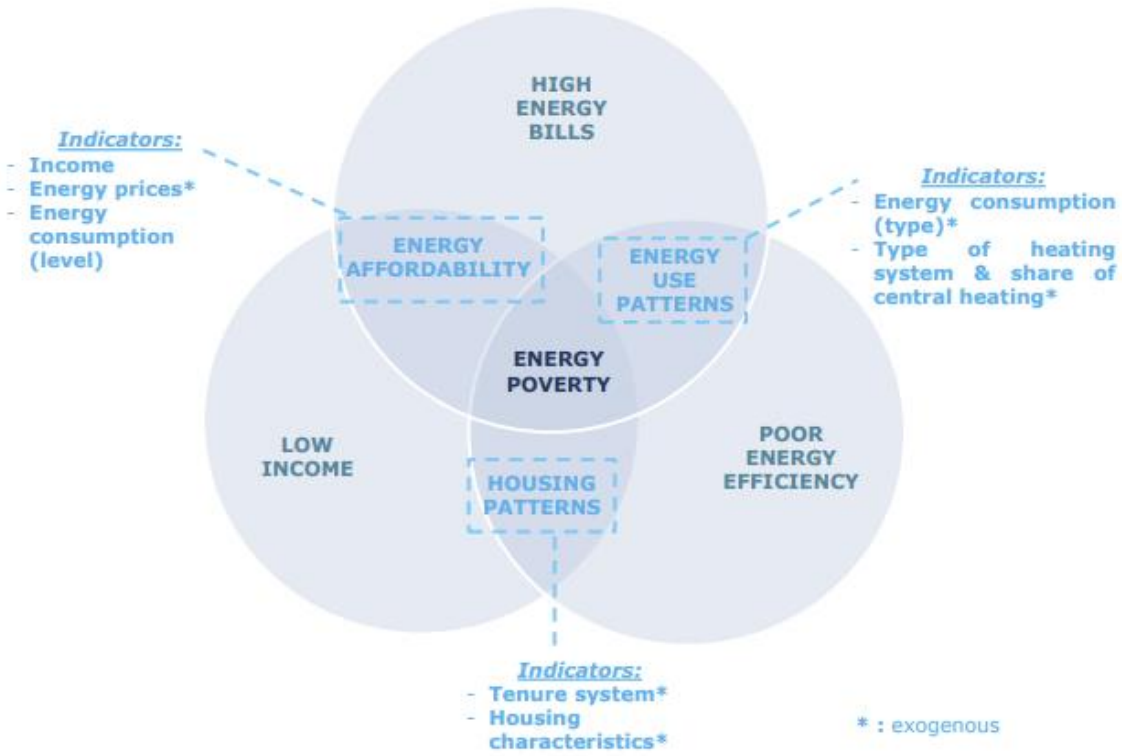

Figure 1: Drivers of energy poverty and key indicators. Source: Insight Report 2015 [7]

Being a complex, multidimensional and highly context-dependent phenomenon, the concept of energy poverty is not easy to grasp empirically. The widespread effort to operationalise and measure it has resulted in a variety of indicators. As different measurement methods lead to different target groups and policy consequences, choosing one approach over another is not merely a scientific decision, but also a political one [8].

The complexity of the concept stems from several challenges:

- Quality and affordability aspects
- Different energy sources available (e.g. firewood is not included in the utility costs)
- Difficulties of defining 'adequate needs'
- The complexity of the underlying causes of energy poverty
- Different strategies of energy-poor households (e.g. underheating the dwelling vs. disproportionate energy costs)
- Differences in the local context (e.g. energy market, tenure structure, building stock).

1.2. Measuring energy poverty

The energy poverty indicators presented in this chapter can be divided into three broad categories. The first two approaches cover the most commonly used methods, which are often called primary indicators.

- **Consensual approach or subjective indicators:** the focus is on how the household experiences comfort or affordability.
- **Expenditure-based approach:** the focus is on the share of energy expenditures within the total household income.
- **Complex indicators:** relatively new, less widespread methods that aim to grasp the complexity of energy poverty by combining a number of indicators.

1.2.1 Consensual approach or subjective indicators

Some of the most widely used energy poverty indicators belong to the consensual approach or 'subjective' indicators. These are typically based on the self-reporting assessment of households in household surveys. In Europe the most important data source is Eurostat's Survey on Income and Living Conditions (SILC), covering not only EU Member States but also third countries such as some in the Balkan region. One of the most commonly used indicators is the '**inability to keep home adequately warm**'. The adequate temperature is not defined in the question, and consequently this indicator can be influenced by the consumption preferences of the respondents. This indicator records the experienced comfort level of households and its affordability according to them, not necessarily the amount of energy that is sufficient for maintaining the officially recommended temperature in the dwelling. It can be argued that adequate temperature can be defined based not only on narrow health considerations but also on social norms. For example, if a family are reluctant to invite guests to their home because they cannot provide the socially accepted level of warmth, it may lead to social isolation even if the temperature levels are adequate. The major weakness of this indicator is that it covers only one type of energy usage, namely heating.

Another main SILC indicator is the '**arrears on utility bills'** which covers energy expenditures more widely, although not fully. It is not applicable for firewood or any other solid fuels, thus it hides a significant portion of energy poverty in countries where a lot of people rely on firewood and other solid fuels, mostly but not exclusively in rural/suburban areas and detached houses. Further, in some countries utility bills include other charges as well as for energy.

Another important energy poverty indicator, which belongs to the consensual approach, is the '**share of people living in dwellings not comfortably cool during summer'**. The acceleration of climate change is increasing the average temperature from year to year, as well as the frequency and intensity of heatwaves. The lack of proper cooling in the summer might result in serious health issues and has a significant effect on wellbeing. Nonetheless, the issue of cooling is still underrepresented in the discourse over energy poverty, especially compared to heating [9]. Conceptually, the EU Energy Poverty Observatory considers this indicator to be just as relevant as the primary indicators, as it displays a severe problem faced by many energy-poor households [1]. However, it is a secondary indicator due to the lack of a comparable amount of data. Unfortunately, this data is not collected in the SILC survey annually, only in the so-called ad hoc modules of 2007 and 2012.

1.2.2 Expenditure-based approach

One of the most common measurements based on the expenditure-based approach is the **2M indicator**, which is also called 'high share of energy expenditure in income'. This indicator assesses the energy cost/income ratio of a household relative to the typical consumption patterns of society. According to this indicator, households are considered energy-poor if they spend more on energy from their income than double the median energy expenditure/income ratio. The origin of this method is Brenda Boardman's research in the UK: she defined energy poverty as a situation where a household spends more than 10% of its income on energy, based on data from 1988 when the typical energy expenditure was around 5% [10]. Later it turned out that the 10% limit cannot be applied automatically; rather, the limit should be set based on the (double of the) median in the given country. Currently, in most European countries the median energy expenditure significantly exceeds the 1988 level.

There are two ways of measuring energy expenses. One considers the actual cost of consumption paid by a given household, based either on self-reporting or energy bills. The other method uses the modelled/calculated cost of energy needed to heat the dwelling to an adequate temperature, based on the building type, the size of the flat and the household composition. The first approach gives a more realistic picture of the actual expenses of the household and builds on the assumption that the consumption level of most poor households corresponds to their basic needs. The second approach shows how much energy a household would need theoretically, filtering out over- or underconsumption of energy. According to Tirado-Herrero, using actual consumption instead of the modelled energy needs systematically underestimates the severity of the energy poverty problem, as energy-poor people typically spend less on energy than would be needed for their health and wellbeing [11].

The other expenditure-based primary energy poverty indicator is called **M/2** or **'hidden energy poverty'**. This definition aims to work with the fact that energy-poor people do not necessarily have disproportionally high energy costs, but rather sometimes they spend extremely little on energy. This indicator points at energy-poor households who spend less than half of the median level on energy. It may happen either because they maintain a dangerously low temperature in the dwelling, or because they leave some of the rooms unheated. Collecting firewood also often relates to energy poverty and may lead to low energy expenditures. According to Bouzarovski and Thomson, however, low energy costs can be indicative not only of hidden energy poverty but also of high energy efficiency requirements, which lead to households consuming low amounts of energy [1]. The two major expenditure-based indicators correspond to two distinct strategies of energy-poor households. Nevertheless, either in case of too high or too low energy expenditures, energy-poor people restrict their basic needs to make ends meet – even if basic energy needs or other expenses, such as food or rent, are prioritised.

The **Low Income High Cost (LIHC)** method belongs to the expenditure-based method as well, although it is not considered a primary energy poverty indicator. LIHC was introduced in the UK and it replaced the previously used Boardman method (see above). According to the LIHC method, a household is considered energy-poor when its (modelled/calculated) energy costs are above the national median level, and after paying for that required amount, its residual income remains below the official poverty line. The strength of this method is that by examining the absolute amount of residual income, it grasps the financial situation of energy-poor households in a more sophisticated way than the preceding ones do [6]. However, *'this method has a major drawback (besides the heavy data requirements): it assumes that a household should have more than median calculated energy usage to be energy-poor. Poor people may live in very small apartments with lower than median energy costs, that could still have problems paying their bills'* ([6], p5).

Table 1 presents the strengths and weaknesses of the indicators of the consensual and expenditure-based approach.

Table 1: Comparison of consensual and expenditure-based indicators

Indicator	Data source	Primary/Secondary	Strength	Weaknesses
Consensual approach				
Inability to keep home warm	Eurostat SILC (annual)	Primary	• Captures the consequences and the lived experience of energy poverty • Allows EU-wide comparison	• Might be biased by the respondent's perception, e.g. their intent to cover their vulnerability • Binary indicator, cannot grasp the intensity of energy poverty
Arrears on utility bills	Eurostat SILC (annual)	Primary		
Dwelling not comfortably cool in summer	Eurostat SILC ad-hoc modules (2007, 2012)	Secondary		
Expenditure-based approach				
High share of energy expenditure in income (2M)	HBS (annual)	Primary	• Covers all types of energy services • Grasps the financial burden of energy expenditures directly	• Dilemmas regarding the actual vs. modelled energy expenditures; arbitrariness of thresholds • Influenced by the distribution of income within the country • Some of the indicators cannot handle the over/under-consumption behaviour • Differences among countries in the cost of other essential goods (e.g. food) are not handled
Hidden energy poverty / low share of energy expenditure in income (M/2)	HBS (annual)	Primary		
Low Income High Cost (LIHC)	Local statistics	Secondary		

1.2.3 Complex indicators

An innovative attempt to give a sophisticated definition of energy poverty has been made by the **Austrian Social Ministry**. Its study is based on several interviews with experts and proposes a complex indicator. In the first step, it defines household members at risk of energy poverty as the ones who are *'at-risk-of-poverty*[1] *(…) and find it difficult or impossible to utilise basic energy services (heating, hot water and electricity) within their household'*. As a second step, the definition identifies energy-poor household members among the ones being at risk of energy poverty and affected by at least three disadvantages related to housing conditions or the financial burden of energy costs. Factors describing housing conditions include poor quality of the dwelling (e.g. damp walls), lack of access to energy, lack of necessary electric devices. Disadvantages describing the financial burden of energy costs include being unable to heat the home adequately, high energy costs relatively to the total household income or expenditures on other basic needs, arrears on utility bills. According to this complex indicator, to be considered energy poor three of these disadvantages must apply for the household, as well as at least one out of each categories (housing conditions and financial burden of energy costs). [12].

The Hungarian NGO **Energiaklub** created a similarly complex indicator based on the Hungarian social context. Households should be considered energy-poor if they meet three criteria at the same time [13]:

- The yearly total income of the given household is below 60% of the median income of Hungarian households (consequently they are at risk of poverty).
- The ratio of the modelled yearly cost of the energy necessary to heat the dwelling to 20°C and produce hot water to the total household income exceeds the 2M level calculated, based on the self-reported energy consumption and income data from all the households.
- The energy efficiency rating of the building is worse than category 'F'.

It should be noted that both the Austrian and Hungarian indicators narrow down the group of energy-poor to those who are considered income-poor too. It is a strong statement, as the bulk of the energy poverty literature finds it important to differentiate conceptually between income poverty and energy poverty. According to the most common methods, a significant share of energy-poor people are not considered income-poor. The approach represented by these two complex indicators focuses on those energy-poor households that are also affected by income poverty, implying that the intersection of energy poverty and income poverty requires the most attention from decision-makers.

The list of indicators presented here is far from exhaustive. There are several other secondary indicators which can be used as proxies for the severity of energy poverty in a society, such as energy prices, dwellings with leaks, damp or rot, or excess winter mortality. A detailed list of such indicators can be found in the table by Bouzarovski and Thompson in the Annex [1].

[1] According to Eurostat's At-risk-of poverty rate (AROP). It is defined as the 'share of persons aged 0+ with an equivalised disposable income below 60% of the national equivalised median income.' https://ec.europa.eu/social/main.jsp?catId=818&langId=en&id=8

1.3. Energy poverty levels across the EU

In a working paper for the REELIH project the authors compared the results of applying different measurements in different countries [6]. They compared the distribution of four SILC indicators within the total population of European countries: dwellings with leakages and damp walls, arrears in utility bills, those unable to keep their homes comfortably cool, and those unable to keep their homes adequately warm. Based on these data from 2012, the paper concluded that different countries appear the most vulnerable when applying different indicators, which implies that these indicators represent different understandings of energy poverty. An Energy Poverty Observatory report pointed out the same fact in comparing self-reported consensual and expenditure-based indicators [1]. The following maps (Figures 2-5) show the distribution of energy-poor households in Europe based on the four most commonly used indicators with updated data. Figures 2 and 3 represent ***arrears on utility bills*** and the ***inability to keep home adequately warm*** in 2018.

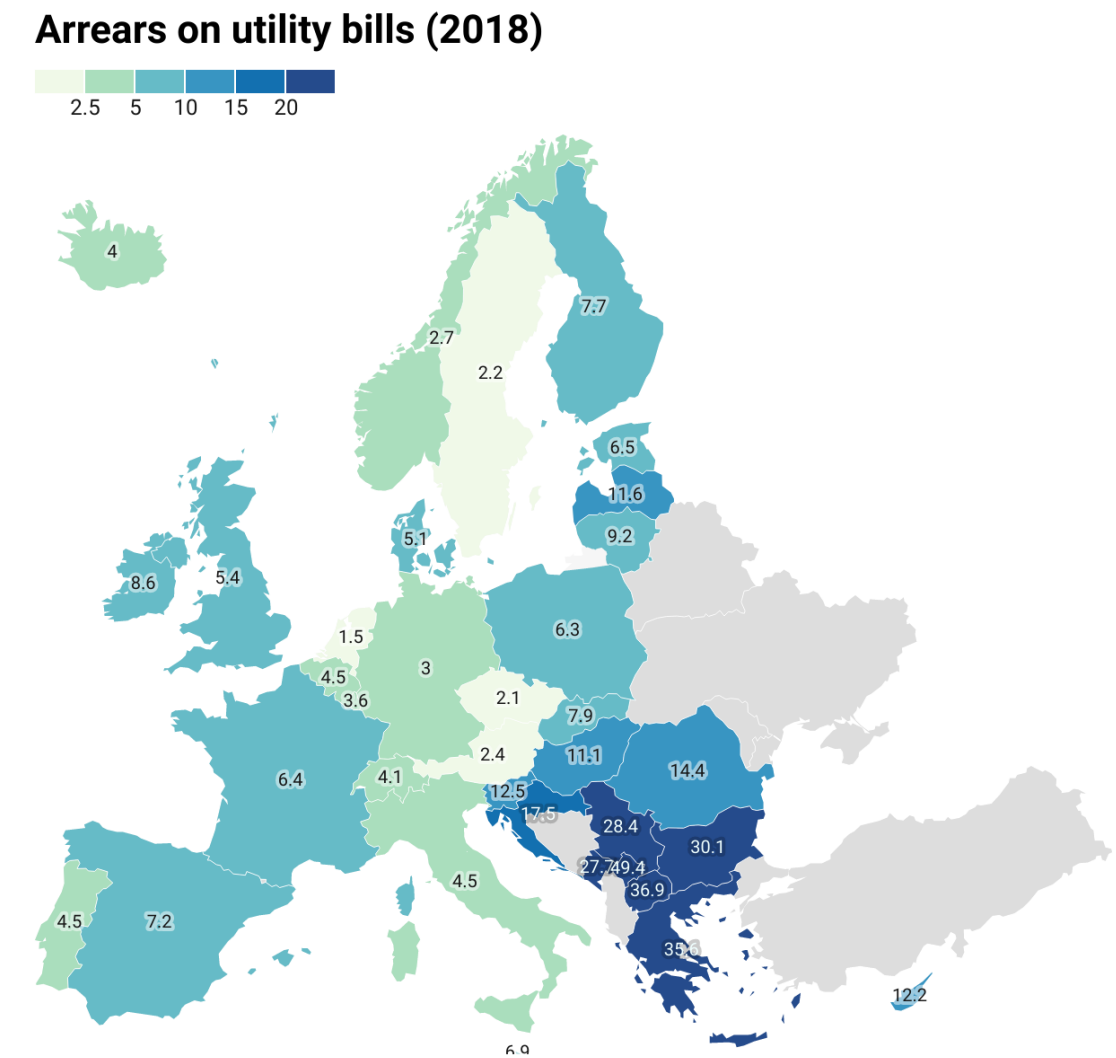

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Figure 2: Share of population that reported arrears on utility bills (based on Eurostat SILC database)

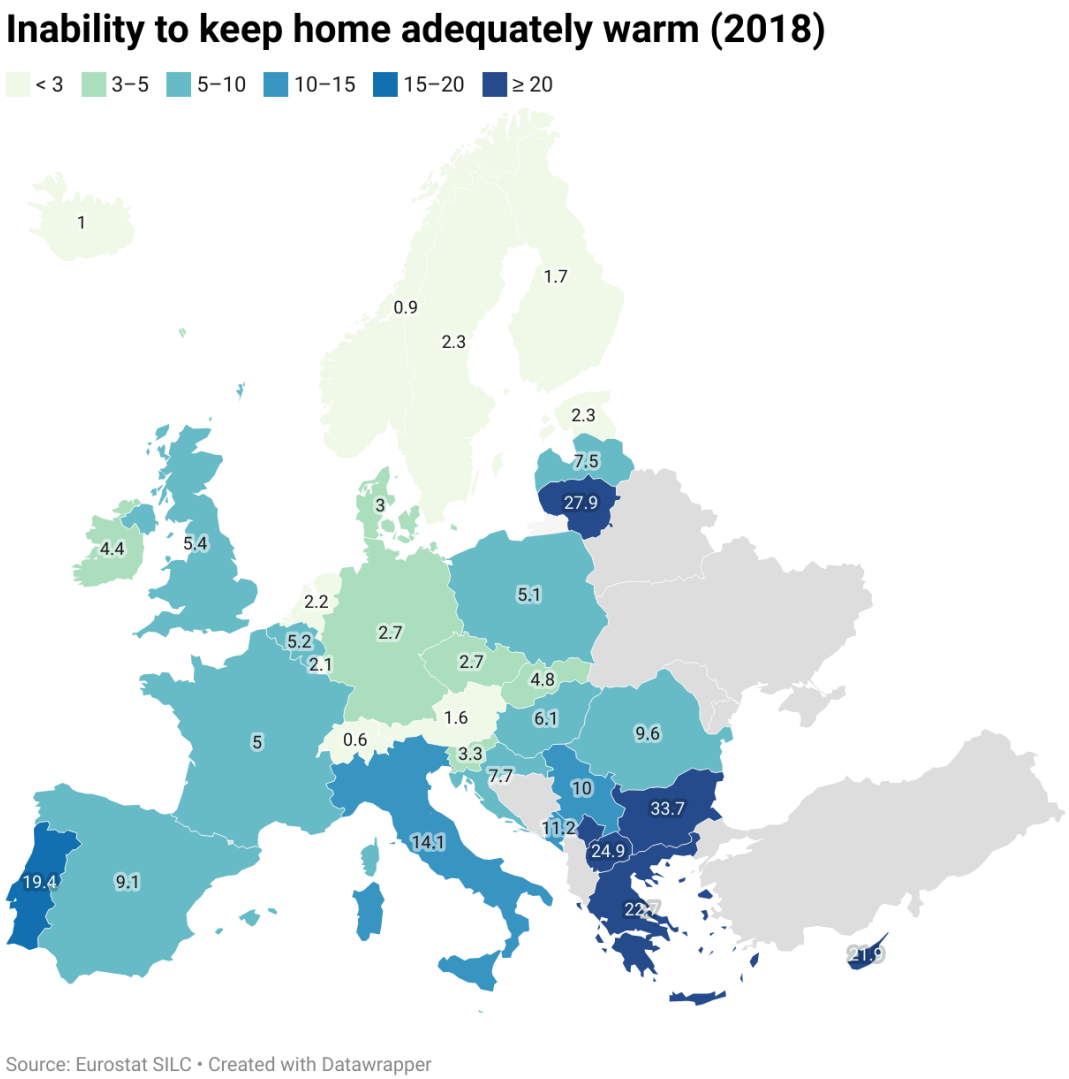


Figure 3: Share of total population that reported inability to keep their home adequately warm. Own figure based on Eurostat SILC database

Figures 2 and 3 illustrate that the inability to keep the home adequately warm and having arrears on utility bills show similar patterns. Both consensual indicators show a divide between the southern and western parts of Europe. The available CIS countries underperform in both categories. Some countries, such as Portugal and Lithuania, are ranked completely differently depending on the indicator. Both have rather low shares of the population with arrears on energy bills, but relatively large shares of households are unable to keep their homes adequately warm. Ukraine is not included in the SILC database: here, 30% have an inability to keep their home warm, while 59% of households have arrears on utility bills.

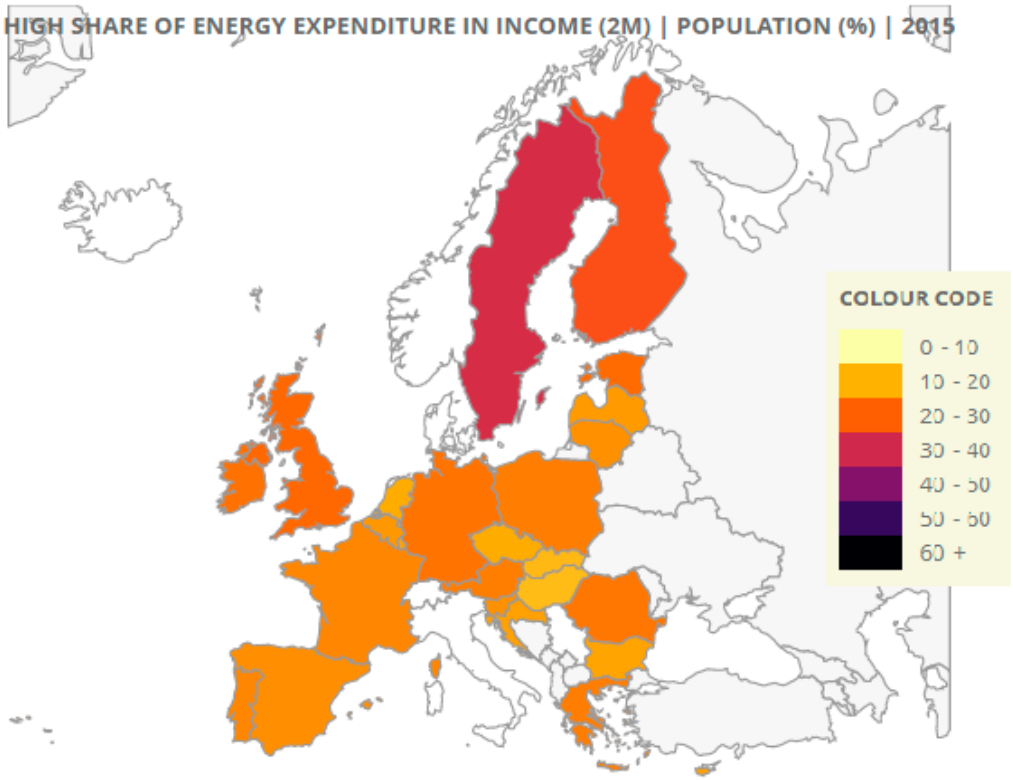


Figure 4: Share of population having higher energy expenditure than double the median value (Source: Energypoverty.eu/indicator)

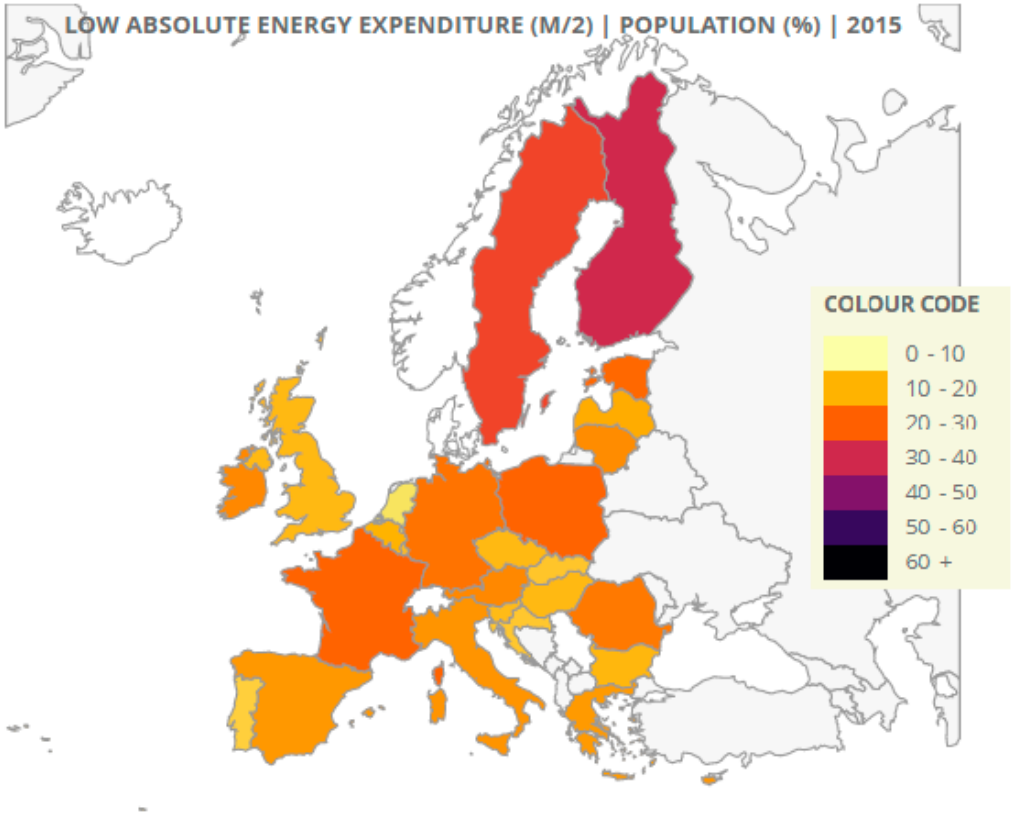


Figure 5 Share of population having less energy expenditure than the half of the median value (Source: Energypoverty.eu/indicator)

Data for the ***expenditure-based indicators, 2M*** and ***M/2*** are available from only some European countries from 2015. These indicators show a slightly different picture than the subjective indicators do. As for the high share of energy expenditure in income (2M), we see less spatial variance than in the case of the SILC indicators. Moreover, CEE and the CIS countries included are not at a disadvantage compared to Western or Northern Europe, most probably due to lower energy prices – even compared to incomes – and because underheating is very common, which artificially decreases the share of energy costs. Hidden energy poverty (M/2) turns the tables even more conspicuously. Sweden, which was among the best performers with the self-reported indicators, seems to be in the most disadvantaged situation according to the M/2 indicator[2]. As it was indicated above, a high level of M/2 can be interpreted not only as a high level of 'hidden energy poverty', but also as reflecting strong energy efficiency in buildings, which is a possible explanation of the unexpected distribution.

