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Energy efficiency policies across the EU and their impact on alleviating energy poverty. Insights from the MURE database

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Abstract

Energy poverty, characterized by a lack of access to reliable and affordable energy services, persists to be a critical global challenge with far-reaching socio-economic implications. As this also remains to be an urgent issue in the EU, measures alleviating energy poverty are critical to ensure a just energy transition. Instead of being a co-benefit of packages such as the *Energy Efficiency first principle* and only tackling the issue via social policies, the recast of the *Energy Efficiency Directive (EED)* and the *Energy Performance of Buildings Directive (EPBD)* mandate are treating energy poverty via energy efficiency measures. Thus, this paper focuses on energy efficiency policies that address energy poverty, based on the MURE database which contains energy efficiency measures of the EU Member States, Switzerland, and Energy Union partners. Recognizing the diverse nature of energy poverty across the EU, the European Commission guides Member States to adopt individualized approaches to combat this issue. To illustrate the different contexts and strategies, the paper includes case studies from Greece, Finland, Ireland, Latvia, and India. In the upcoming years, further policy measures alleviating energy poverty are to be expected due to the new requirements for the Member States in the EED and EPBD recast. This paper is intended to show examples of measures alleviating energy poverty that could be used to implement the future EU requirements in the Member States.

Keywords:

Energy poverty; energy efficiency policy; EU policy; case studies; reporting requirements

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1 Introduction

1.1 The Issue of Energy Poverty

Energy poverty is a global and delicate issue. It affects households worldwide and is widespread in the European Union (EU) as well. It occurs when households lack access to sufficient, affordable and modern energy to meet their basic needs. For example, homes are not heated or cooled adequately, energy for health appliances is scarce, and electricity bills cannot be paid. The revised *Energy Efficiency Directive (EED)* and the *Energy Performance of Buildings Directive (EPBD)* both include requirements for alleviating energy poverty with energy efficiency measures. This paper will discuss energy poverty out of the energy efficiency perspective, based on the MURE database on energy efficiency policies.

Energy poverty (and thus the inability to adequately fulfil one's basic energy needs such as heating, cooling, cooking etc.) can lead to physical and mental health issues and social disadvantages. Given the nature of energy poverty, it becomes a viscous cycle for vulnerable households. Ordonez et al. (2017) depict how high energy bills, low energy efficiency and low income reinforce each other and lead households into energy poverty. In 2022, 21.6% of households in the EU were at risk of poverty or social exclusion (Eurostat 2024b). Hence, energy poverty is not exclusive to people with low income. Rather, households facing low energy efficiency in their homes and high energy expenditures must be added to the risk group. This means that energy poverty can be treated as a distinct issue by implementing specific measures that individually address energy efficiency (Ordonez et al. 2017; Ugarte et al. 2016). New requirements due to the *EED* and *EPBD* demonstrate the political focus on energy efficiency to combat energy poverty in the EU.

Energy poverty manifests itself in different ways depending on climatic conditions, infrastructure and the root causes of energy poverty. For instance, while northern countries should rather address adequate heating, southern countries rather require cooling systems. Energy efficiency and adequate energy systems for buildings thus differ by climatic conditions - and so do measures alleviating energy poverty. Moreover, energy infrastructure and energy systems determine how and to what extent households are exposed to energy poverty. For example, if households use gas for heating, they are dependent on the fossil fuel and its price. Given the recent rise in gas prices following Russia's war of aggression against Ukraine, these households are at greater risk of energy poverty than households connected to district heating or heating with renewable energy sources. However, feasibility of energy sources also depends on geographical conditions, e.g. with hydropower in Norway or photovoltaic systems in Mediterranean countries. Since EU Member States differ in terms of energy systems, climatic conditions, building stock and general infrastructure, as well as socio-economic conditions, the causes and effects of energy poverty vary widely across the European Union (COM 2023), as will be seen in the upcoming chapters.

The effects of energy poverty range from social, mental and physical health to economic and ecological effects (Dear et al. 2011; González-Eguino 2015; Hernández et al. 2023; Ordonez et al. 2017; Song et al. 2023; Ugarte et al. 2016; Vondung et al. 2022). Alleviating energy poverty will improve health, living standards and overall well-being of affected individuals. For example, Dear et al. (2011) found that children living in cold homes have a higher risk of respiratory diseases, and young adults have a higher risk of mental health problems. Given the multiple barriers to energy efficiency for low-income households, policies are required to address the issue and its diverse facets. Ordonez et al. (2017) identify behavioral, informational, economic and administrative barriers to energy efficiency for low-income households. These barriers lead to market failures, in this specific context to the so-called *energy efficiency gap*, meaning the difference between the cost-

efficient and the realized energy efficiency level. Thus, the measures analyzed in this paper ought to address these respective barriers.

This paper provides an overview of European energy efficiency policies addressing energy poverty and is structured as follows: First, the European Commission's definitions related to energy poverty are summarized, and the current situation regarding energy poverty in the EU is analyzed. Chapter 2 describes the methodology used to qualify the reported measures in MURE. The results are presented in Chapter 3, emphasizing Greece's efforts to combat energy poverty and highlighting case studies on Finland, Ireland, Latvia and India.

1.2 EU Definitions and Guidance on Energy Poverty

Energy poverty has been on the radar of the European Commission since 2009, however, it gained substantial attention since the launch of the *Energy Poverty Observatory* in December 2016. Under the *European Green Deal* announced in 2019, and the interim package *Fit for '55*, social dimensions of the clean energy transition are highlighted (COM 2019, 2021). Among measures such as the *Emission Trading System (ETS)* and the *Renewable Energy Directive (RED)*, energy poverty is addressed in the recast of the *Energy Efficiency Directive (EED)*, the revision of the *Energy Performance of Buildings Directive (EPBD)* and the *Social Climate Fund* (EU 2023a, 2023b, 2023c, 2023d, 2024). Due to these regulations, Member States are forced to tackle energy poverty also via transformative policy measures (as e.g. energy efficiency measures), and not only by social policies. All Member States are required to report a national energy poverty definition, indicators to monitor energy poverty, as well as actions to alleviate the issue in their National Energy and Climate Plans (NECPs) since 2019 (COM 2024).

While the EU regulation addresses energy poverty primarily through energy policy, it is a multidimensional issue that in some EU Member States (as e.g. Germany or Sweden) is rather approached through social policy (see e.g. Ludden et al. 2024; Noka et al. 2021). Social policy generally addresses energy poverty or provides support for affected people and vulnerable groups, e.g. through social assistance, housing support or lump-sum payments. Energy policy, on the other hand, tends to address the issue by reducing the demand for fossil fuels, e.g. by improving the energy performance of buildings and appliances, expanding renewable energy generation or through taxes on fossil fuel consumption. In terms of direct outcomes and financial relief of affected groups, financial aid and subsidies can be effective short-term measures and help avoid energy poverty long-term. However, social policies have no impact on CO_2-emission reductions and do not contribute to the EU-wide targets of increasing energy efficiency and reducing energy demand. Energy prices and CO_2- and energy taxes are important drivers of energy efficiency improvements and energy demand reductions; financial aid and subsidies reduce the incentivizing effect of such measures (Ugarte et al. 2016). Thus, policy mixes considering both social and energy policies to address vulnerable groups might help to both reach the energy and climate targets and to avoid negative distributional effects of e.g., carbon or energy taxes.

Since 2016, the European Commission provided definitions on *energy poverty, vulnerable customers* and *vulnerable households,* revised the EED addressing energy poverty and installed programs to coordinate measures. In their recommendation on energy poverty, the European Commission lists three main drivers for energy poverty (COM 2024):

- a high proportion of household expenditure spent on energy
- low income
- low energy performance of buildings and appliances

Following the E*nergy Efficiency First Principle* of the EU[1], energy poverty ought to be primarily treated at its roots via energy efficiency improvements of buildings and appliances.