Regarding expenditure-based measurements, Bouzarovski and Thomson highlight some important methodological points to interpret the results [1]. In countries with more equal income distribution, variance in energy expenditures may increase the level of the 2M indicator. High variance in the share of

[2] This can be partly explained by the fact that in Sweden heating cost is often included in rent, and the variance in energy/income shares is high [5].

energy expenditures in income can be explained not only by inequalities among different household groups over energy consumption and income, but also by the fact that in some cases energy costs are included in the rent. The study also notes that the level of hidden energy poverty is influenced by how absolute energy expenses are divided among households under the median consumption. A high M/2 indicator can be the result of a high median and an unequal distribution within the lower half of the population [1].

Climatic conditions in themselves do not appear to explain cross-country differences. Combined with other aspects, however, they can shape the nature of energy poverty in a country. For example, as the REELIH report highlights, in Southern Europe apartments are often not equipped with built-in heating facilities, because winter in general is relatively warm. However, those who cannot ensure adequate complementary heating devices suffer from the cold when the temperature drops below 10°C [6]. Climate change is leading to increasing variance in temperature and more frequent extreme weather events, such as unusually cold winter days in regions that are used to relatively warm winters. Thus, the lack of proper heating infrastructure may be a growing problem in Southern European countries[3].

Interestingly, the effect of climatic conditions on the share of those living in ***not comfortably cool dwellings in summertime*** (see Figure 6) is also not clear. On the one hand, the worst performing countries according to this indicator are in the south of the continent (Portugal with 35.2% and Bulgaria with a staggering 49.5%). Also, high shares can be found in CEE and northern countries like the Baltics or Finland, which indicates that summertime has become extremely hot all over Europe, while the use of air conditioning is still not common (presumably due to behavioural or financial reasons). The EU average for the share of dwellings not comfortably cool during summertime was 19.2% in 2012.

[3] Extreme weather events in the winter of 2020 in Spain are considered an illustration of this phenomenon. https://english.elpais.com/spanish_news/2021-03-05/has-the-weather-gone-mad-this-winter-in-spain.html

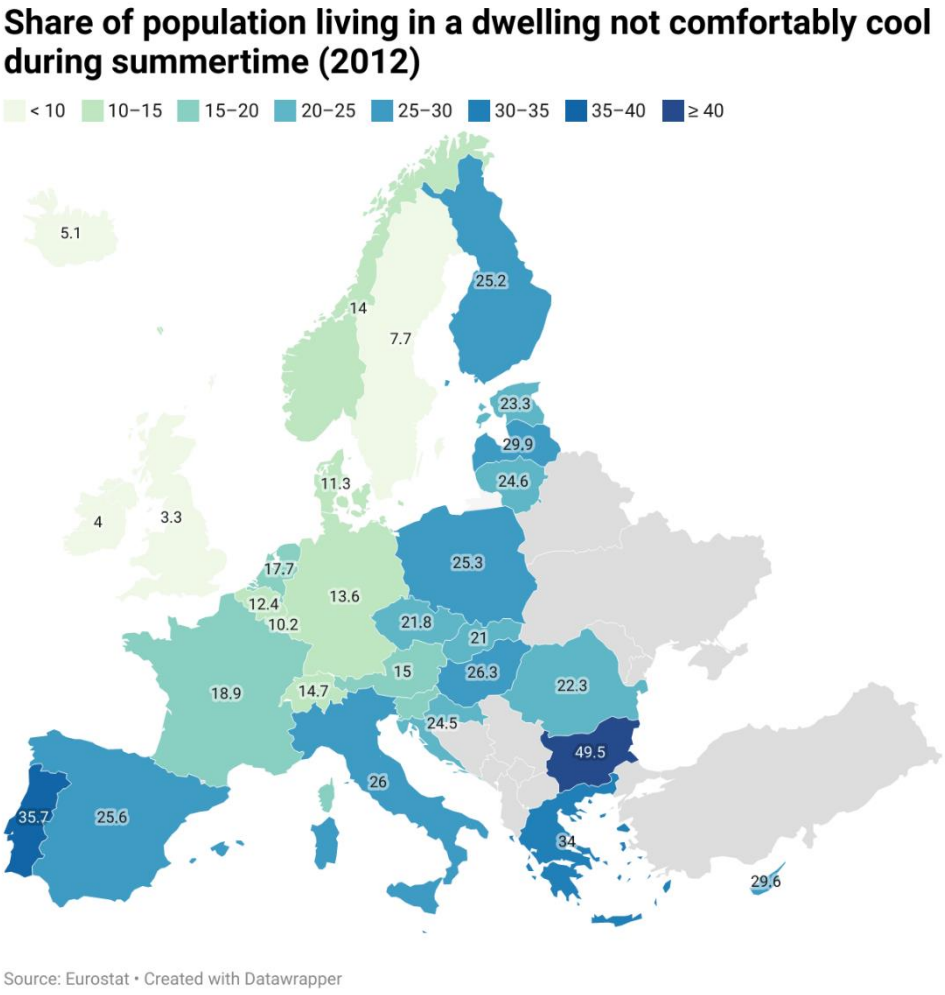


Figure 6: Share of population that reported living in a dwelling not comfortably cool during summertime. Own figure based on Eurostat SILC data

The knowledge and suggested solutions dominating the prevailing energy poverty discourses tend to build on experiences and data from Western Europe. ComAct aims to highlight the specificities of the CEE and CIS regions, which need to be taken into consideration to tackle energy poverty in these countries. In addition to the higher concentration of energy poverty according to the consensual indicators, there are important differences shown through other indicators, such as energy efficiency of the building stock, energy consumption and patterns, energy market and housing conditions. Figure 7, taken from a report of the InventAir project, illustrates the higher residential energy demand in the eastern part of Europe [14].

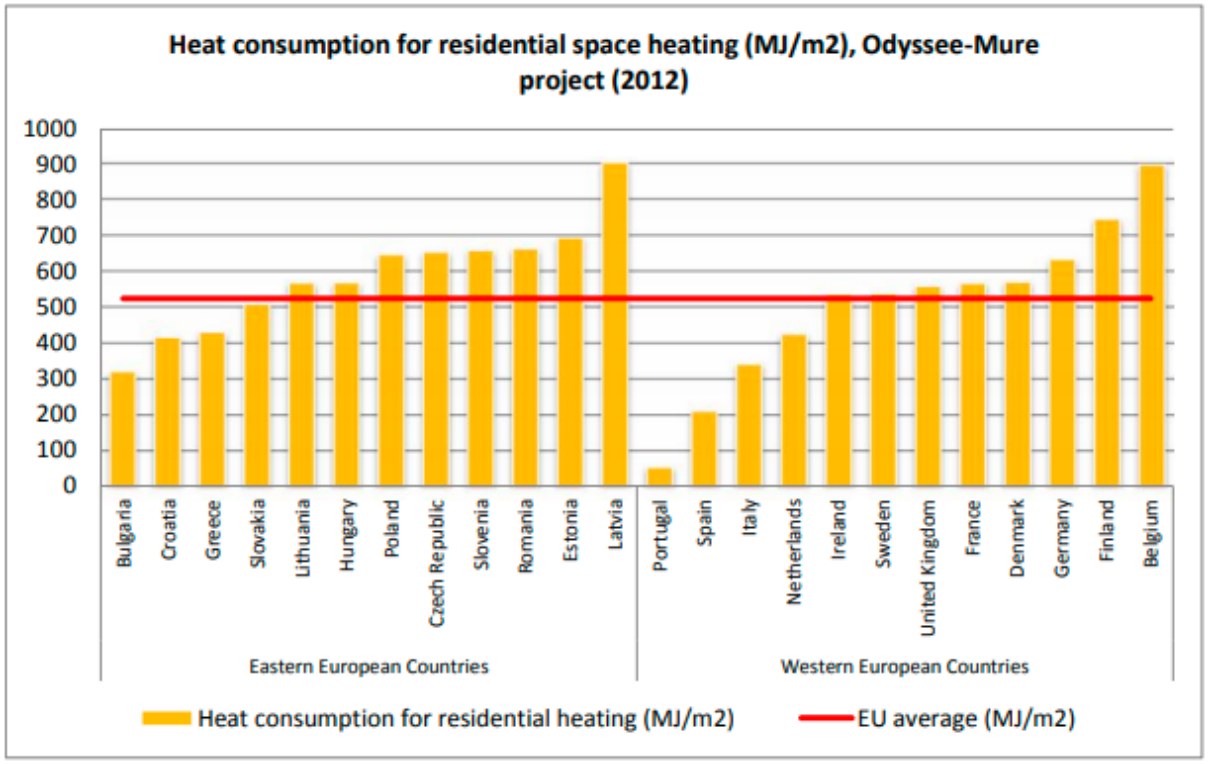


Figure 7: Heat consumption for residential space heating (MJ/m^2)

Regarding the ***energy efficiency of the building stock***, there are significant differences not only along the East-West divide but also between CIS and CEE countries. Countries in the CIS region face a much more severe energy efficiency problem than those in the CEE region. An Ecofys paper studied the energy efficiency regulations for building insulation across Europe [15]. They compared the existing requirements with a cost-optimum scenario, which would lead to the best outcome also from an economic and climate perspective[4]. Figure 8 represents the difference between the current requirements for roof insulation (left) and the modelled outcome of recommended cost-optimum regulation (right) in European countries.

[4] Methodology: they used the so-called U-value, which is a term used to describe the amount of heat loss that occurs through an element of construction such as a wall or window. The lower the U-value the less energy is lost and the better the insulating characteristics.
https://www.eurima.org/uploads/ModuleXtender/Publications/13/EURIMA-Ecofys_VII_leaflet_0412071.pdf

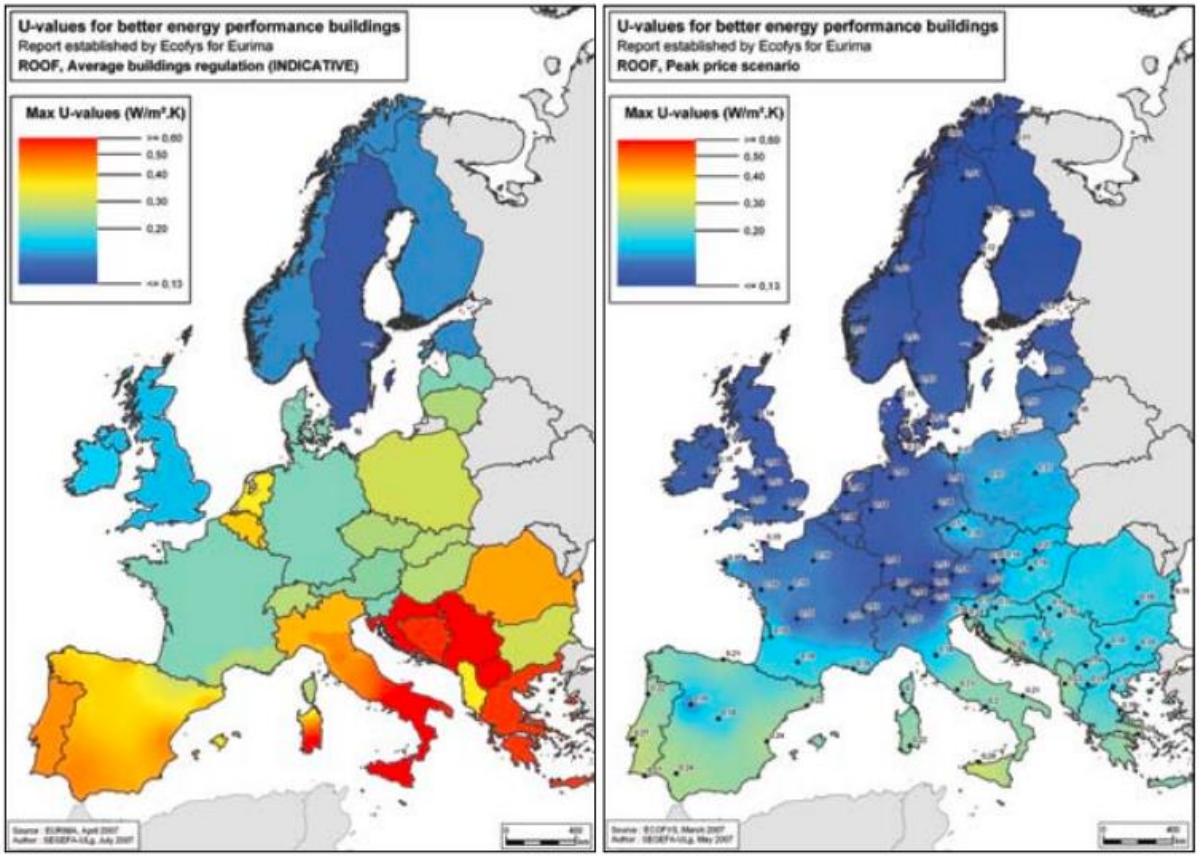


Figure 8: U-values of the building stock based on the energy efficiency requirements in each country (W/m^2)

The figure shows that the CEE region's regulations are closer to the optimum, but they are still behind the Western European and Scandinavian region. The map on the right shows that by insulating roofs the gap between the different regions of Europe could be narrowed. The results are similar in the case of wall insulation.

In Central and Eastern Europe and the Balkan region, ***heating with firewood and other solid fuels*** is more widespread than in western and northern parts of Europe. This gap is even wider if we include the CIS countries in the analysis. Heating with solid fuels is especially widespread in rural and suburban areas, but in the Balkan region it is present in urban areas as well and even in MFABs, as we can see in the case of North Macedonia (see Chapter 3.4 of the present study). This can be caused by a lack of infrastructure and availability of modern energy services, or a lack of modern appliances. In some cases collecting firewood from a nearby forest is the only affordable solution for poor rural households. As these fuels are rarely included in utility costs, the share of households with arrears on utility bills most probably underestimates the level of energy poverty in these countries. If wood is not bought but collected, it might appear in the statistics as a smaller financial burden than having to pay for utility bills. However, collecting wood is often a physically demanding and time-consuming task that may place a heavy burden on households, particularly for women. Furthermore, air pollution – a harmful effect of heating with solid fuels and old stoves in these neighbourhoods – is not captured in energy poverty indicators.

There are further social and economic aspects of the regional divides within Europe regarding energy poverty. One of them is that ***household incomes in CEE and CIS regions are substantially lower*** than the EU average, which has important consequences regarding energy poverty and the energy efficiency of the building stock [16]. As we lack comparable data on such sophisticated indicators as the Low Income High Cost measurement of the UK, we cannot accurately compare households' residual incomes after paying for their energy bills across Europe. Thus, there is a need for data to capture the specific situation of countries with lower median wages and other incomes. Even with the same share of energy expenditures within the household budget, the absolute amount of residual income can make a huge difference regarding the social situation of the given family or person. Also, low wages and low amounts of personal savings make energy-efficient investments hardly affordable or attractive for residents. Thus, state support and financial tools available for lower-income people are of particular importance.

Furthermore, energy poverty indicators, like many methods of measuring poverty or wellbeing, take the ***household as a unit***. This makes it challenging to assess energy poverty in MFABs, as residents with various social backgrounds may live in the same building, the energy efficiency of which affects all residents. In Western Europe, energy-poor people living in MFABs are typically renters of publicly owned dwellings, which makes both identifying energy poverty and implementing energy-efficient interventions relatively straightforward. In the CEE and CIS region, however, energy poverty in MFABs typically affects homeowners, frequently with a mixed social composition within the same building. As energy-efficient interventions with the highest impact (e.g. deep renovation of buildings) require building-level action and the cooperation of different homeowners, there is a need for a method to identify energy-poor buildings as well, not only energy-poor households.

1.4. Policy implications of different energy poverty definitions

Cross-country comparisons lead to different outcomes depending on which energy poverty indicator is used. In many cases, the selected definition also heavily influences the socio-demographic composition of the energy-poor within the borders of a country. Consequently, the definition and measurement of energy poverty is a crucial issue when policymakers identify the target group of policies designed to fight energy poverty. An overview of the implications of different definitions in four countries – the United Kingdom, Hungary, Poland and Spain – is below.

1.4.1 Who is considered energy-poor?

In the ***UK***, the official definition and measurement of energy poverty has changed, creating an opportunity to compare the target groups based on the two methods [2]. Before 2013, the 2M indicator was used, while since 2013 the Low-Income High Cost (LIHC) indicator has been in use[5]. The new definition influenced the size of the affected group: it decreased from 3.2 million to 2.28 million people. Furthermore, according to the 'simple' 2M definition, single people were predominant (53%) within the energy-poor, and only 11% of households with children were represented. As a consequence, when the new model came into use, more families with children and fewer single households were officially recognized as energy-poor (27% and 26%

[5] According to the LIHC method a household is energy-poor if it spends more than the median on energy, and its income after paying for the energy costs remains below the official poverty line.

respectively). The group identified as energy-poor through the official measurement only partly overlapped with people categorised as energy-poor based on a self-reporting definition. As an example, 'only one in seven occupiers who were actually fuel-poor[6] responded that they could not keep comfortably warm in winter' (p9) [2].

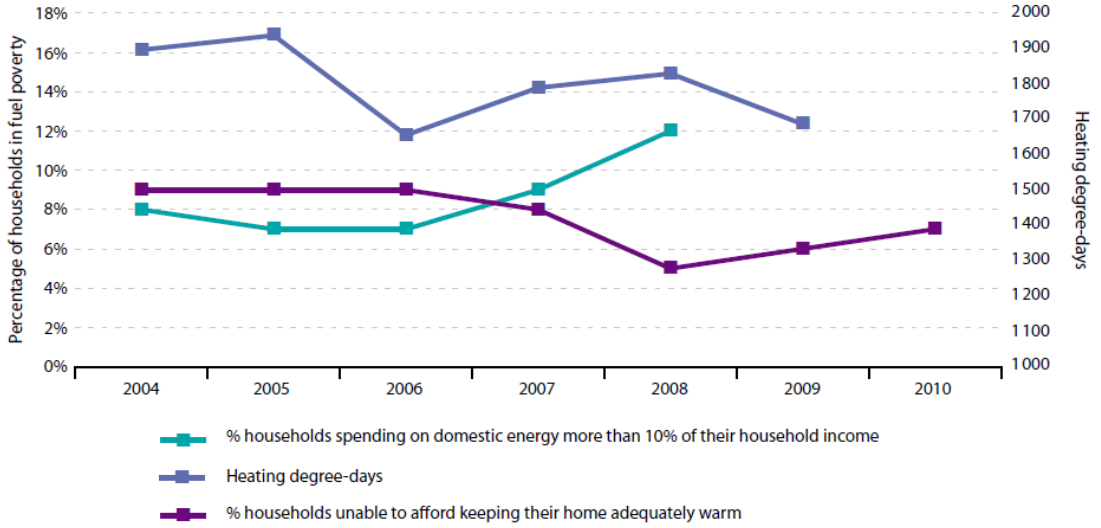
Very similar results were found in ***Hungary*** by an analysis based on data from the National Survey on Living Conditions and Household Budget of 2011 [17]. When comparing the 2M and LIHC indicators, different socio-demographic groups are defined as energy-poor. The simpler method identified less than half as many people as the enhanced version: 10% vs. 21% of the population. The 2M indicator pointed predominantly to single households, while according to the LHIC indicator families with children are much more vulnerable to energy poverty. Both measurements show that energy poverty is more common among people living in detached houses.

An analysis presented in the REELIH report examines the outcome of using the LIHC indicator and the self-reporting, survey-based measurement (inability to keep home adequately warm) in ***Poland***. The comparison reveals a kind of rural-urban divide between the two groups of energy-poor defined by the two indicators. According to the LIHC method, 66% of the energy-poor live in villages. Those who declared lack of thermal comfort live predominantly in cities (66%) and in MFABs (61%). Thirty percent of them are blue-collar workers. In the case of the LIHC indicator, the main cause of energy poverty turned out to be the combination of large floor areas and low income, while in the case of the self-reported method the age and low energy efficiency of the buildings explained energy poverty the best. The size of the two groups was approximately the same (12.2% and 11.5% respectively).

Although in ***Spain*** the social and demographic compositions of different 'types' of energy-poor groups were not examined, the analysis showed that different indicators lead to different trends in energy poverty in the country. While, for example, the share of those who spend more than 10% of their income on energy increased between 2006 and 2008, the share of those who reported a lack of thermal comfort decreased in the same period (see Figure 9.)

[6] In this context, fuel poverty is used as a synonym of energy poverty, as the source adjusts its wording to the UK context, where the two terms are more commonly used interchangeably.

Figure 7.7: Fuel Poverty Indicator, Spain



Source: Tirado Herrero, S., López Fernández, J.L., Martín García, P. 2012. Pobreza energética en España, Potencial de generación de empleo derivado de la rehabilitación energética de viviendas. Asociación de Ciencias Ambientales, Madrid.

Figure 9: Share of energy-poor population according to three energy poverty indicators in Spain. Source: REELIH final report [5]

The fact that different definitions lead to different target groups further complicates the fight against energy poverty. Current methodological tools require that decision-makers prioritise between different potential beneficiaries or develop complex and generous policy packages to cover all possible groups in or at risk of energy poverty. As Brenda Boardman points out, '*who is fuel poor depends on the definition; but the definition depends on who you want to focus on and this involves political judgment*' (p21) [8]. This is especially relevant if decision-makers aim to build their policies on scientific definitions, which is often not the case. Even in the UK, which is widely recognised for its pioneer work in studying and defining energy poverty, actual policies are not aligned with the scientific definitions of energy poverty [13]. Energy poverty experts criticise such gaps between theory and policy [8]. More sophisticated local measurements and research are needed to identify the relevant target groups, i.e. those groups who are suffering from or are at risk of energy poverty. Policymakers should use this knowledge and develop the proper policy tools accordingly.

1.4.2 Policy tools and the main causes of energy poverty

Chapter 5 of the present paper discusses in detail common policies for combating energy poverty. Regarding the energy poverty concept, it is worth noting that such policies can target the three main causes of energy poverty (low income, high energy prices, poor energy efficiency of buildings), or more of them in combination. Energy poverty is often approached using traditional social policy measures focusing on ***low income***, such as housing allowances. If one considers energy poverty not as a specific kind of deprivation, but only as a symptom of poverty in general, it may lead to the conclusion that increasing the income of

poor households will solve the problem. In many cases, severe energy poverty and its most crucial consequences (such as excess winter mortality) can be reduced by decreasing poverty in general. This approach, however, ignores other factors behind energy poverty, such as energy prices and the energy efficiency of the building stock. Energy poverty and general poverty do not completely overlap empirically, as we can see in case studies on Hungary and Poland among others [17] [2]. Many people are not considered poor in general but live in a building in a poor condition, which leads to energy poverty. Some people are considered poor based on their income but do not face energy poverty, for example because they are eligible for institutional accommodation. Furthermore, increasing the income of energy-poor and also generally poor people to a level above the poverty line will not make energy-efficient investments available for them.

As we will see in the next chapter, in CEE and CIS regions policies often focus on ***keeping energy prices low***. Energy price subsidies, regulated prices and non-competitive energy markets are typical policy tools in many post-socialist countries. Targeted price subsidies for vulnerable consumers are another way of reducing energy prices. Keeping the prices low contributes to the affordability of energy, and thus helps many energy-poor households to avoid debts and secure a certain level of energy provision. In itself, however, it is not sufficient to tackle energy poverty as it does not intervene in the energy provision/energy consumption system and consequently does not provide a sustainable solution. Also, universally low energy prices might disincentivise energy-efficient renovations by extending the payback period of the investment. Since energy inefficiency of residential buildings is one of the most significant sources of CO_2 emissions and air pollution in Europe, keeping the price of energy at unsustainably low levels is also problematic from an environmental perspective. Besides, the political sustainability of universal price regulation policies is questionable, as non-EU countries are often pushed to liberalise and deregulate their energy markets, as a part of European integration. However, we can see such policies in some EU Member States too, such as Hungary (see Chapter 3.2 in the present study).

The third cause of energy poverty is the poor ***energy efficiency of buildings***. Many policies aim to improve the quality of the building stock, not only to reduce energy poverty but also for the environmental considerations mentioned above. Although improving the energy efficiency of buildings and appliances has huge potential to ease the energy poverty problem, policies in this field often ignore the affordability aspect, and thus remain unavailable for energy-poor people or the most vulnerable segments of them. As an example, deep renovations are highly costly interventions, which require complex technical and organisational support as well. An even more serious challenge is the case of owner-occupied multi-family buildings with inhabitants from a mixed social background. The renovation of such a building, particularly with a significant share of energy-poor homeowners, requires various kinds of support measures. In CEE and CIS countries, owner-occupied MFABs comprise a large part of the poor-quality building stock. The difficulties of such policies emphasise the need for energy poverty definitions that can also be applied at the building level.

2. Energy poverty concept in five pilot countries

Five CEE and CIS pilot countries were chosen for closer scrutiny of their energy poverty situation and the ways in which they tackle it. They have certain issues in common, such as the socialist past, the high share of MFABs, a relatively inefficient building stock, and a high private ownership rate in MFABs. In other terms, these countries are very different regarding their population, political institutions and means of alleviating energy poverty. This chapter will describe these commonalities and differences. Table 2 gives an overview of the countries in question.

Table 2: Overview of implementation countries

	Bulgaria	Hungary	Lithuania	North Macedonia	Ukraine
GDP/capita	€8,717	€12,500	€17,385	€4,800	UAH €2,818
Population	6.9 million	9.773 million	2.794 million	2.1 million	42.028 million
Climate	Temperate-continental	Continental	Humid continental	Mediterranean (partly continental)	Temperate-continental
EU membership	Yes	Yes	Yes	No	No
Housing ownership rate	84.3%	91.7%	90.84%	85.9%	97.5%
Share of MFABs within the building stock	50.6% [18]	40%	65%	19.7%	42.73%-47.59%*
Inability to keep their homes adequately warm**	33.7% (2018)	5.4% (2019)	26.7% (2019)	33.1% (2019)	30% (2019)
Share of energy expenditures within the household income**	13.5% average (2019)	12% (median, 2015)	n.d.	10-12% (based on HFHM estimation)	n.d.
High energy expenditures (2M)**	11.5% (2015)	10.2% (2015)	13.9% (2015)	n.d.	n.d.
Hidden EP (M/2)**	9.4% (2015)	9.3% (2015)	14.6% (2015)	n.d.	n.d.
Arrears**	30.1% (2018)	10.2% (2019)	9.2% (2018)	34.4%	59% (2020)
Dwellings not comfortably cool during summer**	49.5% (2012)	26.3% (2012)	24.6% (2012)	n.d.	n.d.

*** First figure regards the square metres, second regards the number of people living in buildings**

**** Energy Poverty Observatory Data**

2.1. Bulgaria

2.1.1. Local context, specific conditions

In 2018 the Bulgarian energy supply was dominated by coal, natural gas, nuclear energy and oil [19]. Hydropower, renewables and waste combustion contributed roughly 15% to the electricity supply, indicating that both the heating and the electricity market remain predominantly dependant on fossil and other conventional energy sources. Since 2010 the share of renewables in the energy mix has grown slowly [19]. Bulgaria adopted the Energy from Renewable Sources Act in 2011 to facilitate this process. Coalfired thermal plants and domestic stoves remain an important source of heating in Bulgaria [20]. Replacing coal heating and coal-generated electricity with gas and renewables therefore has great potential to reduce carbon emissions [18].

The Bulgarian energy market is dominated by state-owned energy generation facilities owned by the Bulgarian Energy Holding (BEH), privately owned reserve capacity installations and renewable energy suppliers [20]. In the context of the EU Green Deal and pressure from the EU for further energy market integration, Bulgaria has implemented legislation fostering electricity market liberalisation for non-residential customers.

Energy prices in Bulgaria ranged from €0.099/kWh[7] for electricity to €0.04/kWh[8] for natural gas in 2020. Figure 10 presents the development of the electricity price in recent years. In Bulgaria, the Energy and Water Regulatory Commission is responsible for price regulation in alignment with the Bulgarian Energy Act.

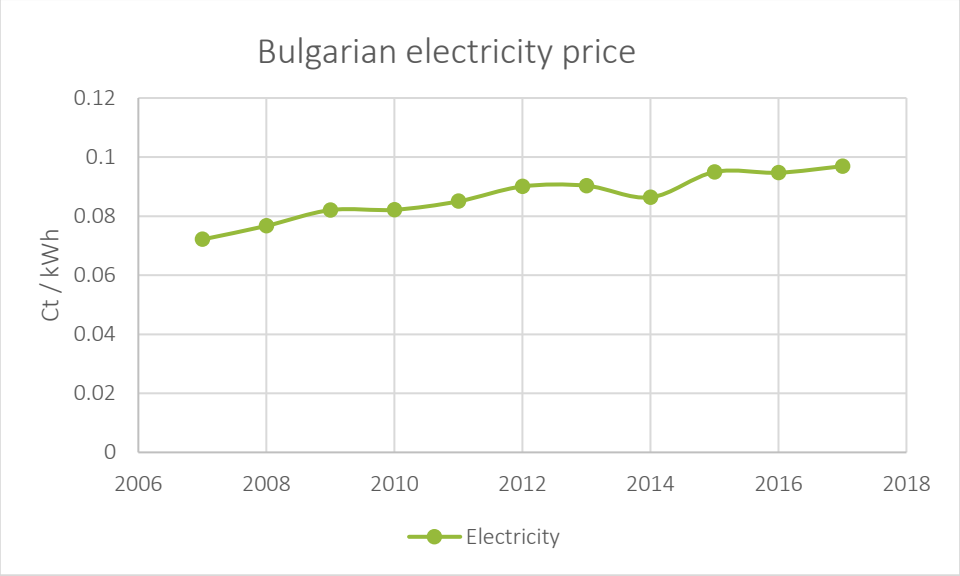


Figure 10 Electricity price in Bulgaria (Energy poverty observatory, 2020)

[7] Statista. Available at https://www.statista.com/statistics/418072/electricity-prices-for-households-in-bulgaria/
[8] Bulgaria Statistics Institute. Available at: https://www.nsi.bg/en/content/5044/natural-gas-prices-household-customers

2.1.2. Official recognition of the energy poverty problem

In Bulgaria there is not yet any official definition of energy poverty. Nevertheless, the draft version of the current National Recovery and Resilience Plan stipulates that a legal definition will be adopted in 2022. There are several causes of energy poverty in Bulgaria that revolve around relatively high energy prices, low incomes, and the inefficiency of the Bulgarian building stock. Studies performed by EnEffect suggest that the definition of energy poverty should be based on objective indicators rather than on self-evaluation, potentially focusing on the analysis of disposable income at household level after covering the costs of providing adequate comfort in the dwelling [21].

In this respect, the report *Energy Poverty in light of Local Elections: An Analytical Rationale* contains various definitions for energy poverty. The reason why several possible definitions are provided is because there are several causes of energy poverty: low incomes, high energy prices relative to purchasing power, and buildings with unsatisfactory energy quality [21].

The report defines energy poverty based on five aspects, which can be measured with subjective, objective, and absolute indicators:

1. Energy-poor are those households that spend more than 10% of their income on energy.
2. Energy-poor are those that cannot provide 'adequate' heating to their homes. This concerns access to heating services and benefits from those services.
3. Energy-poor households cannot pay their heating bills on time and have accumulated energy debts.
4. Energy poverty exists when households remain with a disposable income below the average monthly cost of consumer goods and services after paying for adequate thermal comfort.
5. Energy poverty exists when households do not have access to modern energy services.

The first indicator is less applicable to Bulgaria because on average people spend more than 10% of their income on energy [18]. The third indicator is difficult to measure in Bulgaria due to a lack of data collection and market failures (e.g. related to district heating). The fourth indicator is more suitable for qualitative and quantitative measurement and allows differentiation between seasons. Based on the analysis of households in Bulgaria, the report proposes to subdivide the general population into segments: 'energy independent', 'at energy risk' (those just above and below the level of providing adequate heat), and 'energy vulnerable' (not being able to provide adequate heat) [21].

State programmes influencing energy poverty

Social heating subsidies aim to provide households with the means to pay for basic heating needs [18]. The subsidy is available from November until March and should be applied for twice during this period. The total subsidy of the two disbursements equals BGN 495.90 (€253.53). Applicants must prove that they have no property maintenance contracts[9], have not sold real estate in the last five years, have not travelled abroad at their own expense over the last year, and have no more than BGN 500 in savings per family member [22]. In 2019/2020 around 3.6% of the population (252,615 families) received these benefits, which is considered relatively low [18].

[9] Contracts between a building owner and an external service provider for maintenance of the HVAC systems and other building elements. For more information visit: https://www.upcounsel.com/property-maintenance-contracts

Several programmes target efficiency of buildings instead of subsidising energy bills: these are partly nationally funded and partly funded by the EU. One example is the national programme for energy efficiency of multi-family residential buildings, which allows building owners, independently from their income status, to receive financial support for energy performance renovations. The minimum energy performance required per renovation is an EPC-rating of C. Reference values are updated annually [23]. In 2020 more than 5,000 applications were received by municipalities which operated the grants, but the resources were only sufficient for around 2,000 buildings[10]. This programme provided 100% grants to building owners but is considered unsustainable [24]. As the subsidy covers 100% of the renovation costs, and hence only a small portion of the buildings have access to financing due to budget constraints, it is believed that a different approach and corresponding financial incentives should be designed for the different income groups [21]. The World Bank has suggested the programme should instead be continued with an 80% grant component, depending on the income level of the owners, a focus on renewable energy sources, and a minimum EPC-A rating. The poorest residents should still receive 100% grants, however. The World Bank also suggests that a specialised fund for bank guarantees should be established for financial institutions [25].

The Bulgarian Energy Efficiency and Renewable Sources Fund [26] specifically addresses homeowner associations, in that the fund covers the first 5% of the default risk, paid to lenders in case homeowner associations cannot pay back their loans. The disadvantage is that this has no components tailored to energy-poor residents [24]. Additionally, being in direct competition with the 100% grant programmes, this mechanism has been tested only on a few occasions.

EU funding was available in the Operational Programme 'Regions in Growth' 2014-2020, for energy efficiency financing in peripheral areas, from the European Structural and Investment Funds [18]. This programme was targeted at energy efficiency investments in residential buildings in small municipalities under the same conditions (100% grant scheme) as the National Programme for Energy Efficiency in Multifamily Residential Buildings [27]. Meanwhile, the Residential Energy Efficiency Credit Line (REECL programme) provided by the European Reconstruction and Development Bank provided loans with smaller grant components – 10-20% depending on the type of renovation – to Bulgarian residential building owners [28].

Finally, the Bulgarian Long Term Renovation Strategy (LTRS) discusses the advantages and disadvantages of several financial instruments including a National Trust Ecofund (NTEF), ESCO contracting with performance guarantees, green bonds, energy efficiency mortgages, special credit lines, national/municipal guarantee funds and specialised risk sharing (more accessible for the energy-poor), on-bill financing initiatives, guaranteed performance contracts, SUPER ESCO schemes, conditional loans from revolving funds, and a National Decarbonisation Fund [18]. It is yet to be decided which instruments will be implemented.

2.1.3. Energy poverty in general

Because there is no official definition of energy poverty in Bulgaria, other sources of information must be consulted to estimate the scope of the problem. The Bulgarian LTRS mentions three national indicators related to energy poverty [18]:

[10] According to 2020 statistics from the Ministry of Regional Development and Public Works. For more information visit https://www.mrrb.bg/bg/aktualizirana-informaciya-za-napreduka-po-nacionalnata-programa-za-energijna-efektivnost-na-mnogofamilni-jilistni-sgradi-kum-31-12-2019g/

1. Households experiencing restriction on heating their homes (33.6% of the Bulgarian population in 2018)
2. Households that cannot meet unexpected financial expenses with their own funds (32.1% of the Bulgarian population in 2018)
3. Households that cannot pay dwelling-related expenses on time (31.9% of the Bulgarian population in 2018).

Indicators one and three are also visualised in Figure 11. In a population of 6.9 million[11] this is equal to roughly 2 million Bulgarian citizens, indicating that a significant number of Bulgarians are experiencing or are vulnerable to some form of energy poverty. In terms of absolute poverty, the Bulgarian national statistics institute indicates that 1.67 million inhabitants (23.4%) live under the poverty line of BGN 351.08 (€197.50) per month [21]. Of this group only 250,000 receive heating subsidies [18].

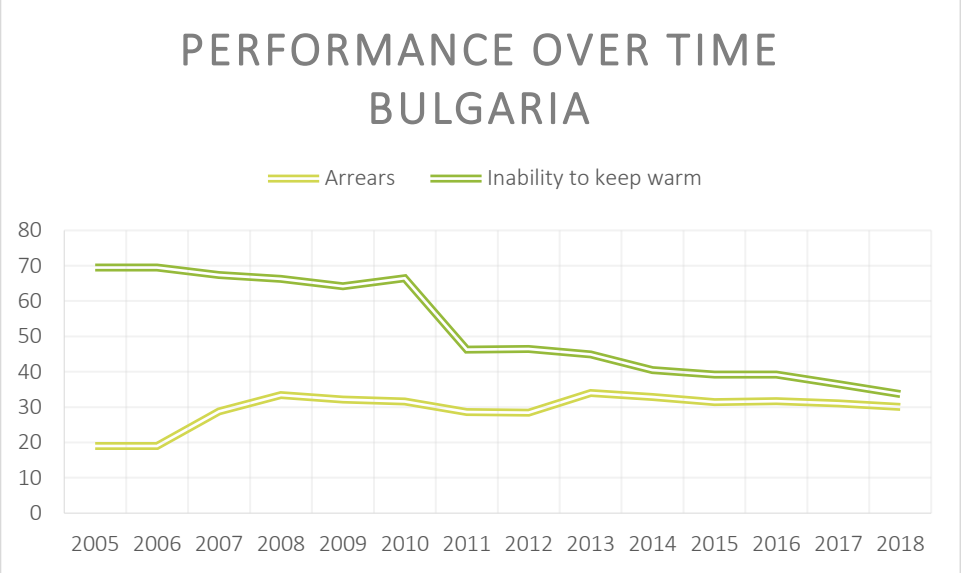


Figure 11: Energy poverty performance in Bulgaria. Energy Poverty Observatory, 2020

The share of income spent on energy can also be subdivided in quintiles (fifths of the population). Based on EU Energy Observatory data it becomes clear that Bulgarians generally spend a larger share of their income on energy than the EU average, and the most vulnerable income group – quintile 1 – on average pays the largest share of its income on energy.

[11] In 2021. For more information visit: https://www.worldometers.info/world-population/bulgaria-population/

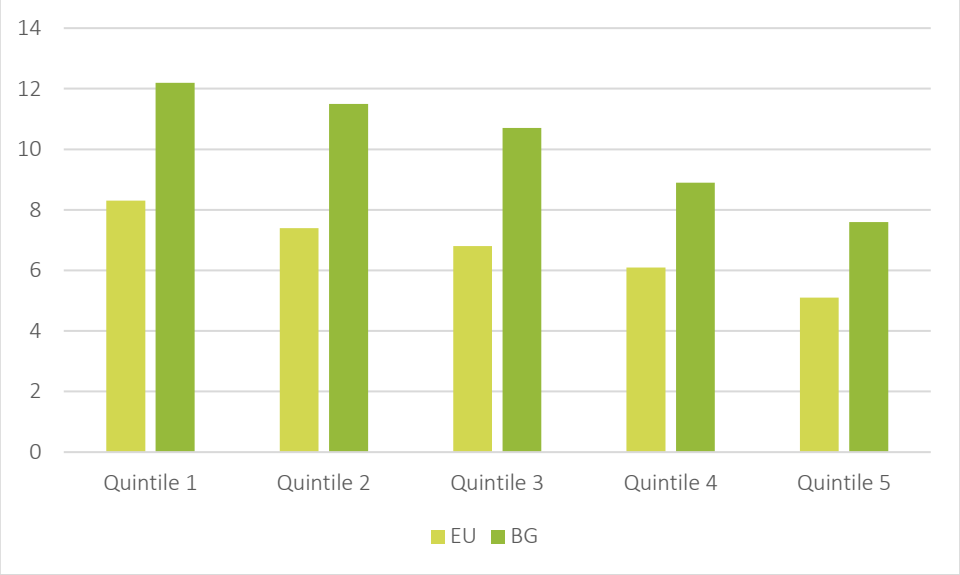


Figure 12. Share of income spend on energy per quintile

Heating sources and building efficiency in Bulgaria

In terms of heating, EnEffect summarises the heating sources for Bulgarian households based on 2011 census data as presented in Figure 4.

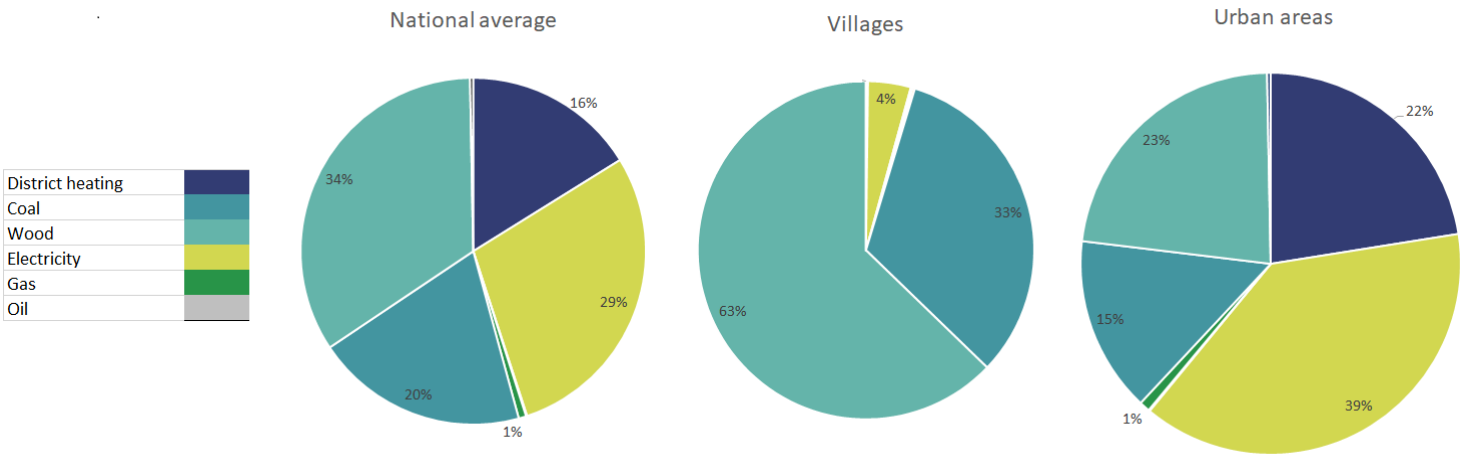


Figure 13. Heating fuels in Bulgaria [21]

The distribution and type of heating sources in Figure 13 show that there are significant differences between urbanised areas and the countryside, where burning solid fossil fuels and biofuels in the form of wood is still predominant [21]. Although electric heating is the most common way to heat buildings in urban areas, solid fuels like wood and coal still account for roughly 45% of the heating supply.

The Bulgarian residential building stock consists of many inefficient buildings, with 91% of non-renovated buildings having a poor energy performance (classes E, F and G) [18]. Subdivided by EPC-rating, the share of each performance category is presented in Figure 14.

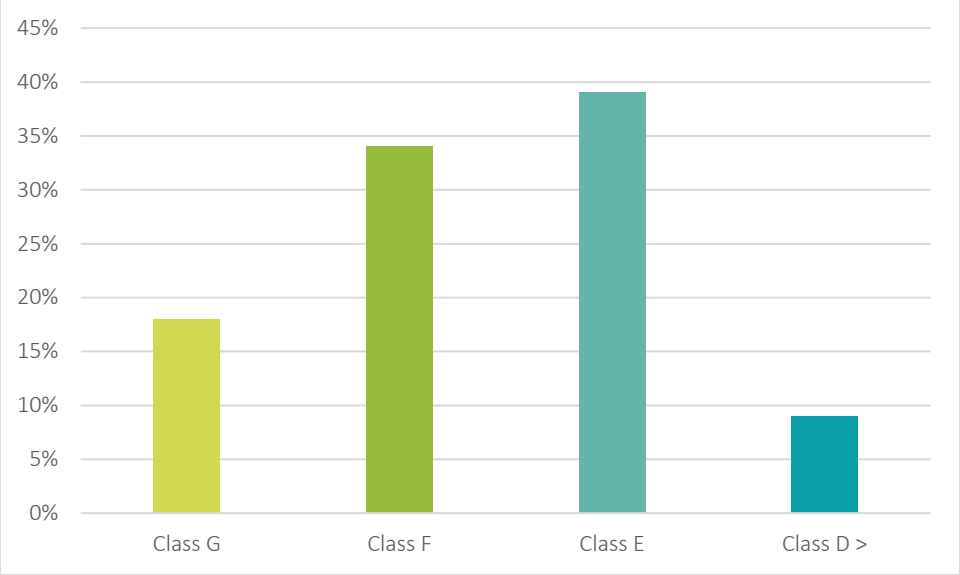


Figure 14: Energy classes in Bulgaria's building stock

The energy classes correspond to the following primary energy consumptions per square metre per year:

- EPC class G (> 435 kWh/m^2/year)
- EPC class F (364-435 kWh/m^2/year primary energy)
- EPC class E (291-363 kWh/m^2/year primary energy)
- EPC class D rating or higher (<291 kWh/m^2/year).

This indicates that a large share of the un-renovated residential building stock is inefficient in Bulgaria.

2.1.4. Energy poverty in owner-occupied MFABs in the country

Multi-family buildings are only located in urban areas in Bulgaria, since the villages almost completely consist of single-family buildings [21]. Taken as a whole, a significant part of the Bulgarian building stock still consists of multi-family buildings (see Table 3).

Table 3: Building stock characteristics Bulgaria [18](p25)

Type of building	Year-round inhabited buildings		
	Number of buildings	Usable area (m^2)	Number of dwellings
Single-family buildings	1,291,549	118,300,032	1,490,460
Multi-family buildings	66,865	117,158,877	1,640,120
Mixed type buildings	6,465	4,052,585	53,838

Dormitories, buildings for collective households	1,019	1,103,153	20,157
Total	1,365,898	240,614,647	3,204,575

Both multi-family buildings and single-family buildings are dominated by low-rise buildings (96% of inhabited buildings built before 2011) up to three floors [18]. The LTRS provides further information on the subdivision of the building stock based on age and energy performance. Overall, 60% of the Bulgarian population lives in multi-family buildings, with rich owners and poor owners living in the same buildings. This is an obstacle to renovating such buildings because it complicates the often-required co-financing from all inhabitants [18]. Of all residential dwellings 97.6% are privately owned, of which 96.5% are owned by private individuals. Only 2.4% of residential dwellings are managed by public authorities [18].

In terms of heating systems, the Bulgarian national statistics institute indicates that only 29% of urban households and 0.6% of rural households have access to district heating systems [29]. Households that do not have access to district heating or electric heating, which is relatively widespread in urban areas, often make use of old inefficient heating stoves. This is an important contributor to the poor air quality in Bulgarian cities [21].

A study into financing for energy poverty carried out by EnEffect suggests creating tailored renovation support for target groups based on their socio-economic status, and to focus on multi-family buildings [24]. For wealthier 'energy independent' households it would be sufficient to provide technical and legal advice, for example. For people at 'energy risk' low-interest or free loans could be provided. Possibilities for increasing the energy efficiency of energy-poor households could be to reduce the heating subsidy and invest the money saved as co-financing for participation in new renovation programmes (e.g. 40% lower subsidy after 40% energy efficiency improvement) [24]. Moreover, an assessment is provided of the potential for a holding fund that could collaborate with private sector initiatives to provide green homes.

2.2 Hungary

2.2.1 Local context, specific conditions

Following the transition to the market economy in 1989-90, the Hungarian energy market was privatised. By 2010, along with the economic and social effects of the financial crisis in 2008, high energy prices had caused a severe affordability problem in the residential sector. Households typically spent more on utility bills than on food and beverages, and arrears rose. The price of electricity and natural gas in Hungary was the highest among EU Member States with purchasing power parity [30]. In 2012-2013 the government restructured the energy market via centralisation and renationalisation of the majority of the sector. They introduced a major energy price regulation programme called 'Utility price reduction' ('Rezsicsökkentés'). A public company (National Utilities Ltd.) now sells energy to households at a regulated price, which cannot be higher than 90% of the market price level of 2013. The intervention resulted in a drop in consumer prices, which are currently among the lowest in the EU [31]. A price effect emerged, increasing

the energy consumption of the population, and presumably disincentivising residential energy efficiency investments [30]. However, in the past few years, the state-owned company providing gas for residential consumers has generated revenue through the programme as global market prices dropped while consumer prices remained at 2013 levels [32]. As a consequence, consumers currently pay more for utilities at the regulated price level than they would at regular market prices. The company is creating a reserve from the remainder, which theoretically can be used for further price reductions in the future.