The European Commission defined vulnerable customers and energy poverty distinctively. Vulnerable customers are defined in Art 28 of the *Electricity Directive 2019/944:*

> *The concept of vulnerable customers may include income levels, the share of energy expenditure of disposable income, the energy efficiency of homes, critical dependence on electrical equipment for health reasons, age or other criteria. (EU 2019).*

The *Energy Efficiency Directive 2023/1791* provides a binding definition for energy poverty in Art. 2 (52), which is also used for the classification of energy poverty measures[2] in MURE:

> *(52) 'energy poverty' means a household's lack of access to essential energy services, where such services provide basic levels and decent standards of living and health, including adequate heating, hot water, cooling, lighting, and energy to power appliances, in the relevant national context, existing national social policy and other relevant national policies, caused by a combination of factors, including at least non-affordability, insufficient disposable income, high energy expenditure and poor energy efficiency of homes* (EU 2023c).

In the definition for vulnerable households, the European Commission combines vulnerable customers and energy poverty resulting in the Regulation 2023/955 on the Social Climate Fund:

> *households in energy poverty or households, including low income and lower middle-income ones, that are significantly affected by the price impacts of the inclusion of greenhouse gas emissions from buildings within the scope of Directive 2003/87/EC and lack the means to renovate the building they occupy (EU 2023b).*

Since those definitions require national clarifications, the European Commission provides guidance toward a national definition of energy poverty:

> *(6) Recommendation (EU) 2020/1563 and the accompanying staff working document provides guidance on energy poverty as well as on the definition of what constitutes a significant number of households affected by energy poverty. It identified a set of 13 energy poverty indicators from which Member States can choose those available and relevant to their context in order to identify energy poverty in their territory, reflecting different facets of energy poverty, and use alternative data sets to reflect local realities, such as overheating in summer, gender and ethnical background, and cross-reference income and energy consumption data jointly in order to understand affordability challenges of households in energy poverty. (COM 2023).*

The EU Energy Poverty Observatory (EPOV) recommends the use of four indicators for energy poverty (out of a set of multiple indicators) in their Member State Reports (EPOV 2020):

- Inability to keep home adequately warm (2018)
- Arrears on utility bills (2018)

[1] The Energy Efficiency First Principle of the EU aims to reduce the overall energy demand and production, to avoid investments in stranded assets and to manage energy demand in a cost-effective way. As of 2023, the Energy Efficiency First Principle is included in the revised EED as Article 3 (EU 2023c). see here: https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficiency-targets-directive-and-rules/energy-efficiency-first-principle_en

[2] We use the term energy poverty measures as referring to energy efficiency measures that address energy poverty and aim to alleviate energy poverty through energy efficiency. If we mean other types of measures, such as social policy measures, this will be specified in the context.

- High share of energy expenditure in income (2015)
- Low absolute energy expenditure (2015)

The indicators *Inability to keep home adequately warm (2018*) and *Arrears on utility bills (2018*) are part of the *EU statistics on income and living conditions* (EU-SILC) survey collected and published by Eurostat. The other expenditure-based indicators are calculated by EPOV. These indicators are not official EU indicators but are often used to indicate energy poverty. They are suggested in the Governance Regulation as well as the EED to assess energy poverty in a Member State in case there is no national definition and assessed number of energy poor households. Further indicators to assess energy poverty and to be used to build national strategies and policies are provided by the Energy Poverty Advisory Hub (EPAH), who published two reports on national indicators for more effective measuring (Gouveia et al. 2022, 2023).

The different definitions have been established over time to guide Member States towards their national definitions. As mentioned above, the EU installed regulatory guidance, e.g. via the *EED* recast in 2023, and demands national individual actions. A single European definition lacks individuality and therefore will not adequately function for all Member States with the different applicable conditions. The Commission thus requires national definitions and will hold the Member States accountable according to their own set indicators.

The revision of the *EED* of 2023, which includes the cited definition of energy poverty above, is the main legal instrument by the Commission to address energy poverty. The recast of the EED will guide Member States on combating energy poverty as it requires energy savings for energy-poor households and vulnerable customers. These energy savings are to be long-term structural changes, so that financial aid programs do not suffice to fulfil the EED obligations. The EU grants flexibility as the groups of vulnerable customers and households affected by energy poverty are defined by the Member States. The EU holds Member States accountable according to their own set definitions. Further, the EED focuses on providing information on energy efficiency and access to technical and financial advice services, as well as legal alleviations to incentivize energy efficiency renovations (COM 2023; EU 2023c).

Since Member States are to comply with the *EED* two years post publication, those measures are not included in the analyzed MURE database. However, the *EED* recast will impact the treatment of energy poverty immensely and an analysis on its effects based on newly initiated measures to fight energy poverty promises an interesting case.

Moreover, the *EPBD* revised in 2024 regulates, e.g. new buildings to be zero-emission as of 2030, and new public buildings as of 2027. Also, the most inefficient 15% of the EU building stock are to be upgraded from *Energy Performance Certificate* label G to at least label F by 2030, and public and non-residential buildings by 2027. Residential buildings should be renovated from G to at least F by 2030, and to at least E by 2033. The *EPBD* thus addresses the driver *low energy performance of buildings* (EU 2024).

The *Social Climate Fund* provides financial means for energy efficiency and renovations of buildings, especially to support vulnerable groups. The revenues from the *ETS 2* are bundled to be redistributed according to national *Social Climate Plans* which are to be submitted by June 2025. *ETS 2* covers buildings, road transport and additional sectors and is set up to start in 2027 (EU 2023b). In June 2024, Ludden et al. published a guidance note commissioned by the European Commission as support for the implementation of the Social Climate Fund aiming at identifying good practices for cost-effective measures and investments. The note also includes practical advice on design and implementation of the recommended measures and investments and is intended to provide support for EU Member States in the development of the national Social Climate Plans (Ludden et al. 2024).

Besides definitions and legislation, several EU-programs target energy poverty. The *Horizon 2020 energy efficiency* program included 16 projects with a financial volume of €29 million from 2014 to 2020. The following program *LIFE Clean Energy Transition* program has a budget of nearly €1 billion for the period 2021–2027 and finances the ODYSSEE-MURE databases (COM 2024).

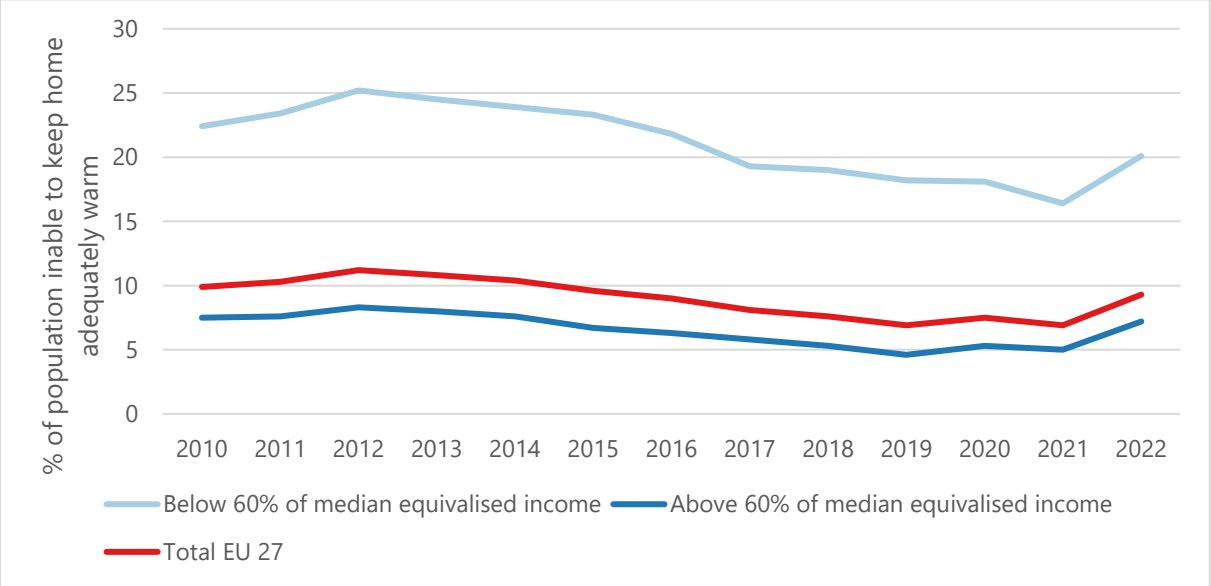
1.3 The State of Energy Poverty in the EU and its Member States

Energy poverty is an EU-wide issue, albeit to varying degrees. One indicator of *energy poverty* according to the definition of the EU Commission is adequate heating of homes. The following data reports on the *Inability to keep home adequately warm* in the Member States and on the aggregate level of the EU 27 countries (Eurostat 2024a). It is based on the *European Union Statistics on Income and Living Conditions* (EU-SILC) survey conducted by Eurostat and updated in November 2023.