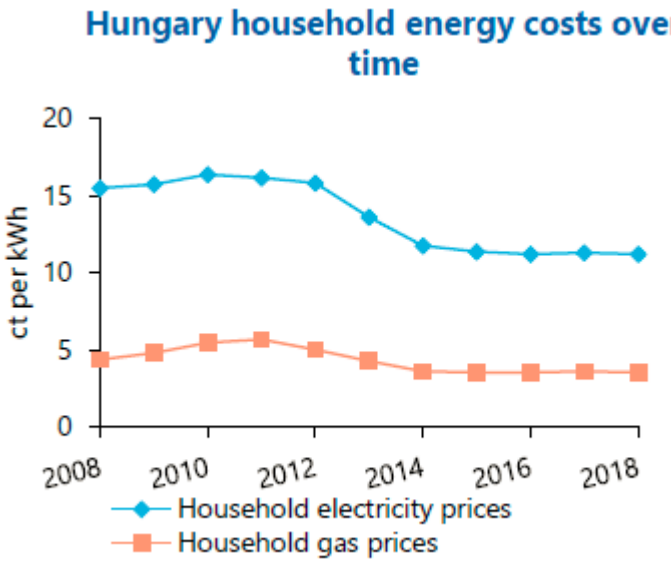


Figure 15: Household electricity and gas prices between 2008 and 2018 in Hungary. Source: Energy Poverty Observatory Member State Report – Hungary, 2020 [19]

The utility price reduction programme is not socially targeted and does not include firewood and other solid fuels, despite the fact that the most vulnerable households (mainly in the countryside) use firewood as a heating source. The price of firewood increased by 36% between 2012 and 2018 [33].

2.2.2 Official recognition of the problem

In Hungary, there is no official definition of energy poverty. According to the National Energy and Climate Plan, energy-poor households are households that spend more than 25% of their disposable income on energy, which roughly corresponds to double the median energy expenditure (2M) [34]. Otherwise, those 'affected by energy poverty' and 'vulnerable consumers' are used interchangeably in the document. Compared to the NECPs of other Member States, the Hungarian document discusses energy poverty briefly and marginally. According to the NECP, the government's interventions against energy poverty will be targeted at a) families with multiple children living in single-family homes in small settlements; and b) single pensioners in multi-apartment residential buildings. Social targeting is not mentioned related to this area. The document places great emphasis on continuing the 'Utility price reduction' programme as a major policy instrument supporting the affordability of energy. Beyond this, the most highlighted interventions to be implemented are the support of smart devices and decentralised heating systems, the installation of

prepayment meters, educative and communication campaigns, and the introduction of an Energy Efficiency Obligation Scheme (EEOS). There is no detailed public information available about the Hungarian implementation of the Recovery and Resilience Facility or the Renovation Wave, or how Hungary intends to handle the question of energy poverty. A short overview of the Hungarian government's plans regarding the energy sector is available. It does not contain direct support for energy-poor people or building renovation. Rather, it focuses on the implementation of the EEOS, supporting renewables in electricity production, and investments in smart metering systems[12].

In Hungary, energy-poor people are practically supported in two ways. First, as vulnerable consumers via social benefits and direct reductions of their energy costs; and, second, as recipients of the utility price reduction programme, which is not targeted at all. The vulnerable consumer status has been in use for a long time as the legal basis for social benefits for low-income consumers. Vulnerable consumers can request instalment payment for utilities, payment deferment or prepayment meters. The vulnerable consumer status is based either on extremely low income or physical or mental disability[13]. There is also a socially targeted subsidy for firewood available for low-income people living in villages, although it is not very generous. In 2015 the Hungarian state withdrew from financing the housing allowance which was available for low-income consumers for covering housing or energy costs. Currently municipalities decide whether they will keep financing the allowance or not, which has resulted in a dramatic shrinkage of the programme. Even in settlements, where the municipality still provides the subsidy, the amounts are marginal.

Energy efficiency improvement and energy poverty reduction are not connected in Hungarian policies. Subsidy schemes for building renovations in the past lacked social targeting and were hardly available for energy-poor households and communities. The new renovation programme launched in 2021 provides a 50% subsidy of up to HUF 3 million (€8,000) for renovations for all families with children. Although it can be complemented with a subsidised loan, it is uncertain to what extent low-income people will be willing to take it. A further limitation is that the subsidy is targeted at households and cannot be used for the renovation of the common parts of multi-family buildings. Currently there is practically no subsidy programme available for the energy-efficient renovation of the multi-family building stock (other than a slight interest rate subsidy that results in near-market rate interest).

[12] The Recovery and Resilience Plan of Hungary can be downloaded here: https://www.palyazat.gov.hu/helyreallitasi-es-ellenallokepessegi-eszkoz-rrf#

[13] Vulnerability based on low income is defined by eligibility for social benefits typically targeting the poorest groups of society. Among others, such benefits include: allowance for elderly people with no other income (around €70-112/month); allowance for citizens of working age without any other income source or wealth (around €62/month); housing subsidy for people with less than HUF 105,000 (€290) per family member or HUF 135,000 (€372) for single people is around €11-16/month; in-kind allowance for children living in families with extremely low income (HUF 41,325 or €114/person/month); allowance for people who care for a relative at home full time. Most of these benefits are linked to the amount of the minimum pension, which was set at HUF 28,500 (€78.60) in 2008 and has not changed since then.

2.2.3 Energy poverty in general

In the case of Hungary, we can rely on the EU-SILC survey, the Household Budget Survey and the data of the National Statistical Office (KSH). In 2019, 5.4% of households reported that they were unable to keep their homes adequately warm in winter [35]. This indicator showed a steady decline from 2005 (17.7%) to 2009 (8.9%), when – probably due to the financial crisis – it started to increase again until 2012 (15%). In parallel with the implementation of the utility price reduction programme and the general recovery from the financial crisis, it started to drop and now it is at a record low level (5.4%). The number of households with arrears on utility bills peaked at 25% in 2012 and fell to 10.2% in 2019. These data do not reflect the effects of the economic crisis emerging due to the Covid-19 pandemic.

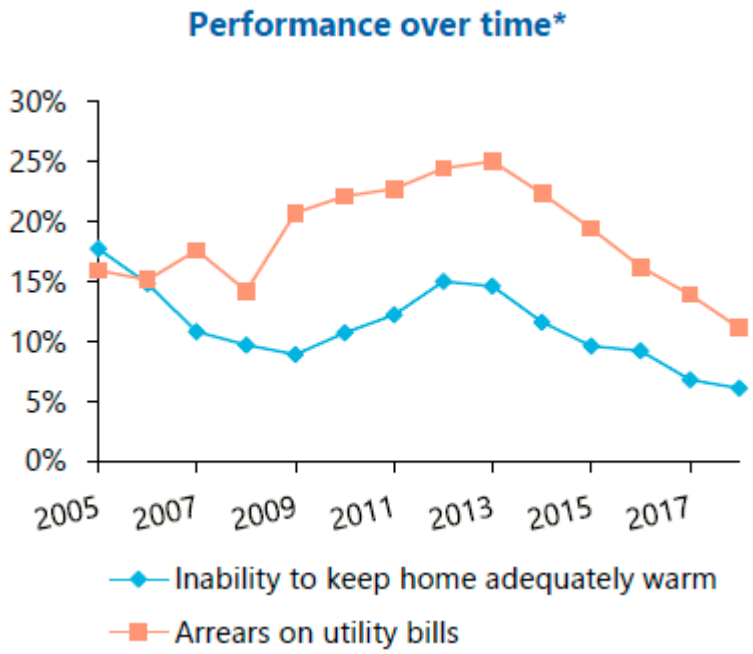


Figure 16: Share of population reporting inability to keep home adequately warm and with arrears on utility bills, 2005-2018. Source: Energy Poverty Observatory Member State Report – Hungary 2020 [34]

The median share of energy costs in the total expenditure was 12% in 2015, when most households spent 10-15% of their income on energy [33]. This is higher – in all income quintiles – than the corresponding EU average value. However, according to the 2M indicator, 10.5% of households spend twice as much as the median share of their income on energy in Hungary, which is much better than the EU average of 16.2%.

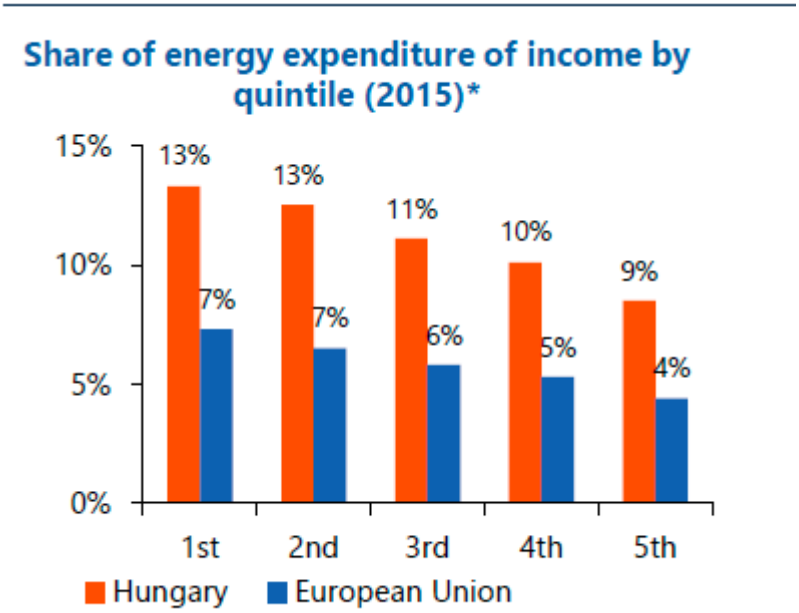


Figure 17: Share of energy expenditure in total household income by income quintiles in Hungary, 2015. Source: Energy Poverty Observatory Member State Report – Hungary 2020

Hidden energy poverty (M/2) is also less severe in Hungary than in the EU on average: the rate is only 9.3% compared to 14.6% in the EU [36]. It is important to note, however, that regional inequalities within the country are of particular concern. According to a recent research project, in the southern and eastern regions of Hungary energy poverty rates can exceed 50%, especially in small villages with a high share of Roma people in the population [37].

According to Habitat for Humanity Hungary's housing report from 2020, the social groups most vulnerable to energy poverty are single pensioners, the unemployed, families with children, and single-parent families [33]. Fülöp and Lehoczki-Krsjak systematically analysed the social composition of the energy-poor comparing two different energy poverty definitions based on data from 2012 [17]. Using the median of that time (15%), the 2M indicator included those who spent more than 30% of their income on energy. Using this definition, 10% of Hungarian households were considered energy-poor: this share included twice as many single households as the average population, comprising half of all the energy-poor households. The other definition they applied was the Low Income High Cost method (LIHC), according to which energy-poor households are those which spend more on energy than the median, and whose income remains under the poverty line after this expense. Based on the LIHC indicator, 21% of Hungarian households are considered energy-poor. Single households are only slightly overrepresented within this group (30% compared to 24% in the total population). This definition includes many more families with children than the previous one (42% vs. 22%). The analysis showed how using the 2M indicator draws our attention to a different kind of vulnerability affecting predominantly single households, while the LIHC definition focusing on disposable income after paying utility bills highlights the energy poverty of families with one or more children.

About two-thirds of the 4.3 million dwellings in Hungary need energy-efficient modernisation, as 65% of them were built before the 1980s, when the energy efficiency requirements were lower, and only a small fraction of them have undergone a deep renovation [38].

Heating amounts to 72% of the total residential energy use in the country, hot water is responsible for 13%, and lighting and household appliances for a further 10%. The residential heating mix is dominated by natural gas (56%) followed by solid fuel and renewables (32%). Eight percent of the heating is provided by district heating [39]. Within the poorest income quintile, almost 40% of the households use firewood for heating [33]. As the utility price reduction programme does not include solid fuels, it means that the most vulnerable receive much less support from the state for covering their energy needs than those who use modern energy services, regardless of their social status.

2.2.4 Energy poverty in owner-occupied MFABs in Hungary

The homeownership rate in Hungary is 91%, 8% of the inhabitants are tenants while 1% of them hold other titles. More than 60% of all the dwellings are in family houses, and the remainder are in the multi-apartment building stock. The vast majority of MFABs are in Budapest [40]. As for the social and demographic composition of the MFABs, most communities are heterogeneous. A 2011 research project by the Metropolitan Research Institute analysed the low-status MFABs in Hungary, namely the bottom 40% of MFABs based on the ranking by income and education level of residents [41]. It turned out that, in most cases, the social status of inhabitants is mixed, and the residents who are most socially vulnerable do not necessarily live in the buildings in the worst technical condition, while better-off residents do not necessarily live in the buildings in the best condition. As a rule, MFABs built with traditional technology are in significantly worse condition than those built with industrialised technology.

MFABs constructed with industrialised technology are heated with district heating in the majority of the cases, whereas in traditional buildings individual heating systems are the predominant methods. Most MFABs do not have proper thermal insulation. If partial insulation is taken into consideration too, 50% of the buildings built with industrialised technology are to some extent insulated. As the most important Hungarian renovation scheme was for a long time available only for industrialised buildings, and traditional MFABs were excluded, the latter buildings are generally in a worse condition[14]. Doors and windows have been changed in less than half of all MFABs [42], [39].

Energy poverty is more severe among people living in single family houses in rural areas [17]. However, energy-poor inhabitants of MFABs face special hardships and challenges for three main reasons:

[14] Between 2001 and 2009, and in 2015, there were major grant schemes for the renovation of MFABs called 'Panelprogram' I. and II. (2001-2009) and 'The Warmth of Home' (2015). The programme was initially designed for buildings with industrialised technology, but in the last round in 2015 traditional buildings were included too.

I. Due to the mixed social and demographic composition of these buildings, differences in interests, capabilities and needs constitute a significant obstacle to energy efficiency investments.
II. The currently available renovation subsidies cannot be applied at building level, as they can be requested only by individual households. Energy-efficient refurbishment requires the renovation of the shared parts of the building, such as façade, ceiling etc., and dealing with the building as a whole. As a result, the problems of inhabitants of energy-inefficient MFABs are not covered by state support.
III. Academic and public discourse about energy poverty typically focuses on single family houses and/or the rural context. The difficulties of renovating MFABs are discussed less frequently.

2.3 Lithuania

2.3.1 Local context, specific conditions

Until 2009 Lithuania was a net electricity exporter due to its nuclear power plant. Following the shutdown of the Ignalina nuclear power plant in 2009, the country became dependent on the import of electricity mostly from Russia, as Lithuania is not connected to the European electricity network [43]. The country also relies heavily on gas imports from Russia, although this need is gradually diminishing. While Lithuania is still a net importer of energy, together with other Baltic countries it is making efforts to reduce its dependence on Russian energy, and diversify its sources of supply. During the 2010s new connections were made with Finland, Sweden and Poland, and complemented with a new gas terminal in Lithuania [44]. Together with other factors, this resulted in a remarkable decrease in both electricity and natural gas prices from 2013. Starting in 2013, there was also a huge increase in the use of biomass as a source of heating, this becoming the main substitute for natural gas from Russia.

Since the transition, the country has had a regulated and non-competitive energy market. The electricity market is currently undergoing liberalisation, in line with Lithuania's EU commitments [45]. Regulation of retail prices for both household and business consumers will be dismantled, although the price of basic services will continue to be regulated. The liberalisation of electricity markets in neighbouring Estonia and Latvia resulted in rising prices, which sparked concern over the affordability of utilities following the market reform in Lithuania [46].

The following figure shows the dynamics of energy prices before and after 2013.

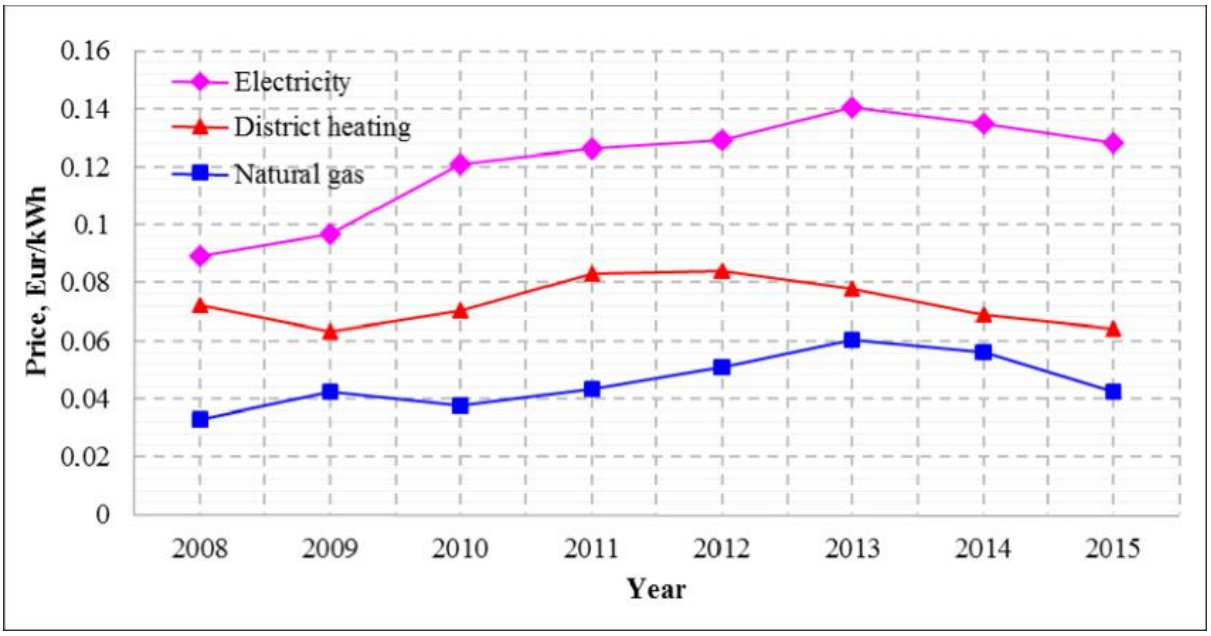


Figure 18: Price of electricity, district heating and natural gas in Lithuania, 2008-2015. Source: Analysis of solar thermal systems and future development possibilities in Lithuania [32]

2.3.2 Official recognition of the energy poverty problem

Despite not having an official national definition of energy poverty, the Lithuanian state seems to recognise the issue and makes a remarkable effort to tackle it. In the country's National Energy and Climate Plan energy poverty is seen as the situation when '*it is difficult or impossible for residents to enjoy adequate heating of their homes or access to essential energy services such as lighting or transport*' (p45)[47]. The document lists in detail several existing measures to fight energy poverty, such as financial subsidies for utility costs, building renovation programmes, the above-mentioned deregulation of energy prices, and consumer education. Beyond the measures that already exist, a number of others are planned for implementation, including stronger protection for vulnerable consumers, and an acceleration of energy-efficient renovations and consumer information measures.

On the policy level in practice, the term 'socially vulnerable households' is used for people entitled to social heating and subsidised hot water costs. Below a certain income threshold the subsidy covers all household heating and hot water costs. Those who earn above the threshold but are nonetheless considered poor still receive a subsidy, so that they pay a maximum of 10% of the difference between their income and the threshold, which represents some kind of poverty line. Before Covid-19, eligibility criteria were stricter, e.g. many low-income people were excluded because they owned a property with a value above a certain threshold. During the pandemic the criteria have been eased so that more low-income people are included. Furthermore, there is socially targeted support for energy efficiency improvement. Within the framework of JESSICA Holding Fund Lithuania (currently JESSICA II.), multi-family apartment buildings receive a subsidy for energy-efficient modernisation, with 100% subsidy on all expenses for low-income households. The support is available for those eligible for the heating and hot water subsidy described above, which is only

the most vulnerable few percent of the population – this is certainly less than the energy-poor population [2].

In 2020, the Ministry of Environment prepared a draft of the long-term renovation strategy for Lithuania and invited the public to participate in a consultation ahead of government approval. The consultation took place in February 2021, and the government sealed the strategy on the last day of March [48]. The new government of Lithuania puts emphasises the importance of renovation in the draft national Recovery and Resilience Facility (RRF) plan. For example, 'organic renovation' (using more wood) will require €218 million from the RRF, among other measures. This comprises almost 10% of the available RRF grants, which amount to €2.225 billion for Lithuania. The strategic goal is to have a completely fossil-fuel-free building stock by 2050. Due to the major contribution made by residential buildings to energy consumption, greenhouse gas emissions and air pollution, this segment of buildings is of great importance in the strategy [49].

2.3.3 Energy poverty in general

Being an EU Member State, energy poverty in Lithuania is well tracked by the EU Energy Poverty Observatory [50]. According to its overview based on Eurostat SILC data and household budget surveys in Lithuania, an inability to keep the home adequately warm is strikingly higher than the EU average. While 26.7% of Lithuanian households were unable to maintain the necessary temperature in their homes in 2019, the EU average is 6.9%, almost four times less. The difference is also significant (while less extreme) in the case of arrears on utility bills: 9.2% of Lithuanian households reported arrears in 2018, whereas the same indicator was 6.6% on average in the EU (in 2019 the figures were 7.5% and 6.2%). People in Lithuania spend a larger part of their income on energy than the EU average, probably because the median income is low. Interestingly, the 2M indicator shows a different picture: the share of households spending a relatively high proportion of their income on energy is lower in Lithuania (13.9% in 2015) than in the EU (16.2%). The share of households with low absolute energy expenditure is similar in Lithuania and the EU (14.6% and 14.4%, respectively).

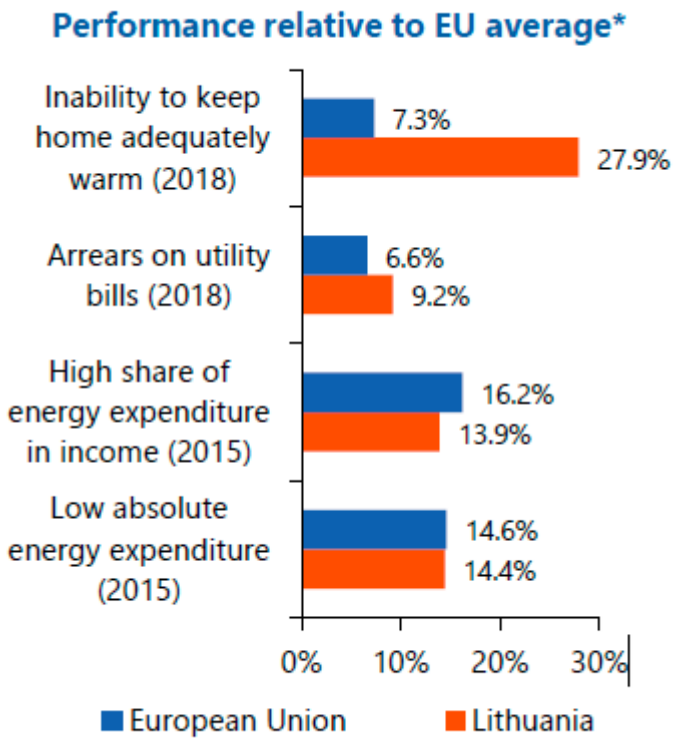


Figure 19: Share of energy-poor population according to the four primary indicators in the EU and in Lithuania. Source: Energy Poverty Observatory (2020): Member State Report – Lithuania [36]

These data imply that people in Lithuania tend to underheat their dwellings and restrict their spending on energy. However, the huge differences between the country's positions relative to the EU average according to different indicators illustrate the complexity of defining, measuring and assessing energy poverty. There has been a declining trend in the share of households unable to keep their homes adequately warm since 2013, as well as in the share of households with arrears [50]. This can be partly explained by the integration of the energy market in the Baltic region, Finland, Sweden and Poland mentioned above; and also by the period of economic recovery after the financial crisis. Unlike the common pattern in other Member States, the share of energy expenditure is not completely regressive in Lithuania – in the case of the first three income quintiles, it is similar.

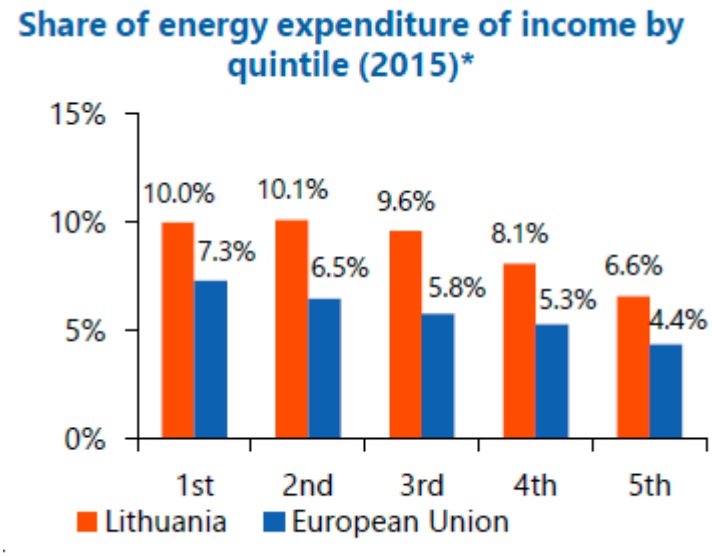


Figure 20: Share of energy expenditures in income by income quintiles in Lithuania and in the EU. Source: Energy Poverty Observatory Member State Report – Lithuania 2020 [47]

In Lithuania, 56% of households use district heating [51]. Heat produced in centralised, biomass-based systems is dominant, comprising 65% of the district heating sector. Still, heating remains highly inefficient in Lithuania. The average annual heat consumption of the buildings is 0.75 GJ m−2, compared to 0.46 GJ m−2 in the neighbouring Nordic countries. Among individual houses, 70% still use firewood for heating [52].

2.3.4. Energy poverty in owner-occupied MFABs

In the socialist era rapid urbanisation took place in the whole CEE region, but it was especially swift in Lithuania [53]. Today, the urban population comprises 68% of the total population, and almost one-fifth of all Lithuanians live in Vilnius (589,000 people) [54]. Despite the suburbanisation trends following the transition, 65% of the population still live in MFABs [43]. Most of these buildings were built before the 1990s, in a Soviet style. The vast majority of apartments are inhabited by the owner, with the homeownership rate being 90.3% in 2020. The multi-apartment building stock from the socialist era is dominated by panel buildings, followed by brick and monolith houses. All building types have severe problems, not only with energy efficiency but also with their general condition. A large number of buildings require urgent repairs. The lack of proper maintenance partly results from the deficiencies in the institutionalisation of building management. The privatisation of the previously state-owned apartments and buildings in the 1990s was not accompanied by the emergence of adequate property management practices [55].