All following data on the EU applies to the 27 countries being part of the EU since 2020. Figure 1 shows the development of the share of the population who is unable to keep their homes warm. For all EU households, the maximum is reached in 2012 at 11.2%, and the minimum in 2019 and 2021 at 6.9%. In 2022, 9.3% of EU households reported to be unable to keep their homes warm. The threshold *Below 60% of median equivalized income* describes the at-risk-of-poverty threshold after social transfers expressed in Purchase Parity Standards. According to the survey, people living below the 60% median are twice as often unable to keep their homes warm as the total EU households. From 2012 to 2021, there is a decreasing trend throughout all categories, but all values of 2022 exceed values of 2021. The declining trend does not lead to a convergence of the income groups (Eurostat 2024a).

Figure 1: Stagnate trend of energy poverty across income groups in EU 27 aggregate

EU 27 values on survey *Inability to keep home adequately warm* - distribution according to poverty threshold from 2010–2022



Source: Own figure based on Eurostat (2024a).

Figure 2 shows the respective shares of the total population of all EU 27 Member States from 2010 to 2022. Most EU Member States are near or below the overall EU-27 trend, which is highlighted in red. However, a rather big variance can be inferred from the figure, along with a trend towards convergence across the states. Most of the countries show a negative trend until 2021 and an upward trend from 2021 to 2022 which aligns with the overall EU-27 trend.

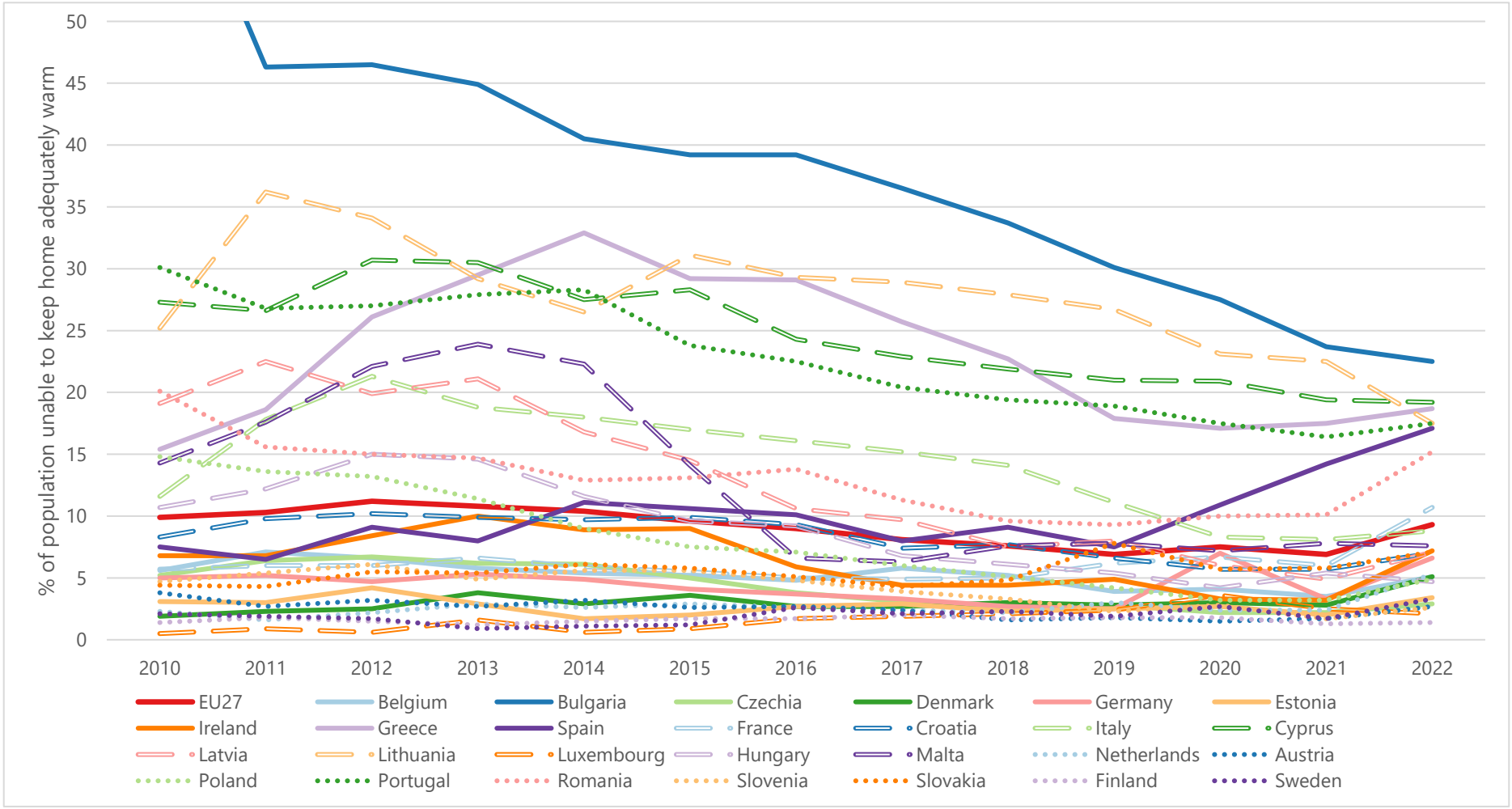
Bulgaria's trend declines strongly, but still exceeds all EU Member States. Lithuania, Cyprus, and Greece all start at a value above 25% in 2010 and reach values below 20% in 2022. Portugal started below the three countries but joins their trajectory in 2014. Denmark, Estonia, Luxembourg, the Netherlands, Austria, Finland and Sweden trend the lowest among the EU Member States and report values below 4% for most of the years.

Although this data merely represents availability of adequate heating, it shows the variety across EU Member States. Given the climatic conditions, history of the countries, national and cultural differences, a heterogeneity in the incidence of energy poverty is not surprising. Combating energy poverty in the EU proves to be a multi-layered challenge.

Figure 3 shows the values of the survey on the *Inability to keep home adequately warm* of 2021 and 2022. In all the Member States, except Bulgaria, Lithuania, Cyprus, Malta, Hungary and Luxembourg, the reported value increased. Energy poverty is an urgent issue, although the overall trend tends to decline. The Covid-19 pandemic, and surging energy prices due to Russia's war of aggression against Ukraine in 2022, put further pressure on households and aggravate energy poverty (COM 2024; Eurostat 2024a).