An analysis of the social and demographic composition of Soviet-type MFABs constructed with industrialised technology in Vilnius shows the overrepresentation of older population groups in these buildings [53]. In general, the age of inhabitants seems to correlate with the age of the building. This can be a barrier to energy-efficient renovations as long-term investments are typically less attractive to elderly people.

In many European countries, rural areas and detached houses show worse performance in energy poverty and energy efficiency than urban areas and MFABs. However, in Lithuania, inhabitants of MFABs and urban areas seem to be more heavily affected by energy poverty than those living in rural areas and family houses [50]. The share of those unable to keep their homes adequately warm among people living in apartments and urban areas is 39.7% and 37.7% respectively. The same indicator is only 21.9% among inhabitants of rural areas, and not more than 12% in the case of people living in family houses. The probability of having arrears shows a mixed picture. Living in apartments and rural areas show a stronger correlation with having arrears compared to family houses and urban areas. As we can see in the figure, the difference is nonetheless much smaller in this case.

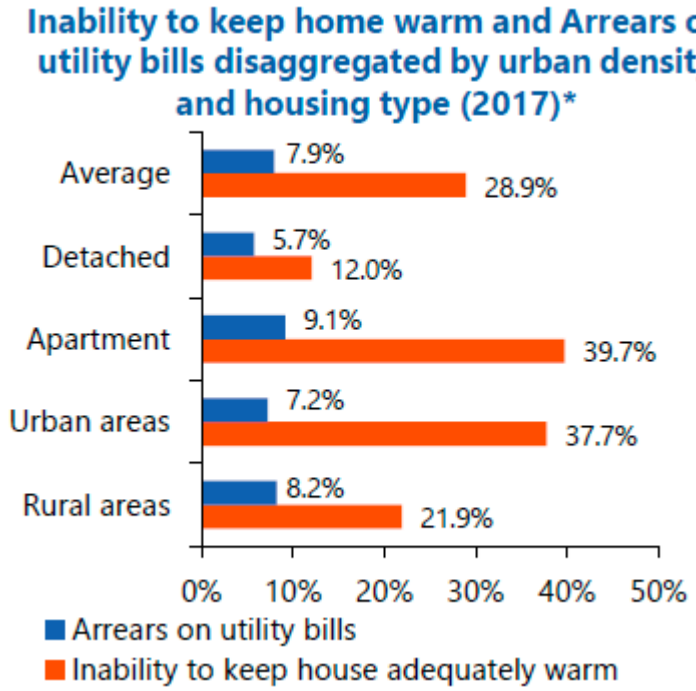


Figure 21: Share of population reporting inability to keep home warm and arrears on utility bills by settlement type and housing type in Lithuania, 2017. Source: Energy Poverty Observatory Member State Report – Lithuania 2020 [47]

Overall, the data indicates that even though energy poverty takes on slightly different forms in different building and settlement types, it seems to be more severe in urban areas and MFABs. More data on the intersections of these categories would be helpful to unfold the causes behind these trends.

2.4 North Macedonia

2.4.1. Local context, specific conditions

The energy market of the Western Balkan region (WB6) is dominated by state-owned enterprises, although the market share of private actors is increasing [56]. As a result of the Energy Community Treaty signed by the WB6 and the EU, the energy markets of the WB6 are undergoing a gradual liberalisation process. In North Macedonia, as in the rest of the region, residential electricity prices are well below the average EU

level: this can partly be explained by service providers' lower costs. According to the analysis of the World Bank, the difference might be explained by lower capital costs due to lower quality maintenance of the networks, as well as the lower share of renewables in the energy mix in Balkan countries [56].

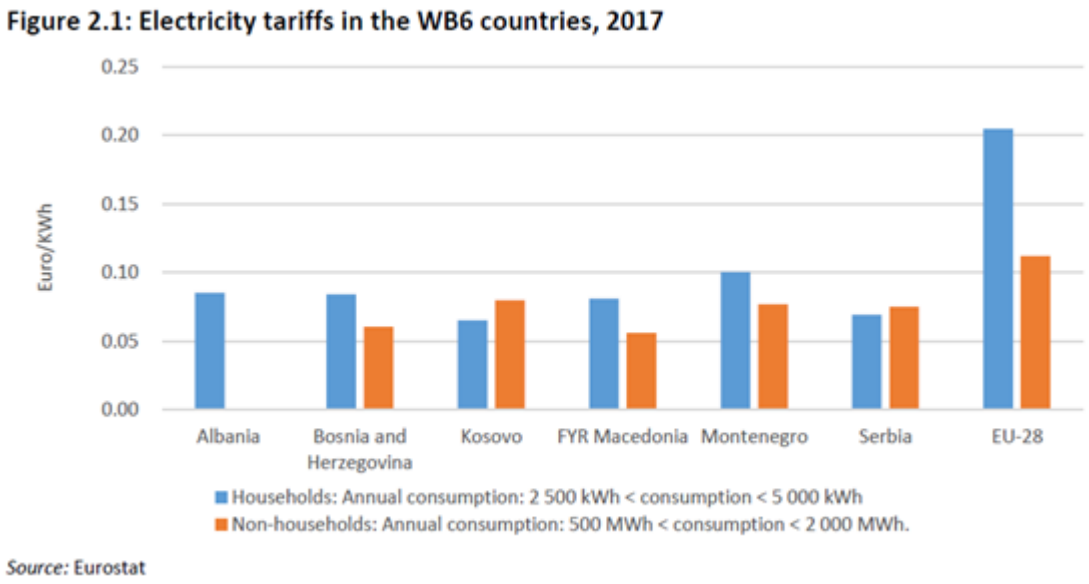


Figure 22: Electricity tariffs in the WB6 countries (Albania, Bosnia and Herzegovina, Kosovo, FYR Macedonia (North Macedonia), Montenegro, Serbia) and the EU-28, 2017

Within the Western Balkan region, the costs of electricity and the revenue shortfall in the sector are lowest in North Macedonia (FYR Macedonia on the figure), though the consumer price level is similar. This implies that the country's electricity sector operates relatively effectively compared to those of its neighbours.

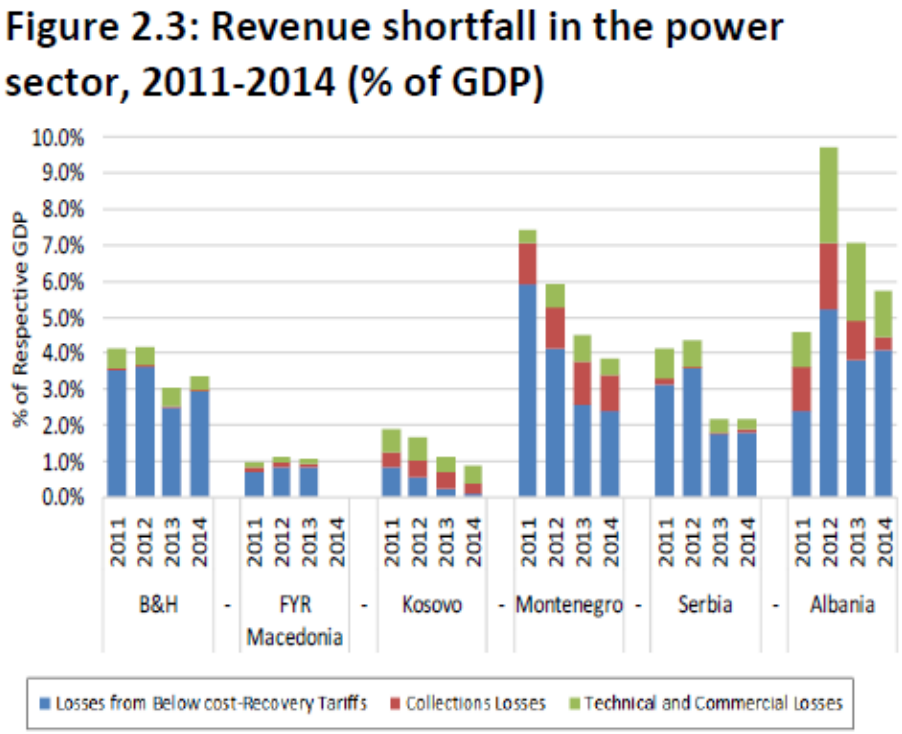


Figure 23: Revenue shortfall in the power sector in the WB6 countries. Source: [53]

North Macedonia has a very diverse climate, ranging from alpine to Mediterranean. The weather is characterised by cold winters and hot summers. In the next decades rising temperatures are expected, especially in the summer, increasing the frequency of heatwaves and extreme natural events [57]. Consequently, the importance of cooling will grow in the future.

2.4.2 Official recognition of the energy poverty problem

As in most countries in the CEE and CIS regions, neither energy poverty nor an appropriate vulnerable group of consumers is officially defined in North Macedonia. The term 'energy poverty' appears in some strategic documents, but it has no exact definition or indicators. The phrase is treated as part of the generic poverty and vulnerability concept. Actions put in place have used the term 'vulnerable energy consumers'. Considering the content of the strategies and the measures implemented it seems that the existence of the problem is recognised by the state, and some important steps have been already taken to tackle energy poverty.

According to the National Strategy on Alleviation of Poverty and Social Exclusion 2010-2020, 'energy poverty' is '*the inability of the household to meet its energy needs to provide a decent life and equal opportunities in a given society and space*'. In the 2018 Energy Law [58] 'energy poverty' is mentioned only in one of the goals of the energy policies, namely the '*reduction of energy poverty and protection of vulnerable consumers*'.

Energy strategies also discuss the socially vulnerable group of consumers, i.e. energy-poor households. One of the priorities for achieving the main goal of the Energy Development Strategy is the development and

implementation of a programme to support this social category of consumers, which shows that energy poverty has been identified as a priority problem.

Vulnerable energy consumers receive direct financial support for utility bills. Beyond that, the state supports energy-poor households in improving the energy efficiency of their homes in a number of ways. In cooperation with Habitat for Humanity Macedonia (HFHM), it provides loans and microloans with advantageous conditions for renovations for low-income households. Another programme covers the reimbursement of part of the costs for purchased and installed solar thermal collector systems and new windows for those eligible for social benefits. The category of vulnerable consumers will be further expanded on the recommendation of the Energy Community Secretariat [59].

As for the recognition of the energy efficiency problem in the building stock, a new, overarching strategy for the reconstruction of buildings is to be created by HFHM and the Ministry of Economy, including a building typology and energy assessment of the national housing stock [60].

2.4.3 Energy poverty in general

Despite the lack of a direct official measurement of energy poverty, it can be estimated with the EU-SILC survey conducted in the country every year, and data from the National Statistical Office. In the past 10 years, the share of households unable to keep their homes adequately warm was more or less constantly around 25%, one of the highest in Europe. According to the EU-SILC, in 2019 it reached a staggering 33% [35]. The explanation for this unexpected rise will require further research, but it may be a result of the worsening of general socio-economic conditions in North Macedonia.

The 2M and M/2 indicators are not applicable, as there is no data available on median energy expenditures. Based on the estimation of the REACH report, the share of households that are vulnerable to energy poverty would reach 45% if the LIHC definition used in the UK was applied [3]. Average spending on housing, water, electricity, gas and other housing costs is 13.4% [3]. As the home ownership rate is 85.9%, this number largely corresponds to the utility costs.

Heating costs relative to total household expenditures in North Macedonia are the lowest in WB6 [56].

Figure 2.4 Energy expenditures as a share of total budgets by fuel use

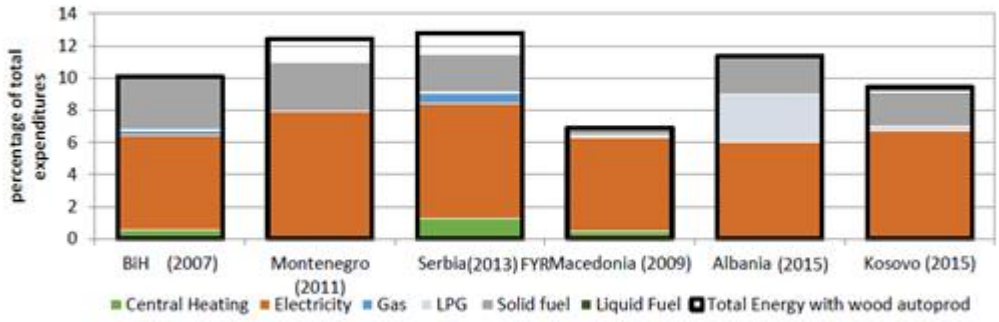


Figure 2.5 Energy expenditures by income quintiles and by fuel use

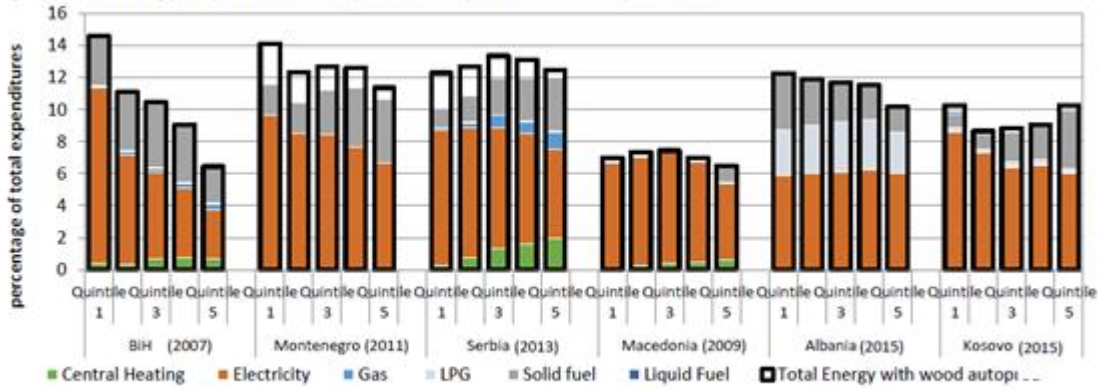


Figure 24: Share of energy expenditures in total expenditures by fuel use in the WB6 countries in the total population (above) and by income quintiles (below). Source: [53]

The relatively low level of energy expenditure and the weak performance on other indicators imply that energy-poor people in North Macedonia choose to keep their energy costs low by underheating their homes.

The same is suggested by the fact that many households tend to keep some of the rooms in their home unheated. The average area of the dwellings is 82.87 m^2, where on average an area of 37.41 m^2 is heated, implying that the share of the total area which is heated amounts to 45.14% [61]. Twenty percent of the liveable dwelling area was not heated at all in 2002 [3]. Households heat their dwellings 6.61 months on average in the course of the year and the average temperature reached is 21.68°C [61].

Another fact indicating the severity of energy poverty in the country is that 60% of deaths are caused by sicknesses that can be related to poor housing conditions and the lack of proper heating [3].

To assess the quality of the building stock in Macedonia, we can rely on the data of the State Statistical Office from 2014 on energy consumption in households [61]. The share of households that live in dwellings with heat insulation amounts to 17.78%. The heat insulation in the buildings (regardless of the year of installation) is mainly placed on the external walls, the roof and the ceiling, with floors being the least insulated.

According to HFHM's analysis of the official statistical data, as much as 78% of the entire housing stock in the country was created during the mass urbanisation period (1946-1989). About 110,000 homes (16% of the existing housing stock) need immediate reconstruction. It is estimated that more than 100,000 units (apartments in apartment buildings) need energy efficiency intervention.

Heating in Macedonia is typically provided by three sources: firewood (64%), electricity (25%), and – in Skopje – district heating (9%). Electricity as a heating source is not only greatly inefficient, but also adds to power supply challenges [57]. The use of firewood is widespread, not only for heating but also for cooking. Most households own solid fuel cookers: 97% in rural areas, and 69.5% even in urban areas [3].

According to the EU-SILC, in 2019 more than one-third of households were in arrears on utility bills. However, other estimations indicate a significantly lower number [2]. The high prevalence of firewood usage also throws into question the usefulness of arrears as an indicator of energy poverty in North Macedonia.

Based on the REACH report, households with one or two members or with more than six members are more prone to energy poverty. They comprise 41% of all households [3].

2.4.4 Energy poverty in owner-occupied MFABs in North Macedonia

Some 75-80% of the population of North Macedonia lives in urban areas, half in the wider area around Skopje [62]. Forty-two percent of the dwellings are in MFABs [63]. The home ownership rate is 88.3%.

Like in other Western Balkan countries, the use of decentralised heating systems is dominant in North Macedonia, even in urban areas [56]. District heating is present in less than 10% of MFABs, all of which are in Skopje. Small heat-only boilers are used in about 30% of MFABs, while 60% of the buildings are heated with electric appliances. Although district heating is considered the most efficient heating system among them, its technical condition in the whole Western Balkan region shows major deficiencies considering the potential of the technology. High energy losses and premature deterioration due to low quality water are common, along with a lack of consumption-based billing. Unlike most Western Balkan cities, Skopje has a privatised district heating company ([56]p41-43). Further, heating with firewood is surprisingly widespread in urban areas too. According to the HFHM study, outside of Skopje the combination of electricity and firewood is very common even in MFABs [64]. As a result, inhabitants might be exposed to high levels of air pollution even if they live in a MFAB. The use of wet, bad quality wood is very common [56] [3]. The next figure from a World Bank study from 2018 illustrates the heat demand and heating systems in North Macedonia [56].

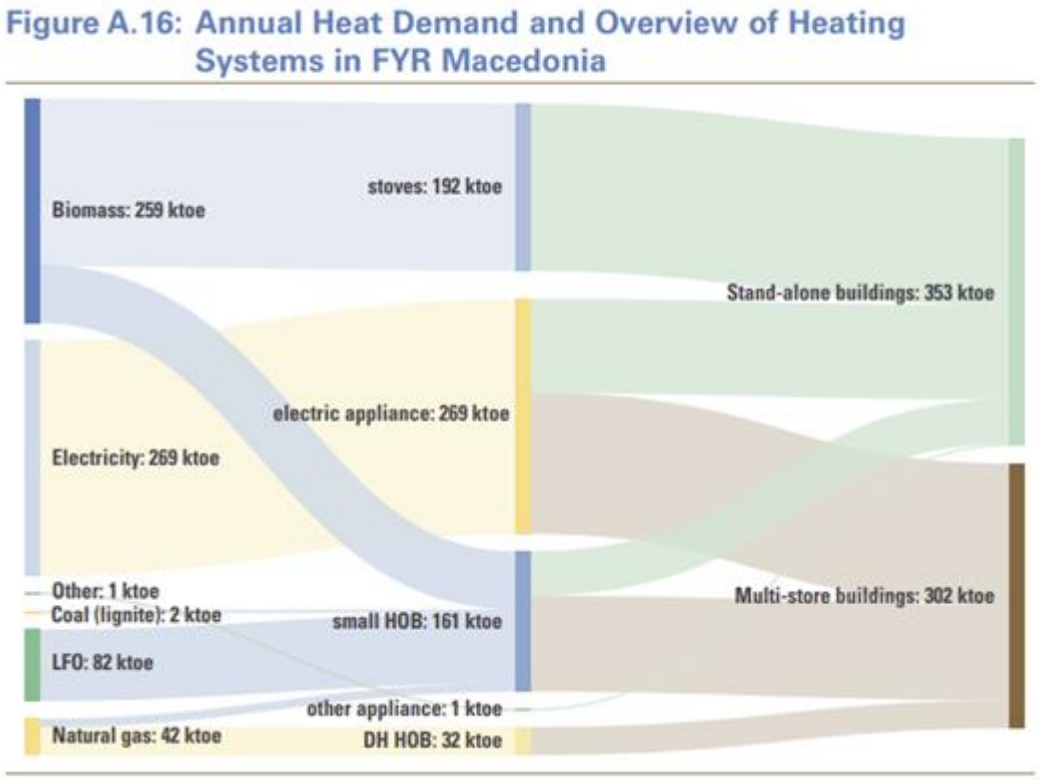


Figure 25: Heat demand and heat systems in North Macedonia. Source: [53]

Based on data from 2013 [3], households in agricultural areas spend a smaller share of their income on domestic energy than those in urbanised or mixed areas. This might be the result of the easier availability of firewood and water for a low price or for free in rural areas. Probably due to the higher unemployment rates and limited accessibility of energy sources in cities, energy costs are a heavier financial burden for urban households. Even if the energy efficiency of buildings might be worse in rural areas, energy poverty is not necessarily more severe.

Although there is no representative data on the extent to which households of MFABs are prone to energy poverty, building on the thorough survey conducted by HFHM in multi-family buildings in some districts of Skopje and in three other cities some general conclusions can be drawn regarding the energy efficiency of MFABs and the presence of energy poverty [2]. There are severe problems with the quality of the building stock in terms of both energy efficiency (lack of insulation) and general conditions (e.g. leaking roofs) that need urgent intervention. The buildings in different cities show a notable variation in their characteristics, reflecting the huge inequalities among Macedonian settlements. For example in Negotino 81% of the buildings have a damaged façade without insulation, while the proportion in Veles is only 28.7%. This comparison, however, only serves as an illustration, as the number of buildings studied is very different (29 and 180, respectively). The survey made by HFHM also shows that even the households of higher-middle status areas like Gjorche Petrov or Veles spend on average 11% and 9.8% of their income on energy

respectively, which is similar to the national average. This may indicate that there is a widespread energy efficiency problem in the country, rather than a very uneven distribution. Furthermore, the habit of heating only some parts of the living area is not confined to family houses: in the abovementioned areas, despite their relatively fortunate financial situation, only part of the apartments are heated: in Gjorche Petrov 50.75 m² are heated of the average 66.69 m². In Veles these numbers are 36.88 m² and 60.5 m². All in all, it seems that people living in urban areas and multi-family units face a slightly different kind of energy poverty than those living in rural areas and detached houses. Furthermore, the division between Skopje and other cities might be significant and would be worth further investigation.

2.5 Ukraine

As Ukraine is part of the Energy Community but not of the EU, like North Macedonia, the legislative instruments do not strictly apply. Nevertheless, Ukraine has adopted several measures to make sure that energy poverty is tackled accordingly, and it has done so with an eye on the legislation used in the bordering EU countries.

2.5.1 Local context, specific conditions

Since the Euromaidan[15] Ukraine has been closely linked to the EU and European political developments. After Ukraine joined the Energy Community in 2011 and further signed the EU-Ukraine Association Agreement, the modernisation and market transformation of the energy sector have been political priorities in the country. The military and economic confrontation with the Russian Federation has seriously interfered with energy prices, which were previously very low and have since been adjusted to a more economically justifiable level.

[15] Euromaidan, the protest movement, began in Ukraine on 21 November 2013, when President Yanukovych unilaterally delayed the signing of the European Union Association Agreement.

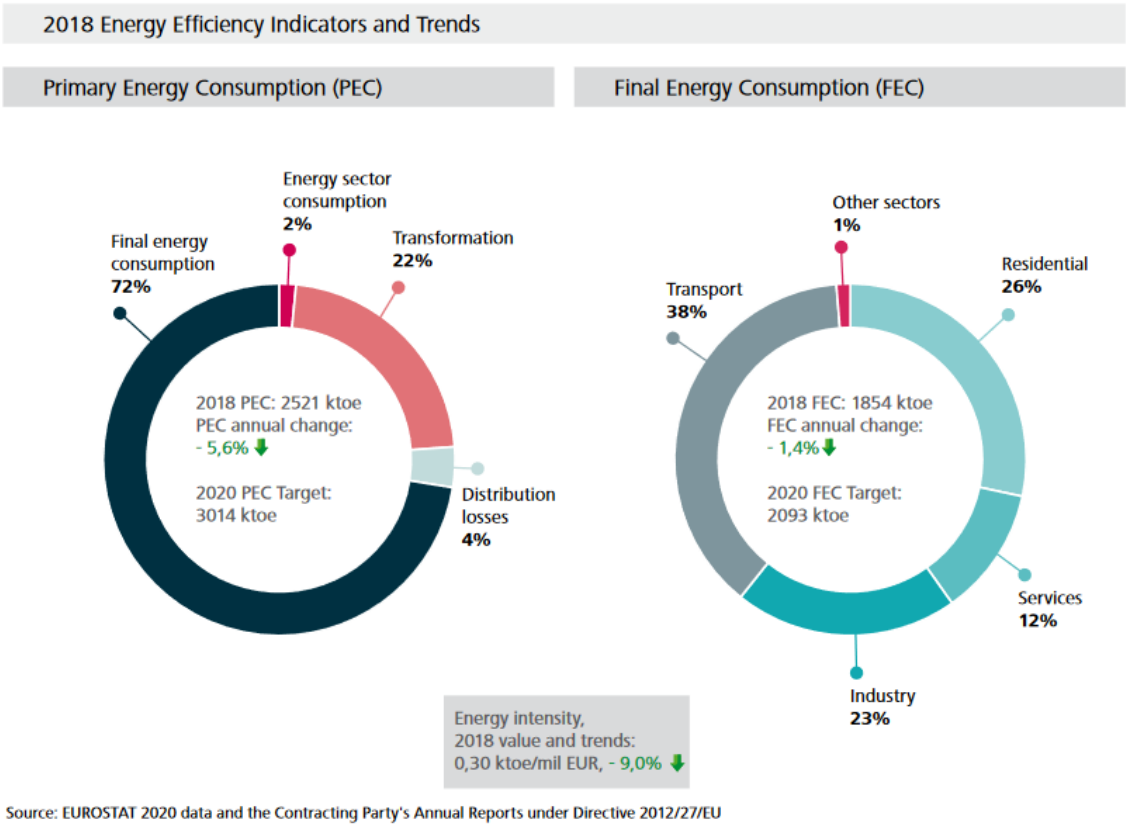


Figure 26: Primary and final energy consumption in Ukraine by sector (Energy Community 2020)[65]

The increase in energy prices from 2015-2018 was caused by the abolition of the practice of subsidising some consumers at the expense of others (mainly households at the expense of the industry), a first step in the preparation for liberalisation reforms in energy markets. As a result, energy prices and tariffs for the population spiked by the following amounts (all data shown is compared to the previous year):

- 2015 – electricity: 66.9%, natural gas: 273%, hot water and heating: 78.4%
- 2016 – electricity: 60 %, natural gas: 42%, hot water and heating: 88%
- 2017 – electricity: 28.1%, natural gas: 1.2 %, hot water and heating: 3.5 %
- 2018 – natural gas: 22.9 %, hot water and heating: 3.5%[16]

More recently, this process has slowed down only slightly: as of May 2019, compared to December 2018, the electricity tariff remained unchanged, while the natural gas price for households even decreased (by 4.2%)[17].