Figure 2: Convergent and declining trend of energy poverty in the EU

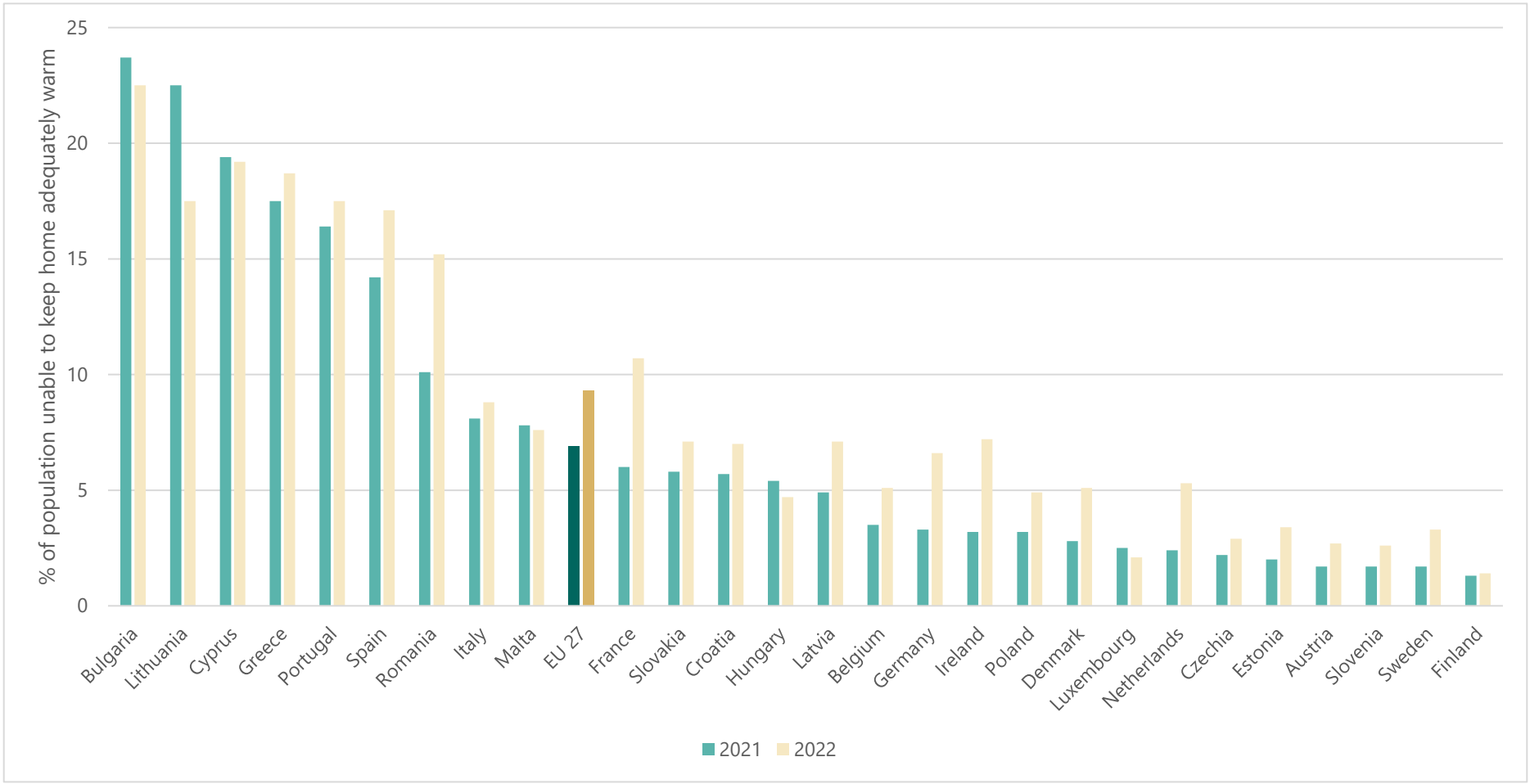
Share of population who report *Inability to keep home adequately warm* - values for all countries of the European Union and the aggregate European Union from 2010–2022.



Source: Own figure based on Eurostat (2024a). EU 27 comprises all 27 EU Member States as of 2020. To enable better visibility, the value 66.5% of Bulgaria in 2010 is not depicted.

Figure 3: Increase in energy poverty in 2021–2022

Share of population who report *Inability to keep home adequately warm* - values for all countries of the European Union and the aggregate European Union in 2021 and 2022



Source: Own figure based on Eurostat (2024a). EU 27 comprises all 27 EU Member States as of 2020.

2 Methodology

2.1 Overview of the ODYSSEE and MURE databases

The present ODYSSEE-MURE project is coordinated by ADEME (The French Agency for Ecological Transition), and technically managed by Enerdata and Fraunhofer ISI. The project is supported by the LIFE-CET program of the European Commission. ODYSSEE and MURE are complementary databases which are being filled in by the national project partners. ODYSSEE contains detailed data and indicators on energy consumption and energy efficiency as well as their drivers (activity indicators) and their related CO_2-emissions. The MURE database (Mésures d'Utilisation Rationnelle de l'Énergie) lists energy efficiency measures, and impact evaluation if available, enacted by the Member States of the European Union, Switzerland, and Energy Community countries (Bosnia-Herzegovina, Montenegro, Georgia, Ukraine, Northern Macedonia, Albania, Moldova, Kosovo and Serbia) (ADEME et al. 2024). The project partners in the participating countries provide input based on national sources and activities, the database is updated every 1 to 2 years. Internal guidelines give detailed information on the data to provide and on how to best add the information. Furthermore, in quality control by the project lead, the type and quality of the content is verified before the final publication in the database. The status of the two databases for this analysis was as of March 2024[3]. The Energy Community data were not published at that time and are therefore not considered here.

The MURE database[4] covers the following information on energy efficiency policies and measures:

- **Measure characterizations:** information on the status of a measure as ongoing, completed or proposed, start and, if available, end years, measure types and target audiences
- **Impacts:** information on the impact, multiple benefits, and evaluations methods
- **Relation to EU Policy Frame:** information on whether a measure is EU related, an NECP measure, reported under Article 8 EED and/or a measure using EU funding
- **Energy poverty & sufficiency:** information on whether a measure has an impact on alleviating energy poverty or on improving energy sufficiency

2.2 Analysis of Energy Poverty Measures in MURE

For this analysis, the measures classified as addressing energy poverty in MURE were exported. The dataset was enriched with the information provided in the MURE database (*Subtype, Country, General description, Target audience*). Measures which cannot be applied to address energy poverty as characterized in the definition by the European Commission are excluded. Hence, respective measures will not be analyzed in this paper.

The measure types *State subsidizes energy cost directly* and *Lump-sum transfer* are taken into account for the classification and analysis of energy poverty measures, although they are not energy efficiency, but social policy measures, because they can be important short-term measures. They are not in the focus of the MURE database and the paper but included for the sake of completeness[5].

[3] It must be noted that the next update of the databases will be finalized in early autumn 2024. However, all changes made in this process are not included in this analysis.

[4] https://www.measures.odyssee-mure.eu/

[5] At the time of data retrieval, one measure of the type *Lump-sum transfer* and two measures of the type *State subsidizes energy cost directly* were included in MURE. For the sake of transparency and completeness, these measures are also included in the analysis.

Energy poverty measures can be analyzed along a time and impact dimension and differ by implementing actor. Either an institutional actor installs measures or the individual initiates the changes. This inductive approach was used to create the following classifications.

For the analysis, *target group design*, *effective impact on energy-poor households*, *longevity*, and *financial volume* are qualified. The *impact on energy poverty* depends on how energy-poor are addressed and is displayed in Table 1. If the measure does not specifically target the energy-poor, it is classified as *Not specified* and valued at 0. This includes subsidies that are feasible for the energy-poor but not designed for them. *Free of charge* measures usually include information campaigns or energy audits which are relevant for energy-poor but do not aim at them. However, as the name indicates, they are free of charge and are qualified at 1. Besides, measures that define energy poverty are classified at 1. The classification *Higher support for low-income households* describes measures that emphasize support for energy-poor households. Often, these programs include an income-based support scheme and thus support energy-poor households and are qualified at 2. Finally, measures that exclusively target low-income households are classified as *Only targets low-income households* and valued at 3.

Table 1: Qualification of specified impact on energy poverty

Qualification of specified impact on energy poverty from low (0) to high (3).

Target group design	Qualification of target
Not specified	0
Service is free of charge	1
Include a definition of energy poverty	1
Higher support for low-income households	2
Only targets low-income households	3

Source: Own presentation.

The *Projected longevity of impact* assesses the structural time impact of measures. Short term measures, i.e. *Information on energy consumption and behavior recommendations*, *State subsidizes energy cost directly* and *Lump-sum transfer*, do not structurally treat the reasons for energy poverty. The effect is immediate and thus assessed as a short-term effect. *Replacement of inefficient appliances* alleviates energy poverty in the medium term, since electronic appliances outdate eventually. Long term measures tackle the cause of energy poverty due to energy inefficiency, i.e. *Increased energy efficiency of buildings* and *Installation of renewable energy systems*. Short term measures are classified at 1, medium term at 2, long term at 3.

The *Effective impact on energy-poor households* describes how energy-poor households will experience the measure. Informational campaigns, energy audits, and smart meters will provide *Information on energy consumption and behavior recommendations*. By nature, no direct incentive but mere information is provided. Households effectively receive information which will enable them to track or change their behavior. These measures are qualified at 1. Singular *Lump-sum transfer* measures or energy bill alleviations (*State subsidizes energy cost directly*) do not address energy poverty at its root. Rather, they treat the symptoms by financing the energy cost immediately. Thus, they are valued at 2. If the programs support *Replacement of inefficient appliances*, the effect is more tangible and thus qualified at 3. Lastly, measures that lead to *Increased efficiency of buildings* or *Installations of renewable energy systems* are classified at 3, because those measures induce structural changes.

The *Approximation on financial volume* provides a structural estimation as well. Measures of the category *Information on energy consumption and behavior recommendations* tend to have low marginal costs, e.g. once a website is online, cost per additional user is insignificant. Hence, the financial volume primarily depends on the fixed cost and is valued at 1. All remaining measure types tend to have higher marginal costs. The costs for programs of the categories *State subsidizes energy cost directly*, *Lump-sum transfer*, and *Replacement of inefficient appliances* vary with the number of addressees and the size of the support. Those subsidies per household tend to range between €100 to €710 and are classified at 2. *Installation of renewable energy systems* and *Increased energy efficiency of buildings* measures entail renovation projects who usually exceed €800. Hence, they are valued at 3.

If a program includes several measures, the highest qualification determines the program's qualification. For example, a program with an informational campaign and the installation of a photovoltaic system will be qualified at 3 in all three categories. If a measure description provides insufficient information, e.g. if a measure is yet to be designed, it is classified as *Unclear* and valued at 0 in all three categories.

Table 2: Qualification of energy poverty measures

Qualification of energy poverty measures by projected longevity, effective impact, and financial volume

Energy poverty measure	Projected longevity of impact (short term 1, medium term 2, long term 3)	Effective impact on energy-poor household (Low 1, Medium 2, High 3)	Approximation on financial volume (Low 1, Medium 2, High 3)
Unclear	0	0	0
Information on energy consumption and behavior recommendations	1	1	1
Replacement of inefficient appliances	2	3	2
Increased energy efficiency of buildings	3	3	3
Installation of renewable energy systems	3	3	3
State subsidizes energy cost directly	1	2	2
Lump-sum transfer	1	2	2

Source: Own analysis.

3 Results

3.1 Overview on Energy Poverty Policies

As described above, this paper analyses energy poverty measures by longevity and impact, as well as how the target group is addressed. Given the focus on energy efficiency in the *EED* and the *EPBD*, energy efficiency measures to alleviate energy poverty are of great importance (EU 2023c, 2024). The MURE database provides an overview of energy efficiency policies, out of which the subset of energy poverty addressing measures is analyzed. These should be congruent with the energy poverty measures required by the EU through EED and EPBD reporting obligations. The following matrices visualize how impact and longevity characterize the measures. This results in four categories:

- Quick Fix
- Temporary Solution
- Lasting Solution
- Structural Change

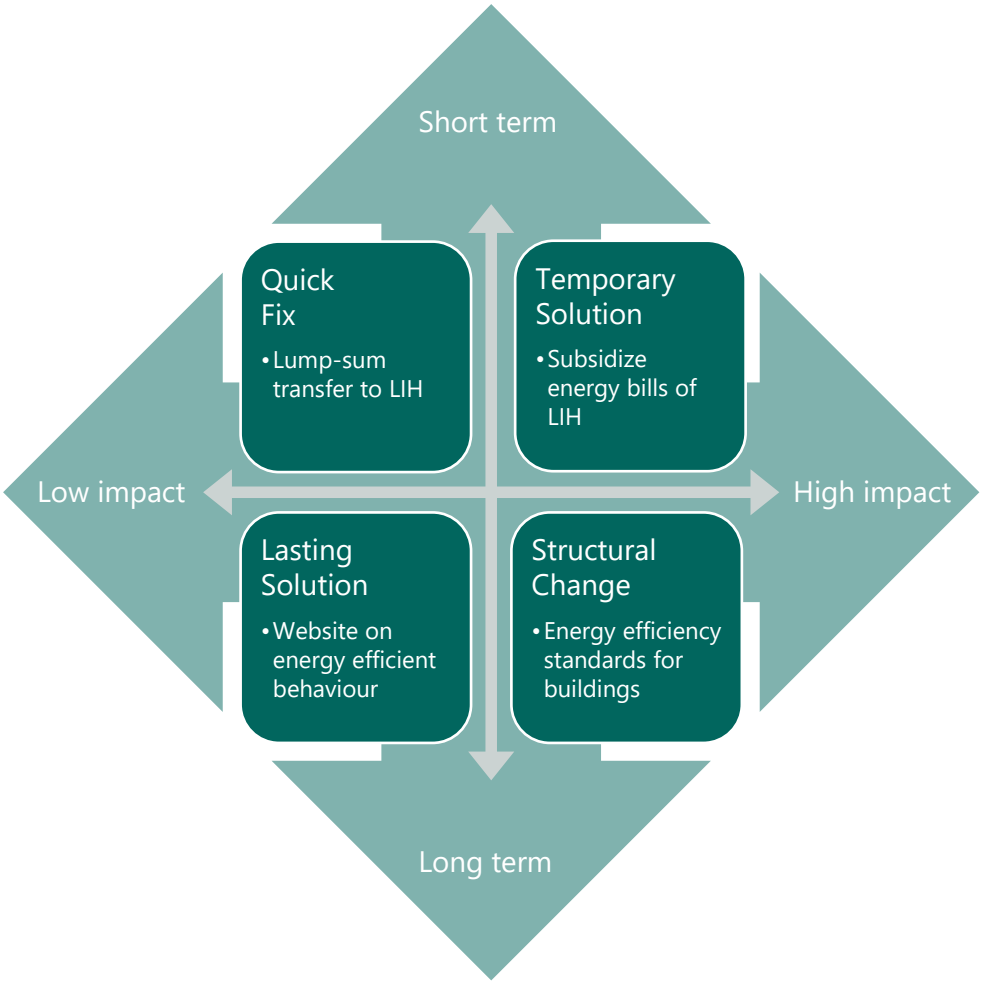
Figure 4 describes the structural measures that are initiated by institutional actors, e.g. state authorities or governmental institutions. An example of a *Quick Fix* by a government which alleviates energy poverty immediately but not systematically are *Lump-sum transfers*. These monetary aids will avert energy shortages in the short run but have a low impact on energy poverty overall. A *Temporary Solution* will soothe the situation in the long term but will not treat the root causes of energy poverty. Subsidies to lower energy bills will reduce the energy costs for the household but will not prevent energy poverty altogether. In general, subsidizing energy costs reduces the incentive dimension of energy prices and discourages energy efficiency improvements (Ordonez et al. 2017; Ugarte et al. 2016). Although respective measures are popular in social security systems in Europe, Ordonez et al. highlight their distortionary nature and contra-productive incentives.

More long-term *Lasting solutions* have a persistent impact, as do measures that lead to *Structural Change*. However, a change in behavior induced by a website or an informational campaign can only reduce energy consumption as much as the appliances and building structures allow. Energy efficiency standards for residential buildings will reduce energy demand per household and thus prevent energy poverty as well.