[16] Consumer price indices for goods and services in 2019 (compared to December of last year). State Statistics Service of Ukraine. See more: http://www.ukrstat.gov.ua/operativ/operativ2019/ct/is_c/is_c_u/isc2019gr_u.html

[17] Consumer price indices for goods and services in 2019 (compared to December of last year). State Statistics Service of Ukraine. See more: http://www.ukrstat.gov.ua/operativ/operativ2019/ct/is_c/is_c_u/isc2019gr_u.html

A number of factors are responsible for energy poverty developing into an important issue in Ukraine. Number one was the very sudden adjustment of energy prices to market levels without an improvement of living standards and incomes of the affected households. This eventually resulted in a large amount of people being pushed into the low-income category, as the share of income they used for energy increased massively. The Ukrainian government has tried to counteract this development with subsidies for utilities and energy services, but this is not sustainable and locks up large amounts of the country's budget.

Ukraine's residential consumers are the main end users for buildings when looking at total final consumption. Natural gas remains the primary end-use fuel, with the residential sector consuming approximately 59% of this. Electricity and heat are consumed by the residential and industrial sectors, while crude oil and oil products are used primarily in transport. Though a significant portion of coal is used for heating and electricity, industrial consumers are its primary end users. In renewables, solar and wind are used to generate electricity, while biofuels and waste are available for end use (mostly for residential consumers) (Figure 27).

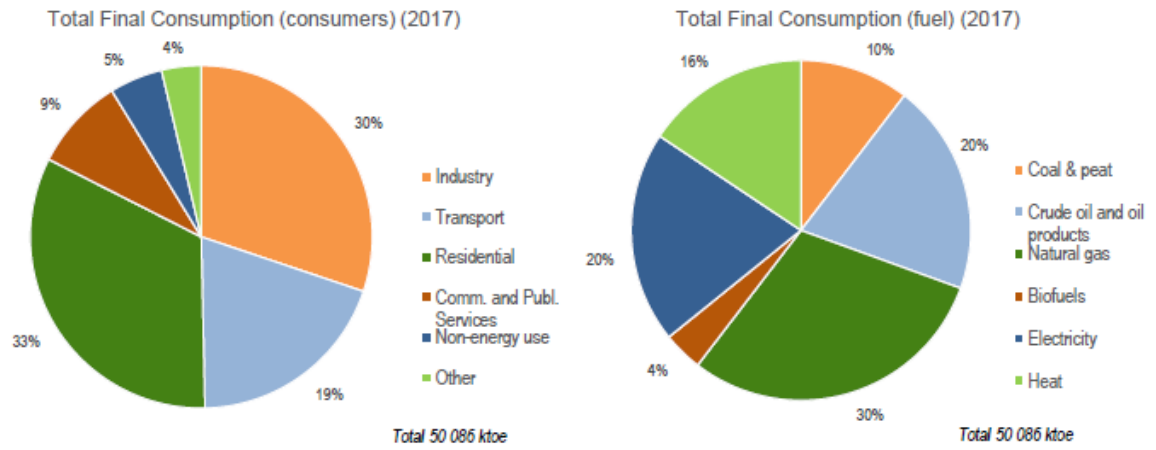


Figure 27: Total final energy consumption in Ukraine by sector and fuel. OECD, 2019 [66]

Regarding the energy system Ukraine is in a very favourable position: its geographical location and its climate, in combination with the availability of resources for extraction and generation of energy, mean it is well placed for energy security. Nevertheless, Ukraine has an increasing energy poverty problem: this is due more to financial and social issues than to a lack of energy. Therefore, it is important to combine increased building efficiency through deep renovation with financial support for vulnerable consumers, in order to avoid more hardship and ensure energy-efficient renovation to a high level.

As a direct result of the implementation of the Association Agreement between Ukraine and the EU and cooperation within the framework of the Energy Community, the Ukrainian parliament and government have made significant progress in harmonising national energy efficiency legislation with the respective provisions of acquis communautaire, primarily the Energy Efficiency Directive 2012/27/EU, Directive 2010/30/EC on Energy Labelling, and Directive 2010/31/EC on Energy Performance of Buildings. As a consequence, during 2017 the following framework laws for large-scale energy modernisation in Ukraine were adopted:

- The Energy Efficiency Fund, which will promote the implementation of incentive and support measures for improving energy efficiency of buildings and energy saving.
- The Energy Efficiency of Buildings, which envisages promotion of energy efficiency of buildings, certification of energy efficiency of construction projects and existing buildings by energy efficiency classes, assessment of compliance with the minimum requirements for energy efficiency of buildings, and development of recommendations for raising the level of energy efficiency that take into account local climatic conditions and are technically and economically feasible.
- On Commercial Metering of Thermal Energy and Hot Water Supply, which lays down the rules for commercial metering and rational use of fuel, energy and water resources, and introduces the principle that an individual consumer should only be obliged to pay for those volumes of utility services that he or she actually consumed.

In 2014 the Ukrainian government started a number of programmes aimed at increasing energy efficiency in buildings. The first one was the Warm Credits programme, which was available for home owner associations (HOAs) and HBCs until 31 December 2020 and is still available to owner-occupied single-family houses. During this period (2014-2020) about 5,000 HOAs received partial compensation for energy renovation through the programme. Additional partial compensation from municipal budgets to participants in the Warm Credits programme added more than 170 local grantees. The Energy Efficiency Fund of Ukraine, which started in 2019, is still available for HOAs. Nevertheless, the number of homes in which energy efficiency measures have been implemented remains critically low, and the Ukrainian government has not yet developed any tools or measures specifically for energy-poor households.

According to certain calculations, the financial resources needed to modernise the buildings stock in Ukraine are very high. If the complex energy modernisation of the housing stock in the post-Soviet EU Member States cost an average of about €150-170 per square metre of living space, then in Ukraine, despite the cheaper labour force and advanced modern technologies, at least €100 billion of investment is needed for the modernisation of the entire housing stock (approximately 1 billion square metres of total living area) [67]. The 2017 budget was entirely inadequate for such demand: funds for housing and communal services subsidies were approximately €2 billion, while those directed to finance energy efficiency measures amounted to slightly less than €24 million. In 2018 and 2019 the situation saw no change, except that total expenditures on the subsidies were reduced, and the social benefits began to be provided in cash.

2.5.2 Official recognition of the problem

There is no clear definition of energy poverty or vulnerable consumers in Ukrainian legislation. There is however the right of every citizen to social protection, which is defined in the constitution. Moreover, there are dedicated pieces of legislation which define categories of individuals who receive state support, particularly for energy, through benefits. The social protection is provided through lower prices and tariffs for low-income families in the form of monthly non-cash subsidies which are meant to compensate for high energy costs.

There is a group of consumers who receive support and benefits and also, depending on their level of income, energy-related subsidies. Among the beneficiaries are (for example) war veterans, teachers, doctors, children of war, police officers, disabled people, families with many children, invalids and people who suffered from the Chernobyl accident. These groups are eligible to receive benefits (rebates) for

electricity and gas within a certain limit, but they might not always fit the common definition of energy poverty.

There are clear instructions on income levels and the share of energy costs within them which help determine which consumers are eligible for funding. These are citizens whose monthly costs (including benefits) are 15% (or 10% in some cases) of their monthly average income[18]. Unfortunately, because of the lack of real data on incomes and a mismatch in registers, the money often does not (only) reach vulnerable consumers but also others who are very capable of paying their bills.

2.5.3 Energy poverty in general

As there is no official definition of energy poverty or vulnerable consumers in Ukraine, the identification of energy-poor consumers needs to be done either through the share of income spent on energy or through the consumers themselves. The number of households which admitted having a problem maintaining a proper temperature in winter has risen continuously with the energy prices. In 2013 only 11% of consumers identified as energy-poor in this way, while by 2018 the proportion had grown to 30%[19].

2.5.4 Energy poverty in owner-occupied MFABs

There are a large number of MFABs in Ukraine, of which a significant proportion are multi-storey buildings with five floors or more. It is interesting to see that although there are 6,500,000 single-family homes in Ukraine, the 240,000 multi-family buildings house almost the same amount of people.

Table 4: Breakdown of Ukrainian housing stock 2011. CEPS 2015 [3]

Type of housing stock	Area, millions m²	Number of buildings	Population
Individual houses	622	6,500,000	23,913,000
Multi-family buildings	464	240,000	21,719,000
Total	1,086	6,740,000	45,632,000

Note: Multi-family buildings including 82,500 multi-storey buildings, defined as those with five floors or more, the rest being one- to four-storey multi-family buildings.

The inefficiency of the multi-family building stock is a problem in Ukraine, as the majority of buildings were built between the 1960s and the 1980s, and they have not been designed to conserve energy or facilitate the rational use of energy. In some regions of Ukraine, the consumption of heat in the buildings exceeds the EU average by more than 60% [67]. The bad condition of this housing stock is the main source of energy poverty in Ukraine, and it can only be tackled through energy efficiency measures. Subsidies for energy have been shown to lead to major rebound effects and households increasing their energy demand, due to the bad condition of buildings, in order to keep their homes adequately warm.

[18] For more information see the Social Strategy of the Energy Community: https://www.energy-community.org/dam/jcr:a58c61f5-feca-45a0-97c0-2bdb6d5ed5bf/PHLG062013_Outline_Social_Strategy.PDF

[19] _

Table 5: Breakdown of multi-family building housing stock of Ukraine by period of construction (2012) [68]

Construction period	Area, million m²	%
Before 1961	76.8	16
1961-1970	71.4	15
1970-1980	105.1	22
1981-1990	134.5	27
1991-2000	62.1	13
2001-2011	34.7	7
Total	484.6	100

3 European legislation – Status quo and developments

The European Commission addressed the concept of energy poverty for the first time in 2009, with the publication of the electricity and gas directives – 2009/72/EC and 2009/73/EC. Member States which are affected, and which have not yet done so, should therefore develop national action plans or other appropriate frameworks to tackle energy poverty, aiming at decreasing the number of people suffering from such a situation. All Member States should ensure the necessary energy supply for vulnerable customers. In doing so, an integrated approach which looks at all policy areas could be used, and measures could include social policies or energy efficiency improvements of housing. Effectively, these directives acknowledge the existence of energy poverty and say that protection of vulnerable consumers is a minimum requirement to eliminate it, keeping in mind that energy poverty is a broader concept than that of vulnerable customers.

The 'Clean Energy for all Europeans' package elaborates the issue further. It consists of eight legislative proposals targeting a variety of sectors: energy efficiency, energy performance of buildings, renewable energy, electricity market redesign, governance rules for the Energy Union, energy security, and eco-design. All these legislative proposals make a point of tackling energy poverty in relation to energy efficiency. While transposition of the directives is still under way in most Member States, the changes are expected to bring considerable benefits from consumer, environmental and economic perspectives [69].

The Governance of the Energy Union and Climate Action Regulation (2018/1999/EU)[20] explicitly stipulates that Member States should 'assess the number of households in energy poverty taking into account the necessary domestic energy services needed to guarantee basic standards of living in the relevant national context' (Article 3). If a significant number of households are in a state of energy poverty, the National Energy and Climate Plan should include a national indicative target for energy poverty mitigation and should provide a mechanism for monitoring progress. Information on policies and measures to address the problem is required.

The Energy Efficiency Directive (2018/2002/EU)[21] requires Member States to take account of the need to reduce energy poverty in the context of their energy efficiency obligations. Article 7(11) requires, to the extent appropriate, a share of energy efficiency measures to address vulnerable households as a priority, including those affected by energy poverty.

Under the revised version of the Energy Performance of Buildings Directive (2018/844/EU)[22] Member States must outline relevant national measures to help alleviate energy poverty, as part of their long-term renovation strategies to support the renovation of the national stock of residential and non-residential buildings.

The EU legislative framework also contains safeguards to ensure that measures taken to address energy poverty do not impede the opening up or the operation of the market. Retail markets that operate smoothly

[20] https://eur-lex.europa.eu/legal-content/EN/TXT/?toc=OJ:L:2018:328:TOC&uri=uriserv:OJ.L_.2018.328.01.0001.01.ENG
[21] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2002&rid=7
[22] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2018.156.01.0075.01.ENG

are essential for a fair transition. These safeguards are enshrined in Article 28 of the recast Internal Electricity Market Directive (2019/944 /EU)[23] and are operationalised chiefly in Article 5(5) thereof.

The NECPs – and as part of them the LTRSs – are the main documents for EU members' energy policies and strategies for 2050. In accordance with the Clean Energy for All Europeans Package, Member States must use their NECPs and LTRSs to identify dwellings of people at risk of energy poverty and develop effective strategies for renovating these as a matter of priority. In these documents they must set out definitions and indicators, timeframes and policies to reduce energy poverty.

An important initiative is the Energy Poverty Observatory (EPOV)[24], which is part of the European Commission's policy efforts to address energy poverty across EU countries. The EPOV aims to improve measuring, monitoring and the sharing of best practice on energy poverty. The Observatory provides a range of useful resources including an indicator dashboard, evidence repository, catalogue of practical policies and measures, training material, members' directory, and discussion forums. It is expected that the EPOV will become a decision support tool for the significant amount of new EU-wide energy policy, regulation and legislation that will be developed in the near future.

This EU legislation is also relevant for Energy Community members, such as North Macedonia and Ukraine, although they have not yet decided to implement the Clean Energy for All Europeans Package and their legislation is therefore lagging behind that of EU Member States in this regard.

3.1 Green Deal

The Green Deal[25] published in 2019 aims to prepare the European economy for the goal of decarbonisation by 2050. This includes looking at the social implications of a green transition and ensuring that its costs and benefits are distributed equally and do not favour one group more than others. Household energy poverty has been identified as one of the risks in the coming years, to be lessened by energy efficiency measures and financial support schemes. The Green Deal is the basis on which the Renovation Wave and its recommendations on energy poverty have been elaborated by the European Commission. The idea behind this is that renovation lowers energy bills and can reduce energy poverty in a sustainable way by reducing energy costs instead of only subsidising them. It can also boost the construction sector and is an opportunity to support SMEs and local jobs.

The Green Deal calls for a socially just transition, which is reflected in policies at EU and national level. This includes investment to provide affordable solutions to those affected by carbon pricing policies, for example through public transport, as well as measures to address energy poverty and promote re-skilling – which can help the labour-intensive construction sector [70]. The Green Deal is not a binding piece of legislation, but it has triggered an ongoing debate on how Europe can reach its goal of decarbonisation by 2050 in a socially just and sustainable way. The fight against energy poverty and the creation of healthy and affordable homes for all Europeans need to be at its core.

The Green Deal together with the climate goal of a 55% reduction in greenhouse gas emissions by 2030 have triggered a number of legislative changes. Several directives and regulations will be revised in 2021,

[23] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019L0944
[24] www.energypoverty.eu
[25] https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

among them the EED, EPBD and RED. This gives the EU a chance to include new provisions on energy poverty reduction, but the legislative process will probably not be completed before 2022/23.

3.2 Renovation Wave and energy poverty recommendation

The Renovation Wave strategy was published on 14 October 2020 as part of the Green Deal. It gives recommendations on how to increase building renovation across Europe to contribute to a higher 2030 climate target and reach the goal of decarbonising the European building stock by 2050. To do so, a wide range of policies, measures and tools must be put in place at all levels to overcome existing barriers and mobilise all actors, including citizens, local authorities, investors and the construction value chain. The Renovation Wave rightly highlights many different intervention points, with a clear timeline. But while a vision to decarbonise the building sector is taking shape, success will depend on how well it is turned into action in the coming years – and a large part of this question relates to how Member States will tackle the problem of energy poverty [71].

Renovation should be used as a lever to address energy poverty and ensure access to healthy housing for all households. To achieve this the European Commission is in the process of launching the Affordable Housing Initiative, which will identify 100 lighthouse projects and examine whether and how EU budget resources alongside EU Emissions Trading System (EU ETS) revenues could be used to fund national energy efficiency and savings schemes targeting lower-income consumers.

Energy communities generate, consume, store and sell energy, and can offer tools for the most vulnerable citizens to lift them out of energy poverty. To exploit their untapped potential as active players in the energy system, the implementation of the Electricity Market Directive and the Renewable Energy Directive will be closely followed. Concerted actions will be used to support their progressive creation and diffusion across Member States. The Commission will further explore how to promote energy communities and disseminate good practices.

One major aspect of the Renovation Wave is to tackle energy poverty and the worst-performing buildings, two factors which come together in many EU Member States. People with a low income have little to no control over their energy bills, which can also cause health and wellbeing problems. People in inefficient buildings are more exposed to cold spells, heatwaves and other impacts of climate change. Inadequate comfort and poor sanitary conditions in housing and work environments – such as inadequate indoor temperatures, deficient air quality and exposure to harmful chemicals and materials – contribute to lower productivity, health problems and higher mortality and morbidity. Poorly performing buildings have significant potential for improvement, but their renovation faces persistent barriers ranging from regulatory obstacles to structural factors. The Renovation Wave addresses the following solutions for energy poverty:

Minimum energy performance standards: Addressing energy poverty in multi-family buildings faces numerous barriers due to the social and financial structure of the inhabitants. One of the solutions is to implement minimum energy performance standards (MEPS) in combination with financing to limit the costs for inhabitants, which would accelerate the renovation rate in Europe and help alleviate energy poverty.

Accompanying services and technical assistance: Financing solutions for low-income households are key to ensuring that energy-poor households have access to renovation measures. Technical assistance and energy service companies (ESCOs) with energy performance contracts can help by limiting upfront investments which use energy savings for the repayment. Such solutions can be used in combination with micro-credits, on-bill financing schemes and on-tax financing schemes.

Blended loans and guarantees from public and private sources through one-stop-shops (OSS): OSS can provide information which is easily accessible to energy-poor and other consumers while ensuring that certain quality requirements are met.

3.2.1 Energy poverty recommendation

In parallel with the Renovation Wave the European Commission published an energy poverty recommendation[26] on how to address energy poverty and how to make sure energy-poor and vulnerable consumers are included in the proposed measures. The following recommendations are relevant for deep renovation in MFABs:

- Develop a systematic approach to the liberalisation of energy markets, with the aim of sharing the benefits with all parts of society, particularly those most in need.
- Produce integrated policy solutions as part of energy and social policy. These should include social policy measures and energy efficiency improvements that reinforce each other.
- Assess the distributional effects of the energy transition, in particular energy efficiency measures in the national context, and define and implement policies that address these concerns.
- Due attention should be given to barriers to investment in energy-efficient housing and those dwellings in most need of renovation, in line with national LTRS.
- All policies should be developed on the basis of meaningful and accountable processes of public participation and broad stakeholder engagement.
- Develop measures to address energy poverty that build on close cooperation between all levels of administration, enabling, in particular, close cooperation between regional and local authorities on the one hand, and civil society organisations and the private sector on the other.
- Take full advantage of EU funding programmes, including cohesion policy, to tackle energy poverty by analysing the distributional effects of energy transition projects and prioritising measures targeting vulnerable groups.
- When allocating public funds, especially grants, target low-income households that have very limited resources of their own and limited access to commercial loans. Explore the role of ESCOs and energy performance contracts in providing renovation financing solutions that enable energy-poor households to overcome high upfront costs [72].

The content of the energy poverty recommendation is expected to be reflected in the recast EED and EPBD as well as in updated National Energy and Climate Plans. It can also serve as guidance when distributing money from the Recovery and Resilience Facility.

3.3 Recovery and Resilience Facility

The Recovery and Resilience Facility (RRF)[27] was initiated as a reaction to the worldwide coronavirus pandemic. As the increase of energy poverty has been one of the side effects of this crisis, it would make sense to focus a dedicated part of the efforts to overcome it on alleviating energy poverty through building renovation. The RRF will make €672.5 billion in loans and grants available to support reforms and investments undertaken by Member States, of which 37% should go to climate financing, part of which could be building renovation. The aim is to mitigate the economic and social impact of the pandemic and

[26] https://ec.europa.eu/energy/sites/ener/files/recommendation_on_energy_poverty_c2020_9600.pdf
[27] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021R0241

make European economies and societies more sustainable, resilient and better prepared for the challenges and opportunities of the green and digital transitions.

The Facility is the centrepiece of Next Generation EU, a temporary recovery instrument that allows the Commission to raise funds to help repair the immediate economic and social damage brought about by the coronavirus pandemic.

Member States were asked to prepare recovery and resilience plans by the end of April 2021 that set out a coherent package of reforms and public investment projects. To benefit from the support of the Facility, these reforms and investments should be implemented by 2026.

Each plan is expected to contribute to the four dimensions outlined in the 2021 Annual Sustainable Growth Strategy[28]:

- Environmental sustainability
- Productivity
- Fairness
- Macroeconomic stability

The Facility is an opportunity to create European flagship areas for investments and reforms with tangible benefits for the economy and citizens across the EU. These should address issues that need significant investment to create jobs and growth, and which are needed for the green and digital transitions.

3.4 Action Plan for the implementation of the European Pillar of Social Rights

Energy efficiency, social policy and housing are very closely liked, which is why it is important to think of these three together wherever possible. The Action Plan for the implementation the European Pillar of Social Rights,[29] launched on 4 March 2021, addresses this issue among others and sets out 20 key principles.

One of the three main targets the plan sets is that the number of people at risk of poverty or social exclusion should be reduced by at least 15 million by 2030. This is closely linked to the goal of providing access to affordable housing, and the Affordable Housing Initiative (which is linked to the Renovation Wave) is its key driver. The Action Plan is therefore closely linked to the Green Deal, the Commission recommendation on energy poverty, the future revision of the Energy Efficiency Directive and the guidance for local action by the EU Energy Poverty Observatory. This will contribute to the alleviation of energy poverty and increase the quality of housing for medium- and low-income households.

3.5 Energy Community

The Energy Community[30] extends the European Union's internal energy market to its neighbouring countries in a step-by-step process. The principal objectives of the Energy Community are to create a regulatory and market framework which is capable of attracting investments for a stable and continuous energy supply. By signing the Energy Community Treaty, the Contracting Parties committed to implement

[28] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2020:0575:FIN
[29] https://ec.europa.eu/info/european-pillar-social-rights/european-pillar-social-rights-action-plan_en
[30] http://energy-community.org/

key EU energy legislation within a fixed timeframe. Both Northern Macedonia and Ukraine are part of the Energy Community.

Since 2006, the Energy Community acquis has significantly evolved to incorporate new directives and regulations. Currently, the acquis covers legislation on electricity, gas, oil, infrastructure, renewable energy, energy efficiency, competition and state aid, environment, statistics, climate and cybersecurity. The adoption of the Clean Energy Package together with the 2030 targets is expected to be tabled for the 2021 Ministerial Council.

The Third Internal Energy Market Package requires Contracting Parties to ensure protection of so-called 'vulnerable customers'.[18] In this context, Contracting Parties '*shall define the concept of vulnerable customers*'[19], but no generic definition is given. Although this package was supposed to be transposed into national law by 1 January 2015, so far none of the Contracting Parties have done so [73].[31] Due to these circumstances and in order to enhance the process, the countries of the Energy Community have been invited to adopt the following definition:

'*A socially vulnerable customer is an electricity consumer:*

- Using energy for supplying her/his permanent housing

- Not exceeding maximum energy consumption per person: when defining electricity consumption level per person, Contracting Parties shall consider total consumption of up to 200 kWh/month for a family with up to 4 members and reflect seasonality.

- Belonging to a category of citizens with lowest income: for the definition of low income, beside the income all available assets shall be taken into account.

- Having her/his electricity consumption supplied through a single-phase meter with a connection not exceeding maximum power. When defining power of a mono phase meter Contracting Parties shall consider power of up to 16 Ampere.'

It was however clarified that the definition should not cover more than a minority of the countries' populations, and that vulnerable consumers should be supported through social allowances.[32]

The Energy Community publishes an annual report on the progress of its target countries and their implementation of the European acquis. Although it does not look at the concept of energy poverty explicitly, the progress of the countries regarding energy efficiency legislation can help shed some light on this general issue.

The 2020 report states that implementation in the energy efficiency sector of North Macedonia is moderately advanced. In terms of climate and environment, North Macedonia is essentially set for a decarbonisation path. The recently adopted energy development strategy sets out three scenarios, of which the green scenario turns out not only to be the most cost-effective but also decarbonises the electricity sector. North Macedonia is also the most advanced of all Contracting Parties in working on the National Energy and Climate Plan. By adopting an Energy Efficiency Law in early 2020, North Macedonia aligned with the energy efficiency acquis. The Energy Efficiency Law transposed the Energy Performance of Buildings

[31] https://www.energy-community.org/dam/jcr:a58c61f5-feca-45a0-97c0-2bdb6d5ed5bf/PHLG062013_Outline_Social_Strategy.PDF
[32] Page 19, https://www.energy-community.org/dam/jcr:a58c61f5-feca-45a0-97c0-2bdb6d5ed5bf/PHLG062013_Outline_Social_Strategy.PDF

Directive. Nevertheless, according to the Energy Community, implementation is still lagging behind as key bylaws are either missing or have not been updated at the cut-off date of this report. North Macedonia was preparing rulebooks on the energy performance of buildings, energy audit of buildings and an energy performance certificates verification system in order to fully implement the Directive. Before the Energy Efficiency Law was adopted, the energy services market was little developed. In August 2020, the first five municipalities implemented energy savings performance contracts on street lighting. No energy efficiency fund exists yet, but one is planned with World Bank support [65].

Ukraine has adopted 13 of the 14 bylaws needed to implement the Buildings Directive according to the Energy Community, five of which are in the process of being amended to align with the Energy Efficiency Directive. The missing bylaw on minimum energy performance requirements is currently in public consultation. A resolution on the adoption of the national nearly zero-energy buildings plan was adopted. The Energy Efficiency Fund was launched in September 2019 with a budget of €100 million from the EU and Germany. It is dedicated to increasing energy efficiency in multi-apartment buildings. The energy services market in Ukraine is significantly more developed than in any other Contracting Party. Energy service company projects for building renovation are progressing well [65].

4 Evaluation of policy measures against energy poverty

Instruments to tackle energy poverty are multifaceted and can be evaluated based on several characteristics. The previous chapters have shown that growing attention is being paid to energy poverty in EU legislation and EU policy initiatives, and that a generic concept of energy poverty is being applied to various target groups and building types, which are addressed by context-dependent policy instruments. This chapter will evaluate several 'conventional' policy instruments from the EU and Member States that are often referred to as showing good practice in the context of energy poverty. The aim is to evaluate how applicable these instruments are for addressing energy poverty in CEE and CIS countries with regard to the MFBA housing stock – the target group of the ComAct project. This evaluation is relevant to policymakers because they need to understand whether tools to tackle energy poverty are effective for and accessible to energy-poor households in multi-family buildings.

4.1 Introduction of selected instruments

Policymakers can choose from a broad variety of policy instruments to tackle energy poverty in their constituencies. Differing categorisations have been made within the academic and policy field to create an overview of available measures. These can range from financing support to awareness-raising. The European Energy Poverty Observatory presents a broader set of policy types [74]:

- Financing structural improvements in the energy situation of households
- Energy audits
- Financial assistance reducing energy bills/social support
- Legal disconnection protection
- Information and awareness measures

Each of these categories in turn contains various types of specific instruments. This chapter aims to illustrate the variety of instruments available to policymakers. The categorisation provided by the EU Energy Poverty Observatory will be used to categorise good practice examples, with special attention on the first category,

which is the closest to supporting the renovation of buildings at the centre of the scope of ComAct. The concluding section includes a comparison of the relevant dimensions of these instruments and assesses their relevance and applicability for the CEE and CIS countries. Rather than measuring their impact on energy poverty, which itself is notoriously hard to measure [74], a broader set of research aspects is proposed that are relevant to the target countries in ComAct. These include:

1. Do the programmes have explicit social targets, and how do these relate to energy poverty?
    - E.g. what definition of energy poverty is given?
2. How accessible are the instruments to the energy-poor?
    - E.g. do instruments include grant elements
3. Are the instruments targeting multi-family buildings?
4. Do instruments trigger deep renovation?
    - European definition – more than 60% efficiency gains after renovation[33]

Explicit social targets in the design of each policy instrument are important to assess whether it is merely targeting structural improvement of buildings, or whether it particularly addresses vulnerable residents. The degree to which an instrument is accessible to vulnerable residents also depends on the extent to which the residents must contribute or take financial risks themselves, even when instruments are specifically targeted at them. In CEE and CIS countries multi-family buildings present a specific challenge and opportunity for energy renovation, due to ownership structures, social diversity, and the fact that these buildings are mostly prefabricated [75]. Therefore, it is important to evaluate if this building segment is targeted by financial instruments. Finally, it is important to see to what extent energy efficiency is improved after renovation, taking into consideration that deep renovation can have a higher potential to reduce energy poverty [21].

4.2 Good practice instruments against energy poverty

This section discusses several policy instruments for financing building renovation which address energy poverty to a certain degree. The policy instruments have been selected throughout the EU and fall within the categories suggested by the European Energy Poverty Observatory [76].

4.2.1 Financing structural improvements in the energy situation of households

Improving building insulation, HVAC installations, household appliances and renewable energy generation are opportunities to structurally reduce energy consumption and reduce the energy expenditure of households. Financing such improvements is therefore considered a preferred option, but the financing scheme behind the interventions is crucial because it determines the accessibility of the instruments for vulnerable households, and whether the interventions increase or decrease energy poverty[34]. Financing can take different forms, ranging from grants to low-interest loans. In relation to financing structural improvements, the Centre for European Policy Studies (CEPS) sums up three conventional private building renovation instruments that are often applied in southeast Europe [77]: renovation loan programmes, urban development funds, and energy service companies (ESCOs). Often these types of financial

[33] EU Commission Recommendation (EU) 2019/786 of 8 May 2019. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1442476465850&uri=CELEX:32019H0786

[34] When high upfront costs must be financed by poor or vulnerable building owners or if the rent rises after renovation measures have been implemented this can have adverse effects and increase energy poverty rather than decreasing it.

instruments include a grant element. Good practice examples evaluated in the following section will be the KredEx renovation loan programme, the Lithuanian modernisation fund, the Latvian Baltic Energy Efficiency Facility (LABEEF), and the Better Energy Warmer Homes Scheme in Ireland.

4.2.2 Energy audits

To resolve energy poverty and plan structural improvements of the buildings it is essential to have data on the buildings and provide advice on how the energy efficiency of individual buildings can be improved. When implemented in collaboration with others such as social workers or healthcare professionals, audits can be effective tools for reaching energy-poor households [74] .

Several countries have implemented programmes that foster the implementation of energy audits in energy-poor households. Examples like the DÉPAR programme in France, the Flanders energy scan programme, the Croatian co-financing of energy auditing, and the energy performance certificate (EPC) illustrate the widespread use of these kinds of instruments to combat energy poverty. A representative energy audit programme from Barcelona will be assessed.

4.2.3 Financial assistance reducing energy bills/social support

Households at risk of energy poverty can receive two kinds of financial assistance to reduce their energy bills. Social tariffs put a cap on the maximum price households have to pay for their energy bills, often expressed as a maximum percentage of their income [76]. Energy bill support, on the other hand, provides temporary financial assistance to pay for energy. This is considered a short-term solution.

Financial assistance for energy bills is available in several European countries, illustrated by policies like the Greek policy to provide free electricity to the extreme poor, the Romanian fuel heating subsidy, or the Croatian energy allowance. The analysis will be performed on the representative Bulgarian heating subsidy and electricity tariff.

Good practice examples which are evaluated in the following section (5.3) will be the Bulgarian heating subsidy and electricity social tariff.

4.2.4 Legal disconnection protection

Legal disconnection protection forbids the complete disconnection of vulnerable households, like disabled or pensioners, often during cold winter months [76]. Although the measures do not foster renovation, they do help to reduce the worst effects of energy poverty in winter. Examples of disconnection protection include the disconnection protection in Catalonia, the disconnection protection in Netherlands, and the disconnection protection in Romania. The disconnection protection in Hungary is analysed in detail in chapter 5.3.7.

4.2.5 Information and awareness measures

Information and awareness-raising measures support household energy performance through education, information and advice [76]. Information and awareness-raising campaigns take many forms and can be tailored to specific target audiences. Specific informative programmes for energy-poor households include the Energy saving cheque programme in Germany, the Social energy without limits programme in Austria and the Keep warm and well programme in Ireland. The analysis will focus on the SLIME programme in France.

4.3 Good practice in detail

The good practice examples below have been selected as representatives of the types of instruments discussed above. The selection has been made to showcase the variety of financing structures and scope in terms of beneficiaries and building types, to allow comparison of important features. Another consideration was the availability of data. Because of that, these good practice cases are representative with respect to specific features, such as financing structures, beneficiaries, budget or accessibility, but not for all other features.

4.3.1 KredEx Renovation Loan Programme – Estonia

Name	*Korterelamu renoveerimislaen* – **Renovation Loan Programme – KredEx**
Short description	The KredEx programme is a preferential loan and grant programme for the renovation of multi-family buildings in Estonia. It was first established in 2003, since which it has been renewed several times. The grant scheme is financed through the KredEx fund and collaborating local banks, and is aimed at apartment associations and apartment owners. The KredEx Fund is part of the broader KredEx Foundation, a non-profit financial service provider established by the Estonian Ministry of Economic Affairs and Communications in 2001 [78]. Grants within the programme range from 15%-40% of total investment costs depending on the energy performance improvements achieved, and are accompanied by low-interest loans. Besides improving the energy efficiency of buildings, the programme also focuses on improving indoor air quality, which brings health benefits to residents [78]. In 2021 applications for apartment associations opened again, according to the Estonian Association of Apartment Associations EKÜL. [35]
What is the total budget of the instrument?	The initial budget for the introduction phase of the programme (2003-2007) was €12.8 million. During the second phase from 2009-2014 loans were provided backed by public funding equalling €71.97 million and €35.9 million in grants [79]. For the 2015-2020 third phase of the programme €102 million was available for grants of varying sizes [80]. The total public investment was €222 million[36].
How accessible is the instrument to the energy-poor?	Risk aversion among building owners was a serious challenge for the KredEx fund between 2015-2020, related to the long loan periods [79]. Such issues reduce the accessibility of the programme for energy-poor households because they might have a higher risk aversion than the average citizen regarding financial commitments. Another critical issue which is not clearly communicated is whether or not the revenues of monthly energy savings are higher than the instalments to be repaid for

[35] For more information visit the EKÜL website at: https://www.ekyl.ee/2021/02/08/korterelamu-renoveerimislaen-kredexist/

[36] In 2020 the Estonian government announced another round of extraordinary grants, equaling €71 million. The report does not clarify whether this is in addition to or part of the initially allocated budget. Accessible at: https://news.err.ee/1101557/kredex-announces-28-5-million-apartment-building-renovation-support-scheme and https://www.kredex.ee/en/node/2051

	the loan. If the instalments are higher this further reduces accessibility for energy-poor households.
Does the instrument target multi-family buildings?	Yes, the programme is only available for multi-family buildings [79].
Does the instrument trigger deep renovation?	The loans and grants do not lead to a deep renovation as defined in the EU Commission recommendation from 2019 (minimum 60%), although incentive structures – in the form of higher grants for higher energy performance renovations and grants for project management and audits – exist to stimulate building owners to perform deeper renovations. For the 15% grant, energy savings must be between 20-30% and final energy consumption must be lower than 250kWh/m^2/year. For the 25% grant, energy savings must be at least 40% and final energy consumption under 200 kWh/m^2/year. For the 40% grant, energy savings must be at least 50% and final energy consumption after renovation lower than 150 kWh/m^2/year [79].

4.3.2 Lithuanian Modernisation Fund – Lithuania

Name	**Daugiabučių namų atnaujinimo (modernizavimo) programa – Apartment Building Modernisation Programme – JESSICA II**
Short description	The Modernisation Programme in Lithuania is based on a revolving fund that provides preferential loans in combination with grants and leverages private investment in the renovation of residential buildings. The preferential loans in the programme are issued with 3% interest rates and a maturity of 20 years [81]. Moreover, subsidies exist for project preparation (100% grant), project implementation administration costs and construction maintenance costs (100% grant), and up to 30% of the investments in energy efficiency (depending on the depth of the renovation) are returned to building owners in the form of a grant, as well as an additional 10% of the costs of implementation of new heating systems [82]. In the latest phase of the programme, after 2018, bank guarantees by the European Investment Bank in the context of this program will ensure that private banks can lend more money to renovate an additional 500 multi-family buildings containing 14,000 households [83].
What is the total budget of the instrument?	From 2005-2013 a total of €368.5 million was invested [84], but the use of resources increased substantially after 2013 when local municipalities started providing professional assistance to the renovation process [85]. In 2019 the European Investment Bank (EIB) provided another €30 million banking guarantee for the participating private banks, allowing these partnering banks to provide another €150 million in loans. Overall investment in the context of the project is estimated at €600 million of public and private funding [83].
How accessible is the instrument to the energy-poor?	Where the owner of the dwelling is entitled to the heating allowance, the state replaces the household as the borrower and pays for 100% of the loan instalments[37]. It is also an additional condition that theoretically the instalments of the loan must be lower than the energy costs saved, thus it is obligatory to prove that the investment creates immediate financial benefits. This programme therefore pays special attention to affordability and the support of the lowest income families.
Does the instrument target multi-family buildings?	Yes, the programme is completely focussed on building owners in multi-family buildings [81].
Does the instrument trigger deep renovation?	Mostly yes. In the first phase energy savings of 'up to 60%' were achieved [81]. Reports of the 'Concluded State Support' for 2018 indicated that around 90% of the renovation projects aimed to improve the energy performance by more than 60%, to an EPC rating of B or C [82].

[37] Based in an interview for the REELIH working paper project (MRI-BPIE 2019)

4.3.3 Latvian Baltic Energy Efficiency Facility (LABEEF) – Latvia

Name	Latvian Baltic Energy Efficiency Facility (LABEEF) – EBRD/Accelerate SUNShINE
Short description	The Latvian Baltic Energy Efficiency Facility (LABEEF) was established to support energy service companies involved in the renovation of multi-apartment buildings to improve the energy performance of the Latvian building stock. The conditions for energy performance contracting (EPC) are improved in Latvia because LABEEF buys roughly 80% of the longer-term EPC receivables that residents pay in return for the renovation of their building and reduced energy costs [86]. After the project has been implemented by the contractor, LABEEF checks the energy performance and purchases the contract. After 20 years the residents enjoy reduced energy costs.
What is the total budget of the instrument?	Currently projects worth €5 million have been completed. Another €20 million in projects are in the pipeline [87].
How accessible is the instrument to the energy-poor?	Residents affected by the LABEEF programme have to pay 15% higher energy bills during the duration of the ESCO contract [86]. This might reduce the accessibility of the programme for energy-poor residents.
Does the instrument target multi-family buildings?	Yes. The explicit aim of LABEEF is to modernise 20% of Latvian multi-family buildings by 2020 [86]. Evaluation of the program will have to indicate if this objective has been reached.
Does the instrument trigger deep renovation?	LABEEF was established with the aim of facilitating the deep renovation of the Latvian building stock. Deep renovations were defined as improving the energy performance by 50% or more [86]. This is slightly lower than the European Commission's recommended definition of 60%.

4.3.4 Better Energy Warmer Homes Scheme – Ireland

Name	Better Energy Warmer Homes Scheme
Short description	The Better Energy Warmer Homes Scheme provides free energy upgrades to building owners who receive specified welfare support from the government [88]. The programme targets buildings constructed before 2006 owned by residents receiving fuel allowances, who are jobless with children, who are single parent families, or who receive other social support. The programme mostly focuses on insulation measures for attics, cavity walls, and external and internal walls, but it also offers boiler replacement in specific cases [89]. To date 140,000 homeowners have already received an energy upgrade through the programme [88].
What is the total budget of the instrument?	Since the inception of the programme, between 2009 and 2019 €268 million has been invested, reaching 124,345 households [90]. Over the years the budget was expanded from €12.3 million in 2009 to €39.8 million in 2019. In 2020 the budget accounted for €52.8 million [91]. In 2021 the combined funding aimed at vulnerable households accounted for €109 million [92]. Based on the estimate that at least 50% of these

	funds will come through the Better Energy Warmer Homes Scheme, this brings the total budget to €375 million.
How accessible is the instrument to the energy-poor?	Since the programme provides housing renovation to low-income families as a 100% grant it is very accessible for the energy-poor.
Does the instrument specifically target multi-family buildings?	No, the instrument does not specifically mention multi-family buildings in its application requirement, and it targets a broader range of buildings [88], with 34% of the buildings being single-family homes and 49% being detached houses [90]. This might be partly because Ireland has relatively few MFABs and a high number of (semi)detached houses [93].
Does the instrument trigger deep renovation?	Around 62% of the renovated buildings achieved an EPC-rating between C1 and D2 [90]. The average level of energy performance before the renovation remains unclear. However, C1 and D2 are classed as semi-efficient buildings, which reduces the likelihood that the result will be considered a deep renovation[38].

4.3.5 Energy audits in Barcelona

Name	***Auditories i intervenció als habitatges en situació de pobresa energètica* – Energy audits for households in energy poverty – Provincial Government of Barcelona**
Short description	The government of Barcelona supports low-income households by paying for energy audits, by installing low-cost elements related to energy efficiency, by supporting procedures to change tariffs, and by training residents in efficient consumption habits [94]. After an energy audit is conducted in the home of a beneficiary, the residents receive tailored advice on how to reduce their energy consumption and support with the implementation of low-cost energy-efficient appliances. Furthermore, training is provided to residents so they can change high energy consumption habits [94]. The regional government supports local authorities with setting up and administering the implementation of the programme.
What is the total budget of the instrument?	The budget of the programme is limited to roughly €400,000 annually [95]: this is low in comparison to programmes aiming for building renovation due to the high costs related to structural renovation. Relevant future analyses could compare these costs to similar programmes in other countries.
How accessible is the instrument to the energy-poor?	The instrument is specifically tailored to building owners and residents living in energy poverty in the Province of Barcelona.
Does the instrument target multi-family buildings?	The programme does not specifically target multi-family buildings, but rather focuses on the individual households.

[38] See the SEAI 2014 Guide to Building Energy Rating for more information. Available at: https://www.seai.ie/publications/Your-Guide-to-Building-Energy-Rating.pdf

Does the instrument trigger deep renovation?	No, but it can be a first step to get into a conversation with energy-poor households and raise their awareness of energy savings, which can lead to future renovation steps.

4.3.6 Bulgarian heating subsidy and electricity tariff

Name	Целева помощ за отопление / социална тарифа на тока – Targeted heating assistance / Social electricity tariff – Bulgarian Government
Short description	The most vulnerable residents in Bulgaria can apply for multiple types of support, including the Bulgarian heating subsidy (Целева помощ за отопление) and the Bulgarian social electricity tariff (Социална тарифа на тока). These measures are complementary. The heating subsidy consists of a predefined financial allowance for Bulgarian residents who do not have sufficient income to heat their homes during the winter months. The subsidy of BGN 495.90 (€253.53) which is distributed twice a winter can only be received after recipients have proved that they have not sold real estate in the last five years, have no property maintenance contracts, have no more savings than 500 BGN per family member, and have not travelled abroad at their own expense over the last year [22]. Additionally, a social electricity tariff has been introduced in the context of the deregulation of the Bulgarian energy sector. Vulnerable customers, around 14% of the population, will pay 33% less for electricity during a period of five years [96]. Moreover, 100kWh will be guaranteed, and households making use of electric heating will receive additional support [97].
What is the total budget of the instrument?	In 2019/2020 the costs of the heating subsidy were roughly €63 million [18]. No information was found for the costs of the electricity tariff.
How accessible is the instrument to the energy-poor?	These instruments are only accessible for the energy-poor, in particular residents that already receive government support.
Does the instrument target multi-family buildings?	No, the allocation of the subsidies is based on the income of the residents rather than the building typology of their homes.
Do instruments trigger deep renovation?	No, the instruments do not trigger renovation.

4.3.7 Disconnection protection – Hungary

Name	***Kikapcsolási védelem* – Disconnection protection**
Short description	Disabled, blind and other vulnerable customers cannot be disconnected from the energy or water supply. This also applies to people experiencing direct life danger due to the disconnection of the utility and energy services [98]. This protects the vulnerable from extreme energy poverty. In cases of energy debts, vulnerable costumers may only be disconnected from the grid in case they refuse to install and use a pre-paid energy meter, which only allows energy consumption that is paid in advance [99]. Residents who are eligible must register themselves in a database of vulnerable customers and provide proof in the form of receipts from other state support programmes, such as the blind people allowance or the disability allowance [98]. Moreover, these vulnerable consumers are eligible for further support to manage their energy. The other support measures include monthly support with reading the meters, cash settlements at home, and on-site explanation of energy consumption and help to understand the invoice [98].
What is the total budget of the instrument?	Costs for implementing these measures are divided between the energy service providers (especially the installation of pre-paid meters) and the local authorities (support for understanding individual energy consumption) [99].
How accessible is the instrument to the energy-poor?	The measure is limited to those people already receiving targeted government support and does not apply to a broader group of energy-poor residents.
Does the instrument target multi-family buildings?	Not specifically.
Does the instrument trigger deep renovation?	No. The disconnection protection does not focus on structural renovation but on limiting the potential damage of disconnection for the most vulnerable during the winter months.

4.3.8 SLIME programme – France

Name	***Service Local d'Intervention pour la Maîtrise de l'Energie (SLIME)* – (Local Intervention Service for Energy Management) – French authorities (local and national) and private partners**
Short description	The Local Intervention Service for Energy Management (SLIME) consists of an action tailored to low-income households that supports them in improving their energy management at home [100]. SLIMEs are in practice local one-stop-shops aimed at households in fuel poverty. They create a single (physical) platform with information that can be used to initiate on-site visits in energy-poor households, and to perform a social and technical audit. During the audit some free energy and water saving equipment is provided, such as LED lights, tools to automatically turn off stand-by appliances, door rolls and water saving equipment [101]. Healthcare, energy, construction, and other professionals should easily be able to report to the platform information about energy poverty situations in households they encounter during their daily work [100]. This helps the local authorities to focus their attention on households in need of support. The same professionals are encouraged, through the platform, to present these households with solutions for getting out of energy poverty, especially energy (how to reduce usage), technical (how to implement (light) energy efficiency measures) and social services (how to deal with arrears on energy bills) [102]. The programme has resulted in annual average energy savings of €170 per household and is mostly operated by local authorities and institutions [100]. Interventions are paid for with revenues from energy saving certificates[39].
What is the total budget of the instrument?	€17 million has been invested in the context of the SLIME programme since 2013 [100].
How accessible is the instrument to the energy-poor?	The tool is specifically designed for energy-poor households and can be considered accessible because there is no financial investment or risk required from their side.
Does the instrument target multi-family buildings?	The programme is explicitly not tailored to specific building typologies but to the socio-economic conditions of the owners/residents [100].
Does the instrument trigger deep renovation?	No, the programme rather focuses on smaller interventions such as lighting and door rolls, which do not achieve the efficiency improvements required for deep renovation.

[39] Also knows as 'white certificates' or Certificats d'Economies d'Energie (CEE), these are part of a system where the French government sets multi-annual emissions-saving targets for private sector energy suppliers that can be met through financing energy efficiency projects. Energy suppliers must achieve energy savings based on their market share. For more information visit: https://www.powernext.com/french-energy-saving-certificates

4.4 Comparative analysis of financial instruments

The next section contains an overview of the different instruments discussed in Table 7 with indicative qualitative assessment. The table compares the good practices' budget size, the specification of MFABs in their scope, the accessibility for the energy-poor, and the share of deep renovations triggered by the instrument. An analysis of relevant advantages, disadvantages and challenges based on the contents of the table is provided in the section below.

	Total budget	Focus on MFABs	Accessibility for energy-poor	Share of deep renovations triggered
KredEx – Estonia	€222 million	Yes		
Multi-family modernisation fund – Lithuania	€600 million	Yes		
LABEEF – Latvia	€25 million	Yes		
Better Energy Warmer Homes Scheme – Ireland	€375 million	No		
Energy auditing support – Barcelona	€400,000 / year	No		
Heating subsidy and social electricity tariff – Bulgaria	€63 million / year	No		
Disconnection prohibition – Hungary	n/a	No		
Slime Programme – France	€17 million	No		

	High
	Medium
	Low

Table 6 Comparative overview of energy poverty instruments

Heating subsidies and social tariffs are not a structural solution

The limited accessibility of social tariffs and heating subsidies, which are often only available for very vulnerable groups or households in extreme poverty, do not reach other energy-poor households. This can for example be observed in Bulgaria, where only 3.6% of the population receive targeted heating assistance, whereas 33.6% of the population can be considered energy-poor [18]. Moreover, these subsidies do not effectively improve the situation of the energy-poor, but rather prevent the worst consequences of their poverty. This means that they combat the symptoms rather than curing the cause of the energy poverty [21].

Budget volumes vary significantly

There are significant differences in terms of budget between the programmes, with especially large budgets for the programmes aimed at structural deep renovation. Programmes that do not trigger deep renovation but aim to lower energy bills, promote energy audits or prohibit disconnections have lower budgets. Sufficiently sizable budgets are required to foster building renovation and achieve impact.

For comparison, the German KfW Energy-efficient Construction and Refurbishment programme provided €73.3 billion in grants and loans for energy-efficient renovations between 2005-2017 while saving up to 7.5 million tonnes of CO_2 emissions [103]. Although this funding is not specifically tailored to the energy-poor, and Germany is much more densely populated than the Baltic states, it illustrates that to achieve significant impact larger volumes of investment are required.

Focus on multi-family buildings with renovation programmes

The structural renovation programmes analysed in this report tend to focus on multi-family buildings[40], whereas most other programmes seem to be designed based on the receiving household rather than the building segment. An exception is the Better Energy Warmer Homes Scheme in Ireland, which is the sole structural renovation programme focusing exclusively on energy-poor households and building segments.

Narrow definitions of energy-poor affect accessibility of programmes

The disconnection prohibition, the heating subsidies, and the Better Energy Warmer Homes Scheme have specific definitions of energy-poor. In all cases the recipients need to present proof that they receive other government benefits, which might exclude households at the edge of energy poverty that are living just above the bare minimum. For example, the Hungarian disconnection prohibition only applies to deaf or disabled people, excluding other energy-poor households.

Lacking deep renovation among energy poverty instruments

The programmes that do focus on renovation also tend to focus on multi-family buildings, except for the Better Energy Warmer Homes Scheme. It is striking that from the analysed cases few programmes consistently focus on deep renovations. Although the energy performance of the building improves in all programmes, the degree to which this happens varies significantly. Only the Lithuanian modernisation fund consistently achieves deep renovations.

Grant elements are important for the accessibility of structural renovation programmes

The programmes focussing on financing structural renovations, like LABEEF, Kred-Ex and the Lithuanian Modernisation Fund, all have a broader scope and do not solely focus on energy-poor households. This makes it hard to assess what share of the total budget ends up benefiting energy-poor households. Instruments that have a broader scope but 100% grant elements for the energy-poor ensure that these instruments remain accessible for the energy-poor. The Better Energy Warmer Homes Scheme, in particular, reserves significant shares of the budget for the energy-poor, which shows that structural renovation programmes tailored to the energy poor are possible.