Figure 5 shows examples for behavioral measures. Those measures are taken by individual households and private actors. By the nature of energy poverty, there are no *Quick Fixes*. A *Temporary Solution* is to monitor one's own behavior to reduce energy consumption or to identify low-hanging fruits to prevent energy poverty. However, energy poverty is usually not caused by overconsumption. Hence, those measures may suffice to reduce consumption in the short term but will not lead to a long-term solution. A *Lasting Solution* is to upgrade appliances to increase energy efficiency. However, appliances tend to have a shorter life span than energy efficiency renovations or energy system upgrades, which are *Structural Changes*.

Figure 4: Structural measures over time and impact

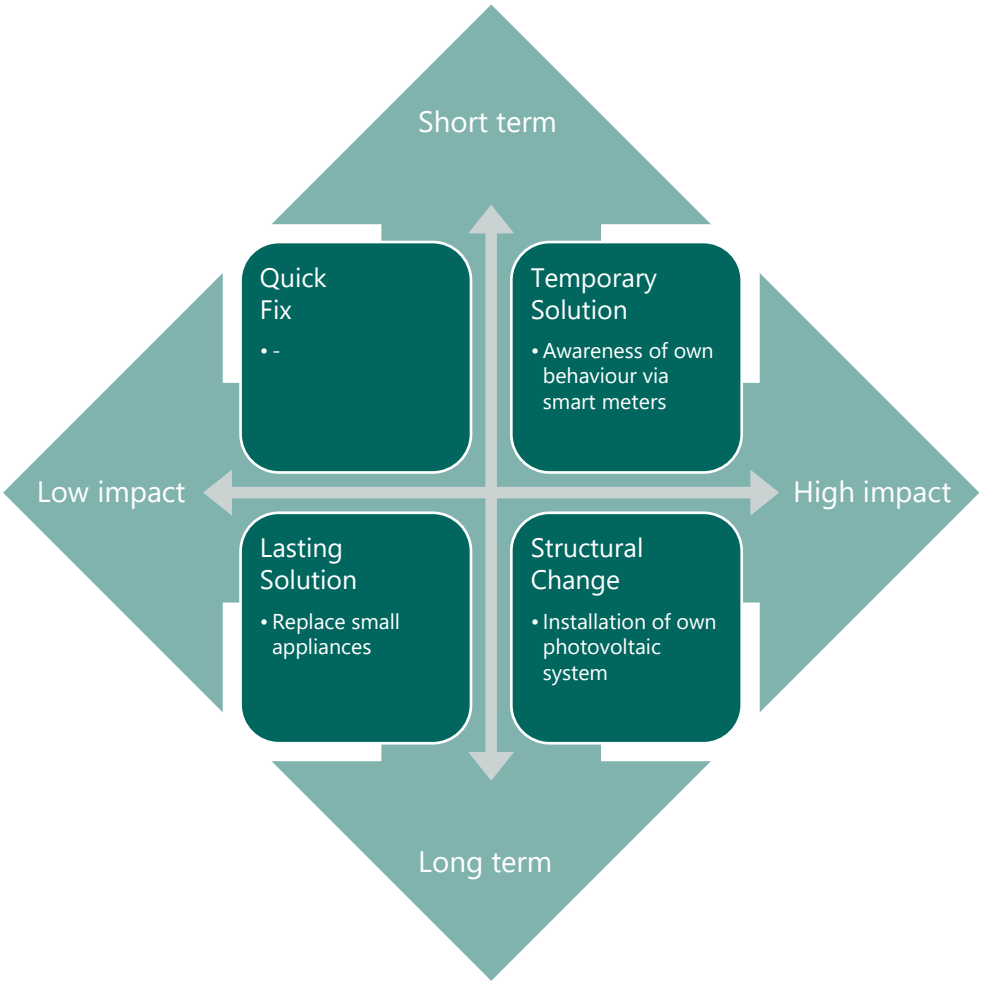
Matrix on measure types analyzed by time and impact, with examples for structural measures



Source: Own figure.
LIH = low-income households.

Figure 5: Behavioral measures over time and impact

Matrix on measure types analyzed by time and impact, with examples for behavioral measures



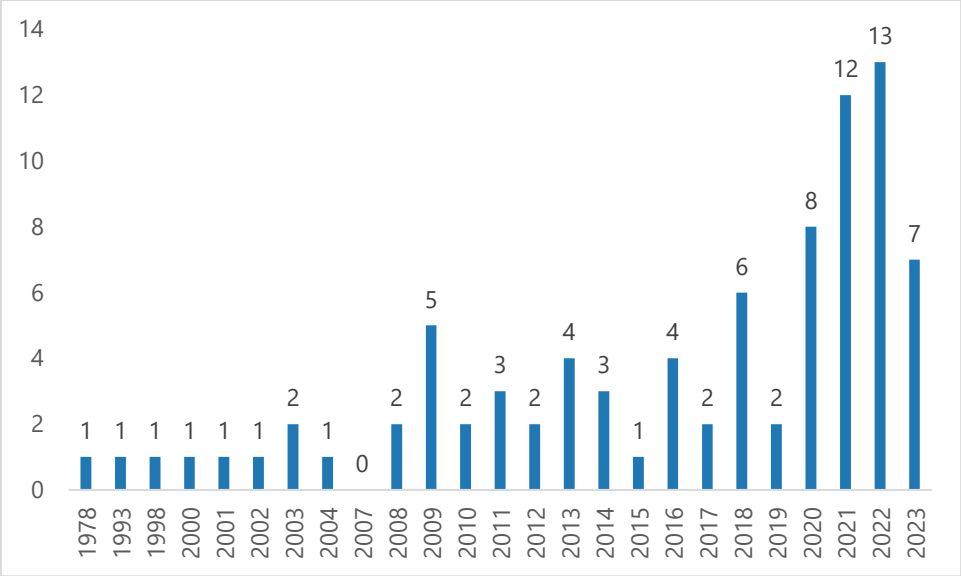
Source: Own figure.

3.2 Energy Poverty Measures in the EU

In the EU, awareness of energy poverty rose throughout the years as the number of measures increases steadily. Figure 6 shows the distribution of all reported measures by starting year. The measures vary greatly in duration, with three measures being in place for one year, and others running for decades. The duration of measures does depend on the type of measure as well; some requiring a recast of measures to prolong duration. 22 measures are not reported with an ending year, one of them being the oldest measure starting in 1978 and thus being in place for 46 years. Germany initiated the consulting program *Energy Consultancy and Energy Checks of the Federation of German Consumer Organizations*. Still ongoing, the German Consumer Organization coordinates and subsidizes energy audits. Since 2009, the number of initiated measures increased, resulting in a significant increase in 2020, 2021 and 2022. Based on these findings, energy poverty combat via energy efficiency measures increased in recent years. The timing aligns with the EU's focus on energy poverty since 2016 and its stronger emphasis on energy efficiency policies to combat energy poverty. The EED recast and EPBD revision promise increased activity as well, which will be implemented in the upcoming years (EU 2023c, 2024).

Figure 6: Number of measures starting per year

Measures and programs reported in MURE by starting year (excluded if no starting year reported)



Source: Own figure based on the MURE database.

Figure 7 shows the number of countries who implemented a measure of the six measure types. Note that in Figure 7 not the number of measures, but the number of countries is counted. This figure aims to visualize the countries' policy focuses and distribution of chosen measures. Thus, the number of measures of a policy type is neglected, as well as the effectiveness of a measure. The six energy poverty measure types, as described in the methodology, are:

- State subsidizes energy costs directly
- Lump-sum transfer
- Information on energy consumption and behavior
- Replacement of inefficient appliances
- Installation of renewable energy systems
- Increased energy efficiency of buildings

Energy efficiency measures to upgrade buildings are most popular, 14 countries installed at least one respective measure since 1978. *Lump-sum transfers* are only reported once because they are no energy efficiency measures. For the same reason, *direct energy cost subsidies* to households and schemes for appliances replacements are less common. In Figure 8, the six measure types are qualified in impact, longevity, and financial volume according to the described methodology. Combining the three dimensions in one graph allows a direct comparison. While a *Lump-sum transfer* treats energy poverty only in the short term, the financial volume and effective impact are valued at 2. A *state subsidy for energy costs* has a higher impact as it supports energy-poor households more systematically. Schemes for the replacement of inefficient appliances are less costly than measures to *Increase energy efficiency of buildings* or to *Install renewable energy systems*, however, all three serve long-term and have a great impact on energy poverty.