Transferability of good practice from abroad for the ComAct project

The transferability of energy poverty instruments is affected by several factors including:

[40] This does not imply that structural renovation programmes in general only focus on MFABs.

- Availability of funds
- The existing regulatory framework
- The structure of the building stock
- Housing tenure
- Decision-making procedures in home-owner associations
- Energy poverty rates

When implementing instruments to improve energy performance and tackle energy poverty, several barriers need to be overcome. According to the Centre for European Policy Studies the appropriate regulatory framework (e.g. for HOAs to get loans) and a thorough understanding of market gaps are essential to design effective renovation/energy poverty instruments and understand the financial capacities of the beneficiaries [77]. Energy poverty is itself an important barrier for programmes needing to attract private investment, requiring well-designed social components to assure accessibility to the poorest. Financial risks related to the expected return on investment, which is even higher for energy-poor households, hinder the wider deployment of energy efficiency instruments and make it harder to attract private capital to combat energy poverty and improve energy performance in MFABs. This relates especially to difficulties with calculating return on investment based on achieved energy savings, and the long lifetime of loans [75]. Common decision-making mechanisms in HOAs are important, and can foster or slow down progress depending on the extent to which unanimity among residents is required and for which building elements and installations the HOA is responsible. To increase deep renovation rates in MFABs internal decision-making processes must be facilitated.

The structure of the building stock is an important aspect for the transferability of the tools. Tools tailored to single family buildings, for example, might not be suitable to renovate multi-family buildings. High shares of private ownership and the focus on multi-family buildings are important instrument characteristics that need to be present to increase the transferability of financial renovation programmes like Kred-Ex, LABEEF and the Lithuanian Modernisation Fund [86]. These conditions are present in other post-communist CEE/CIS countries, which makes the scope for transferability higher. The transferability of other programmes focusing on more building typologies, such as the Better Energy Warmer Homes Scheme, might be lower because of their broader focus and the fact that they result in the renovation of single-family and detached houses.

Combining effective elements of various programmes

To effectively combat energy poverty the programmes that focus on structural renovation can be accompanied by auditing, information and awareness instruments, and disconnection protection policies. Although subsidies help to prevent the worst excesses of energy poverty during the winter months, some perceive them as ineffective because they do not improve energy performance in the long term. At the same time, it is important to find solutions for buildings beyond multi-family buildings.

Bibliography

[1] S. Bouzarovski and H. Thomson, “Transforming energy poverty policies in the European Union: Second annual report of the European Union Energy Poverty Observatory," 2019.

[2] É. Gerőházi, H. Szemző, and M. Fabbri, “How energy efficiency retrofits contribute to energy poverty alleviation. Theory, best practice in the European Union and case studies from the REELIH project in Armenia, Bosnia and Herzegovina and North Macedonia,” 2020.

[3] Z. Ilievski, B. Kalimanov, D. Trpkoska, and Z. Tarevska, “Mapping the national situation on energy poverty,” 2014.

[4] ASSIST Consortium, “Vulnerable Consumers and Fuel Poverty Report,” no. EU H2020-754051, p. 176, 2019.

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

[6] BPIE and MRI, “Energy poverty aspects of the REELIH project In Armenia, Bosnia and Herzegovina and North Macedonia,” 2019.

[7] S. Pye, A. Dobbins, C. Baffert, J. Brajkovic, R. De Miglio, and P. Deane, “Energy poverty and vulnerable consumers in the energy sector across the EU: analysis of policies and measures,” 2015.

[8] B. Boardman, *Fixing fuel poverty: Challenges and solutions*. Taylor and Francis, 2010.

[9] H. Thomson, N. Simcock, S. Bouzarovski, and S. Petrova, “Energy poverty and indoor cooling: An overlooked issue in Europe,” *Energy and Buildings* 196: 21–29, 2019, doi: 10.1016/j.enbuild.2019.05.014.

[10] B. Boardman, *Fuel poverty: from cold homes to affordable warmth*. 1991.

[11] S. T. Herrero, “Energy poverty indicators: A critical review of methods,” *Indoor Built Environment* 26(7): 1018–1031, 2017, doi: 10.1177/1420326X17718054.

[12] S. Matzinger, E. Dawid, and K. Heitzmann, “Studie zur Eruierung einer Definition von Energiearmut in Österreich aus Sicht der Sozialwirtschaftlichen und Energie - wirtschaftlichen Praxis [Study to determine a definition of energy poverty in Austria from the perspective of social and energy economy],” 2018.

[13] D. Fellegi and O. Fülöp, “Szegénység vagy energiaszegénység? Az energiaszegénység definiálása Európában és Magyarországon. [Poverty or energy poverty? Defining energy poverty in Europe and Hungary],” 2012.

[14] InventAir Project, “InventAir: Report on the energy poverty and air quality status in the Eastern European Countries,” 2018.

[15] T. Boermans and C. Petersdorff, “U-Values for Better Energy Performance of Buildings Report established by ECOFYS for EURIMA.”

[16] Coldathome.today, “Over-exposed: Energy Poverty in Central & Eastern Europe — EnAct,” 2019.

[17] L.-K. Adrienn and O. Fülöp, “Energiaszegénység Magyarországon,” *Statisztikai Szle.* 8-9(92), 2014.

[18] Bulgarian Government, “Bulgarian Long Term Renovation Strategy – Renewal of the National Building Stock Towards 2050,” 2021. [Online]. Available: https://ec.europa.eu/energy/sites/default/files/documents/bg_2020_ltrs.pdf.

[19] International Energy Agency (IEA), “Bulgaria,” www.iea.org/countries/bulgaria

[20] CEE Bankwatch Network, “The energy sector in Bulgaria.” https://bankwatch.org/beyond-coal/the-

energy-sector-in-bulgaria

[21] D. Tzanev, “Energy Poverty in the light of local elections: analytical rationale,” 2019. http://www.eneffect.bg/images/upload/123/Energy Poverty Analysis final-zg-cover.pdf

[22] Social Assistence Directories, “Targeted heating assistence,” 2021. https://pomosti.com/socialni-pomosti/pomost-za-otoplenie.

[23] B. M. of R. D. and P. W. (Institution), “National Program for Energy Efficiency of Multifamily Residential Buildings,” 2021. https://www.mrrb.bg/bg/energijna-efektivnost/nacionalna-programa-za-ee-na-mnogofamilni-jilistni-sgradi

[24] K. Simeonov, D. Tzanev, “SMARTER Finance for Families – Improving Citizens' Health Comfort and Financial Well-being by Supporting Banks, Residential Investors and D3 . 03 Solutions for households experiencing Energy Poverty,” 2020. https://c2e2.unepdtu.org/smarter

[25] J. Singh, V. Sirvydis, Y. Song, E. Milova, K. Simeon, and P. Tigran, “Bulgaria National Program for Energy Efficiency in Residential Buildings: Program Design Report for the Second Phase,” 2018. World Bank. http://documents1.worldbank.org/curated/en/329851534930802672/pdf/Bulgaria-National-Residential-Energy-Efficiency-Program-Phase-2-Design-Report.pdf

[26] CityNvest, “Bulgarian Energy Efficiency and Renewable Sources Fund – EERSF,” 2019. http://citynvest.eu/sites/default/files/library-documents/Model 19_Energy Efficiency and Renewable Sources Fund -EERSF_final.pdf.

[27] “Grant procedure BG16RFOp001-2.001 ‘Energy efficiency in pheripheral areas,’” 2016. http://www.bgregio.eu/shemi/120/oprr--oprd--mrrb.aspx.

[28] “REECL: The European Bank for Reconstruction and Development is expanding its energy efficiency program in the housing sector in Bulgaria,” 2020. https://reecl.org/европейската-банка-за-възстановяван/.

[29] National Statistical Institute Bulgaria, “Housing conditions of housesholds,” 2020. https://www.nsi.bg/en/content/5716/housing-conditions-households.

[30] C. Wiener and T. Szép, “The Hungarian Utility Cost Reduction Programme,” 2020.

[31] B. Gaál, “Hungarian electricity, gas prices among lowest in EU,” *Budapest Business Journal*, 2020.

[32] Z. Jandó, “Olyan sokat keres az állam a lakossági gázon, hogy a következő választás előtt akár ingyen is adhatja fél évig [The state makes such a high revenue on selling residential gas, that it could even make it free for 6 months before the next election],” *G7.hu*, 2020.

[33] N. Feldmár, “Energiaszegénység,” in *Éves jelentés a lakhatási szegénységről 2020 [Annual Report on Housing Poverty 2020]*, 2020, pp. 42–56.

[34] Ministry of Innovation and Technology, “National Energy and Climate Plan of Hungary,” 2020.

[35] Eurostat, “Inability to keep home adequately warm – EU-SILC survey,” 2021.

[36] Energy Poverty Observatory, “Member state report – Hungary,” p. 4, 2018.

[37] “Rural Living Lab – Step-in project.”

[38] Ministry of Innovation and Technology, “Második Nemzeti Éghajlatváltozási Stratégia [The Second Climate Change Strategy of Hungary],” 2018.

[39] Z. Koritár, A. Pálffy, F. Sáfián, and I. Szécsi, “A hazai felújítási hullám. A magyarországi lakóépület-állomány korszerűsítésében rejlő lehetőségek, egy lehetséges támogatási programme széles körű hatásainak vizsgálata [Renovation Wave in Hungary. The opportunities offered by the modernisation of the Hung],” 2020.

[40] KSH, “Miben élünk? A 2015. évi lakásfelmérés főbb eredményei [What are we living in? The main results of the 2015 housing survey],” Budapest, 2016.

[41] É. Gerőházi, J. Hegedüs, and E. Somogyi, “Az alacsony státuszú területen található társasházak problémái [Problems of multi-apartment buildings in low status areas],” 2011.

[42] ÉMI Non-Profit Limited Liability Company for Quality Control and Innovation in and Building, “National Building Energy Performance Strategy,” 2015.

[43] C. Jensen, “30 national summary briefs of national energy supply and demand – Lithuania,” 2018.

[44] Urban-energy.com, “An update on the energy poverty situation in Lithuania – Energy Vulnerability and Urban Transitions,” 2017.

[45] Ministry of Energy of the Republic of Lithuania, “The Seimas approves liberalisation of the electricity market, presenting new opportunities for electricity consumers,” 2020.

[46] The Baltic Times, “Liberalized power supplies to Lithuanian residents should not raise prices – energmin,” 2018.

[47] “National Energy and Climate Action Plan of the Republic of Lithuania for 2021-2030,” 2020.

[48] Am.lrv.lt, “Visuomenė kviečiama susipažinti su Lietuvos ilgalaikės renovacijos strategija [The public is invited to get acquainted with Lithuania’s long-term renovation strategy],” 2021.

[49] Epilietis.lrv.lt, “Lietuvos Ilgalaikė Renovacijos Strategija [Long-term Renovation Strategy of Lithuania] ,” 2021.

[50] Energy Poverty Observatory, “Energy Poverty Observatory Member State Report – Lithuania,” 2020.

[51] Euroheat & Power, “District Energy in Lithuania,” 2019.

[52] I. Varnagirytė-Kabašinskienė, D. Lukminė, S. Mizaras, L. Beniušienė, and K. Armolaitis, “Lithuanian forest biomass resources: Legal, economic and ecological aspects of their use and potential,” *Energy, Sustainability and Society* 9(1): 41, 2019, doi: 10.1186/s13705-019-0229-9.

[53] D. Burneika, R. Ubarevičienė, and A. Baranuskaitė, “Soviet housing estates in Vilnius, Lithuania: Socio-ethnic structure and future(-less?) perspectives,” *Urban Book Series*, pp. 247–270, 2019, doi: 10.1007/978-3-030-23392-1_12.

[54] World Bank, “Urban population (% of total population) – Lithuania | Data,” 2019.

[55] S. Raslanas, J. Alchimoviene, and N. Banaitiene, “Residential Areas with Apartment Houses: Analysis of the Condition of Buildings, Planning Issues, Retrofit Strategies and Scenarios,” *International Journal of Strategic Property Management* 15(2): 152–172, 2011, doi: 10.3846/1648715X.2011.586531.

[56] C. Vasquez, R. Begolli, L. Van Gelder, and S. Shukla, “Western Balkans: Directions for the Energy Sector,” pp. 1–57, 2018.

[57] World Bank, “North Macedonia Public Sector Energy Efficiency Project (P149990),” 1944. doi: 10.1111/j.1813-6982.1944.tb02788.x.

[58] *Energy Law (21st May 2018)*. 2018.

[59] Centar.mk, “ERC proposes expanding the list of citizens who will receive financial assistance for electricity bills,” 2021.

[60] Habitat For Humanity Macedonia, “Support for Nationwide Buildings Typology and Energy Assessment .”

[61] State Statistical Office of Macedonia, “Energy consumption in households,” 2014.

[62] R. Folic, M. Laban, and V. Milanko, “Reliability and sustainability analysis of large panel residential buildings in Sofia, Skopje and Novi Sad,” *Facta Univ. – Ser. Archit. Civ. Eng.* 9(1): 161–176, 2011, doi:

10.2298/fuace1101161f.

[63] Energy Community Secretariat, “Riding the Renovation wave in the Western Balkans. Proposal for boosting energy efficiency in the residential building sector,” 2021.

[64] Habitat for Humanity Macedonia, “Socio-economic research in Municipalities of Veles and Gjorce Petrov, conducted for the purpose of preparation of SEAP based EE Action Plan for the residential sector, REELIH (Residential Energy Efficiency for the Low Income Households) USAID financed,” 2019.

[65] Energy Community Secretariat, “Annual Implementation Report 2020,” 2020.

[66] OECD, “Snapshot of Ukraine’s Energy Sector: Institutions, Governance and Policy Framework,” 2019.

[67] Kvaratskhelia, T. et al., “Energy Poverty: Guidance for State Policy and Public Discourse in the Times of Reform,” 2019.

[68] M. Emerson and V. Shimkin, *A Household Energy-Saving Initiative for Ukraine*. 2015.

[69] Buildings Performance Institute Europe (BPIE), “A Guidebook To European Building Policy. Key legislation and initiatives,” 2020.

[70] European Commission, “The European Green Deal. Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions, Brussels, 11.12.2019, COM(2019) 640 final,” 2019. doi: 10.1017/CBO9781107415324.004.

[71] “The European Renovation Wave: From Words to Action. The overall objective: to double the annual energy renovation rate in the EU by 2030 and to foster deep energy renovations.”, 2021. https://ec.europa.eu/info/business-economy-euro/recovery-coronavirus/recovery-and-resilience-facility_en

[72] European Commision, “A Renovation Wave for Europe – greening our buildings, creating jobs, improving lives,” *Communication from the Commission to the European parliament, the council, the European economic and social committee and the committee of the regions*, vol. COM(2020), no. SWD(2020) 550 final. p. 27, 2020.

[73] Energy Community Sectretariat, “Outline of the Social Strategy in the Energy Community,” 2013.

[74] Energy Poverty Observatory, “Guidance for Policymakers,” 2021. https://www.energypoverty.eu/guidance-policymakers

[75] A. J. Hegedüs, V. Horváth, and E. Somogyi, “Affordable Housing in Central and Eastern Europe: Identifying and Overcoming Constrains in New Member States,” 2017. https://ec.europa.eu/futurium/en/system/files/ged/2018.10.22_affordable_housing_in_central_and_eastern_europe.pdf.

[76] Energy Poverty Observatory, “Policies & Measures.” https://www.energypoverty.eu/policies-measures

[77] J. Núñez Ferrer, “Leveraging funding for energy efficiency in buildings in South East Europe,” *Policy Insights* 5, 2019, https://www.ceps.eu/ceps-publications/leveraging-funding-energy-efficiency-buildings-south-east-europe

[78] Citynvest, “KredEx Revolving Fund for energy efficiency in apartment buildings.” http://citynvest.eu/sites/default/files/library-documents/Model 23_KredEx Revolving Fund Estonia_final.pdf

[79] L. Suu, “Financing housing in Estonia – KredEx,” 2016. https://ec.europa.eu/energy/sites/ener/files/documents/6_lauri_suu_seif_riga_11-11-16.pdf

[80] KredEx, “Apartment building renovation loan.” https://www.kredex.ee/et/renoveerimislaen

[81] Energy Poverty Observatory, "Jessica II Fund for Multi-apartment Building Modernisation," 2019. https://www.energypoverty.eu/sites/default/files/downloads/observatory-documents/19-06/case_study_-_jessica_ii_without_url.pdf

[82] Lithuanian Housing Energy Efficiency Agency, "Apartment building renovation (Modernisation) program," *n.d.* http://www.betalt.lt/veiklos-sritys/programos/daugiabuciu-namu-atnaujinimo-modernizavimo-programa/102?c-17/t-44

[83] European Investment Bank, "Lithuania: New financing for energy efficiency loans with Siauliu Bankas," 2019. https://www.eib.org/en/press/all/2019-001-new-financing-for-energy-efficiency-loans-in-lithuania-with-siauliu-bankas

[84] F. Skema, R; Dzenajaviciene, "Lithuanian Renovation Programme with EU funding. Case study prepared by LEI for the EPATEE project," 2017. https://www.epatee-toolbox.eu/wp-content/uploads/2018/10/epatee_case_study_lithuania_renovation_programme_with_eu_funding_ok.pdf

[85] Lithuanian Housing Energy Efficiency Agency, "Multi-apartment modernization programme in Lithuania Housing energy efficiency agency." https://www.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1516631962.pdf

[86] K. Jörling and M. Schäfer, "LABEEF in Latvia," 2018. https://www.euki.de/wp-content/uploads/2019/09/20181205_LV_LABEEF_Study.pdf

[87] European Commission, "SUNShINE builds a project pipeline of € 25M for deep renovation of multi-family buildings in Latvia," 2020. https://ec.europa.eu/easme/en/news/sunshine-builds-project-pipeline-25m-deep-renovation-multi-family-buildings-latvia

[88] Sustainable Energy Authority of Ireland, "Free Energy Upgrades for Eligible Homes," 2017. https://www.seai.ie/grants/home-energy-grants/free-upgrades-for-eligible-homes

[89] Sustainable Energy Authority of Ireland, "Get a Free energy upgrade for your home and health," 2017. https://www.seai.ie/grants/home-energy-grants/free-upgrades-for-eligible-homes/warmth-and-wellbeing/2018-10-WarmthWellbeingA5Booklet.pdf

[90] Goverment of Ireland, "Spending Review 2020: Social Impact Assessment – SEAI Programmes Targeting Energy Poverty," 2020. http://budget.gov.ie/Budgets/2021/Documents/Budget/Social Impact Assessment – SEAI Programmes Targeting Energy Poverty.pdf.

[91] Houses of the Oireachtas, "Warmer Homes Scheme – Dáil Éireann Debate," 2020. https://www.oireachtas.ie/en/debates/question/2020-09-22/146/#

[92] Government of Ireland, "Budget 2021 funding for the Departments of the Environment, Climate and Communications, and Transport reflects Government ambition for a green, jobs-led recovery," 2020. https://www.gov.ie/en/press-release/748e9-budget-2021-funding-for-the-departments-of-the-environment-climate-and-communications-and-transport-reflects-government-ambition-for-a-green-jobs-led-recovery

[93] Central Statistics Office Ireland, "Census of Population 2016 – Profile 1 Housing in Ireland," 2016. https://www.cso.ie/en/releasesandpublications/ep/p-cp1hii/cp1hii/od

[94] Diputació Barcelona, "Audits and interventions in households with energy poverty," 2020. https://www.diba.cat/web/benestar/auditories

[95] Social Action Service Barcelona, "Attention for people," 2018. https://www.diba.cat/documents/14465/91063194/Anunci+BOPB.pdf/c488d768-4e21-4949-ae2f-ad5bc879edbf

[96] Faktor.bg, "1.1 million bulgarians receive a social electricity tariff for 5 years," 2016.

https://faktor.bg/bg/articles/novini/balgariya/11-mln-balgari-sas-sotsialna-tarifa-na-toka-za-5-godini-74315

[97] C. Chernomore, “What does it mean: social electricity tariff?,” 2021. https://www.chernomore.bg/a/5-ikonomika/58356-kakvo-oznachava-sotsialna-tarifa-na-toka

[98] Energy Poverty Observatory, “Protection for disabled consumers – Hungary.” https://www.energypoverty.eu/measure-policy/protection-disabled-consumer

[99] Ministry of Transport Communication and Energy Hungary, “Information on the benefits for vulnerable customers.” http://www.homokbodoge.hu/onkorm/vedendo.html

[100] SLIME, “SLIME – A first step against energy poverty.” http://www.lesslime.fr

[101] SLIME, “Implementing socio-technical assessments,” 2020. http://www.lesslime.fr/preparer-son-slime/realiser-un-diagnostic-sociotechnique

[102] SLIME, “What does SLIME aim for?,” 2020.

[103] N. Diefenbach, B. Stein, T. Loga, M. Rodenfels, and K. Jahn, “Monitoring der KfW-Programme „Energieeffizient Sanieren“ und „Energieeffizient Bauen“ 2017,” 2018. https://www.kfw.de/PDF/Download-Center/Konzernthemen/Research/PDF-Dokumente-alle-Evaluationen/Monitoring-der-KfW-Programme-EBS-2017.pdf

Annex

Summary of EPOV Indicators from Bouzarovski and Thomson 2019, p44-47.

Indicator name	Data source	Data year(s)	Primary/ secondary	Description
Inability to keep home adequately warm	EU-SILC	2004-2016	Primary	Based on the question 'Can your household afford to keep its home adequately warm?' This indicator encompasses the prevailing qualitative definition of energy poverty and captures self-reported thermal discomfort issues. We note that the wording of this question varies by Member State. It is an indicator recommended by Rademaekers *et al.* (2016).
Arrears on utility bills	EU-SILC	2004-2016	Primary	Based on the question 'In the last twelve months, has the household been in arrears, i.e. has been unable to pay on time due to financial difficulties for utility bills (heating, electricity, gas, water, etc.) for the main dwelling?' This indicator captures potential financial difficulties, and is an important indicator as households unable to keep up to date with energy bill payments may experience disconnection of supply. Note, however, that for some Member States it might cover all utility bills, including those beyond energy. In addition, arrears are not possible for some energy carriers, such as heating oil and wood pellets.
High share of energy expenditure in income (2M)	HBS	2010	Primary	The 2M indicator presents the proportion of population whose share of energy expenditure in income is more than twice the national median share. This suggests the prioritisation of energy costs over other household costs. The 2M threshold was established on the basis that this represents disproportionately high expenditure. It is an indicator recommended by Rademaekers *et al.* (2016).

Low share of energy expenditure in income (M/2)	HBS	2010	Primary	The M/2 indicator presents the share of population whose absolute energy expenditure is below half the national median, in other words abnormally low. M/2 is a relatively new indicator that has been used in Belgium to complement other expenditure and self-reported indicators. In Belgium, the M/2 indicator is called Hidden energy poverty, and refers to the proportion of households which have a low energy expenditure due to the fact that they restrict their energy spending below what is necessary to meet their needs. It is an indicator recommended by Rademaekers *et al.* (2016).
Fuel oil prices	BSO	2004-2015	Secondary	Average household prices per kWh generated from fuel oil.
Biomass prices	BSO	2004-2016	Secondary	Average household prices per kWh generated from biomass.
Coal prices	BSO	2004-2016	Secondary	Average household prices per kWh generated from coal.
Electricity prices	Eurostat: nrg_pc_204	2007-2016	Secondary	Electricity prices for household consumers, band DC 2500-5000 kWh/yr consumption, all taxes and levies included.
Gas prices	Eurostat: nrg_pc_202	2007-2016	Secondary	Natural gas prices for household consumers, band 20-200GJ consumption, all taxes and levies included.
Presence of leaks, damp, rot	EU-SILC	2004-2016*	Secondary	Share of population with leaks, damp or rot in their dwelling, which can be seen as an indirect proxy of housing quality and living conditions. *However, from 2020, this indicator will no longer be collected annually; rather it will take place every three years.
Dwelling comfortably cool during summertime	EU-SILC ad-hoc modules	2007 and 2012**	Secondary	Share of population, based on question 'Is the cooling system efficient enough to keep the dwelling cool?' and/or 'Is the dwelling sufficiently insulated against the warm?'

				**For the moment there no plans as to whether and when data for this indicator will be collected.
Dwelling comfortably warm during wintertime	EU-SILC ad-hoc modules	2007 and 2012**	Secondary	Share of population, based on question 'Is the heating system efficient enough to keep the dwelling warm?' and 'Is the dwelling sufficiently insulated against the cold?' **For the moment there no plans as to whether and when data for this indicator will be collected
Equipped with air conditioning	EU-SILC ad-hoc module	2007***	Secondary	Share of population living in a dwelling equipped with air conditioning facilities. ***Collection of this indicator has not occurred since the 2007 ad-hoc module.
Equipped with heating	EU-SILC ad-hoc modules	2007 and 2012**	Secondary	Share of population living in a dwelling equipped with heating facilities. **From 2020, this indicator will no longer be collected.
Number of rooms per person by tenure status and dwelling type	Eurostat: ilc_lvho03	2004-2016	Secondary	Average number of rooms per person by tenure status and dwelling type.
Dwellings in densely populated areas	BSO	2004-2014	Secondary	Share of dwellings located in densely populated areas (at least 500 inhabitants/km^2).
Dwellings in intermediately populated areas	BSO	2004-2014	Secondary	Share of dwellings located in intermediately populated areas (between 100 and 499 inhabitants/km^2).
Risk of poverty or social exclusion	Eurostat: ilc_peps01	2004-2016	Secondary	People at risk of poverty or social exclusion (% of population).
Energy expenditure for electricity, gas and other fuels as a share of income, split by income decile	Eurostat: hbs_str_t223	2005, 2010 and 2015	Secondary	Consumption expenditure for electricity, gas and other fuels as a share of income, by income decile.
Excess winter mortality	BSO	2005-2014	Secondary	Share of excess winter mortality.

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