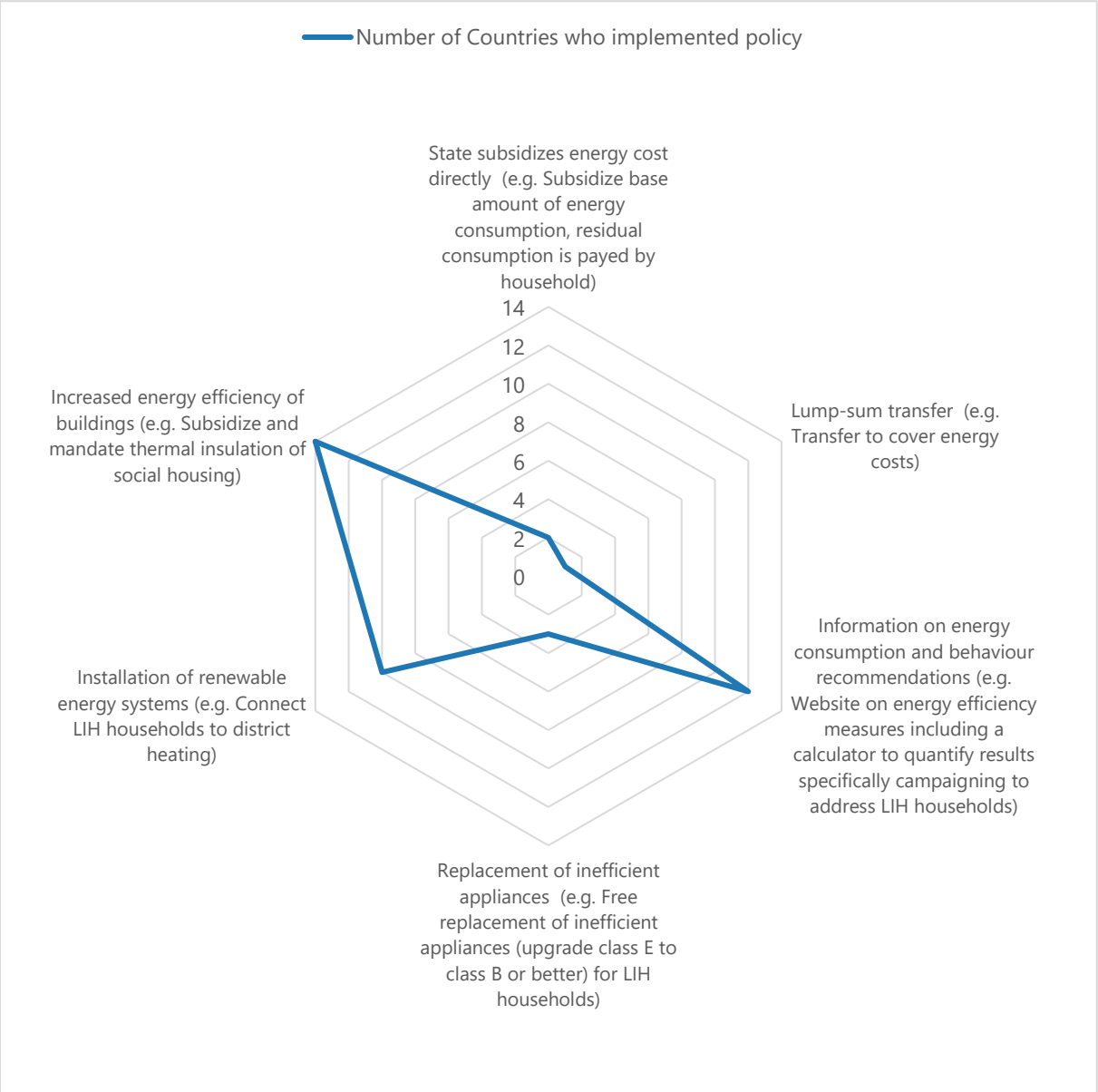
Two of the reported measures in the categories *Lump-sum transfers* and *State subsidizes energy costs directly* were installed during the Covid-19 pandemic and the energy crisis in 2022. This is not surprising, as rapid answers in times of crises are demanded. According to the analysis of the European Union Agency for the Cooperation of Energy Regulators (ACER), 46% of all measures taken in response to the energy crisis in 2022 characterize as *Direct support to final consumers* (ACER 2023). This includes measures as financial aid to final consumers. Such measures were very popular, as 202 measures were initiated throughout the EU and Norway. However, 98% of those measures have a short impact horizon. As explained above, immediate financial aid suffices to cover energy expenditures, but has no transformative impact on energy consumption and CO_2 emissions. Not only that but subsidizing energy costs lowers incentives to invest in energy efficiency or alternative, more cost-efficient appliances and systems (Bruegel 2023, OECD 2021).

Information campaigns seem to rank lowest among these measures, with 12 countries having a respective program installed. Most of the other policies will have an informative character as well, however, specific campaigns are not to be neglected and are recommended in the EED recast (EU 2023c). To ensure a long-term impact, such campaigns could be repeated frequently. An energy sufficiency measure by Finland demonstrates repetition since 1996. As the annual *Energy Awareness Week* (GEN-FI0120) is not an energy poverty measure, it is not respected in the analyses in this paper. However, it serves as an informative example since the *Energy Awareness Week* raises awareness for energy conservation annually and thus, continuously reminds people to consume energy consciously.

In general, a combination of measures promises to combat energy poverty effectively. Information campaigns raise awareness and might lead people to focus on energy efficiency when purchasing new appliances or moving to new homes. A renovated residential building stock prevents households from becoming energy poor as the energy demand per household is decreased. Renewable energy systems not only benefit sustainable development and emission reduction in the housing sector, but also provide a secure and low-cost energy supply for households.

Figure 7: Number of countries per measure

Number of countries who installed measure throughout 1978-2023



Source: Own figure based on the MURE database.
LIH = low-income households

Figure 8: Qualifications of measures by longevity, impact and financial volume

Analysis of six measure types by longevity, impact and financial volume

Source: Own figure based on the MURE database.
LIH = low-income households

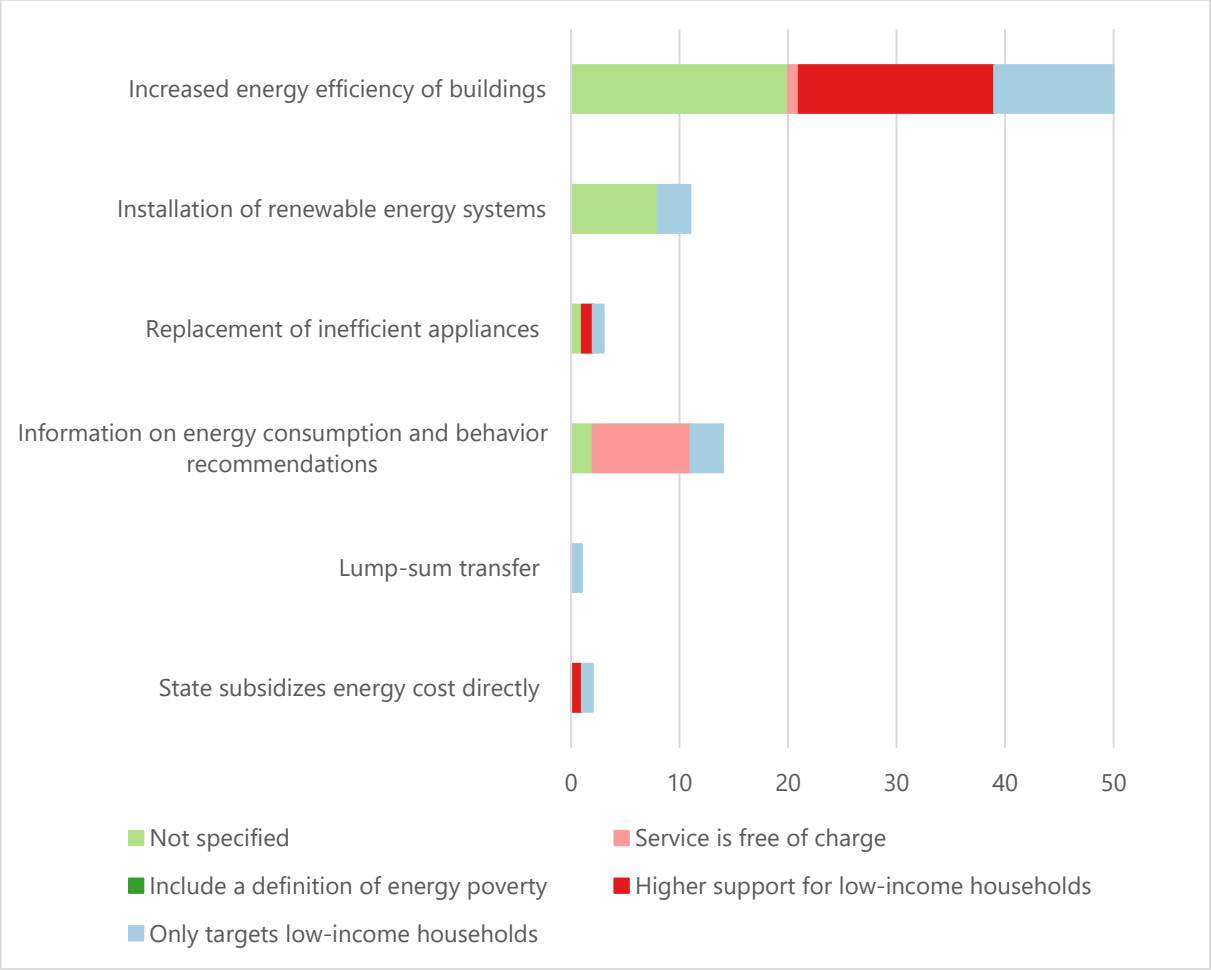
Finally, Figure 9 depicts the distribution of how the target group is addressed. As described above, to target energy poor households, policies can apply to everyone, emphasize support for low-income households, or exclusively target low-income households. In Figure 8, all measures are displayed. It is to highlight that *Lump-sum transfers* and *energy bill subsidies* are targeting low-income households, such that the money is specifically addressing energy poor individuals. Informational campaigns, replacement schemes, and installations of renewable energy systems paint an interesting picture as they are either exclusively targeting low-income households or the general public. The most popular measure *Increaesd energy efficiency of buildings* shows a rather equal distribution, about 40% address every household, another nearly 40% emphasize low-income households, and the final 20% of measures are exclusively eligible to low-income households. Only

one measure includes a decidedly energy-poverty defintion; *National Energy Poverty Action Plan* (GEN-GR4560) of Greece as reported in MURE.

Although these findings promise productive approaches, the number of countries implementing policies is surprisingly small. In MURE, merely 20 countries report ongoing or proposed measures, of which 4 countries installed 3 measure types, another 6 countries have 2 measure types, and 10 countries initiated 1 measure type to combat energy poverty. Not only that many countries do not address energy poverty with energy efficiency measures, but these findings also suggest that most of the countries only use one measure type. In addition, only Greece reported a national definition on energy poverty. Given the upward trend in installed energy poverty measures in recent years, the variety of measures might increase. As mentioned above, the *EED* and *EPBD* require energy efficiency measures to alleviate energy poverty. Consequently, further measures will be reported in the upcoming years.

Figure 9: Target group design of energy poverty measures

Distribution of no, stronger or exclusive low-income targeting per measure type



Source: Own figure based on the MURE database.

3.3 Greece's Plan to Combat Energy Poverty

This in-depth case study analyzes Greece's energy poverty measures. Greece stands out for its variety of measures, exclusive targeting, and interesting timing. This analysis is based on the complete analysis of all energy poverty measures reported in MURE.

Amid the severe economic crisis following the 2008 financial crisis, energy poverty gained more attention in Greece. Energy poverty in Greece stems less from climatic conditions, but more from inefficient residential buildings and low-income levels (Dagoumas et al. 2014; Papada et al. 2016). According to the EU-SILC survey in 2022, 72.8% of Greeks own their homes, and 27.2% are tenants; the EU[6] average owner share is 69.1% and tenant share is 30.9% (Eurostat 2024c). Moreover, 12.5% of the Greek *population living in dwellings with a leaking roof, damp walls, floors or foundation, or rot in window frames or floor* in 2020, which is below the EU average of 14.8% (Eurostat 2024d). Increasing energy prices during the economic recession intensified existing problems, e.g. the share of people *unable to keep house adequately warm*, increased by about 10 percentage points between 2010 and 2012 (EPOV 2020). Throughout 2018 to 2022, Greece had a significant lower performance in national energy poverty indicators than the EU average. 18.7% of Greek households are *unable to keep home adequately warm*, whereas the EU average is at 9.3% in 2022. Greece improved their share in comparison to 22.7% in 2018 and did not report a substantial increase from 2021 to 2022. 34.9% have *arrears on utility bills*, contrasting to the EU average of 6.9% in 2022. The level of *high share of energy expenditure in income* in 2015 is at the EU average around 16%, also the *low absolute energy expenditure* indicator is only 1.8 percentage points below the EU average of 14.6% in 2015 (EPOV 2020). To tackle the issue, Greece monitors energy poverty, aims to address the root of energy poverty, and thus, intents to prevent households from becoming energy poor in the first place. For example, in addition to the *Saving at home*-programs, one of the earliest specifically targeted programs reported in the MURE database, the *Greece Energy Poverty Observatory* was developed in 2014 to monitor the level of energy poverty (Tourkolias 2014). Further, Greece launched a *National Long Term Renovation Strategy* and a *National Energy Poverty Action Plan* in 2021.

Greece is the only country to report an energy poverty definition in a measure description in MURE. In the *National Energy Poverty Action Plan* two national energy poverty indicators are defined (Ministry of Environment and Energy of Greece 2021):

Index I-II: calculates the number of households that simultaneously meet both the following conditions

- Condition I: The annual cost of each household's total energy consumption should be lower than 80% of the annual cost to meet its minimum required energy consumption.
- Condition II: Each household's annual net income should be lower than 60% of the median income of all households, according to the definition of relative poverty.

In addition, the index $I\&II_{eq}$ was determined by substituting the household net income with the reduced net income of each household based on the equivalent number of people belonging to each household, according to the OECD scale (Condition II_{eq}).

Index $I\text{-}II_{eq}$: calculates the number of households that simultaneously meet both the following conditions:

- Condition I: The annual cost of the total energy consumption of each household should be less than 80% of its annual cost of meeting the minimum required energy consumption

[6] The EU average refers to the EU 27 countries as of 2020. Throughout all case studies, the EU average refers to the 27 EU Member States as of 2020.

- Condition II_{eq}: The reduced net income of each household based on the equivalent number of persons belonging to each household, according to the OECD scale, on an annual basis, is less than 60% of the median of the corresponding income for all households, according to the definition of relative poverty.

Further, the Action Plan identifies three dimensions to tackle energy poverty (Ministry of Environment and Energy of Greece 2021):

- Awareness and Information measures
- Protection of households
- Development dimension - financing measures for increasing the energy efficiency of buildings and fostering a higher penetration of renewable energy systems

Measures reported in MURE refer mostly to the last dimension.

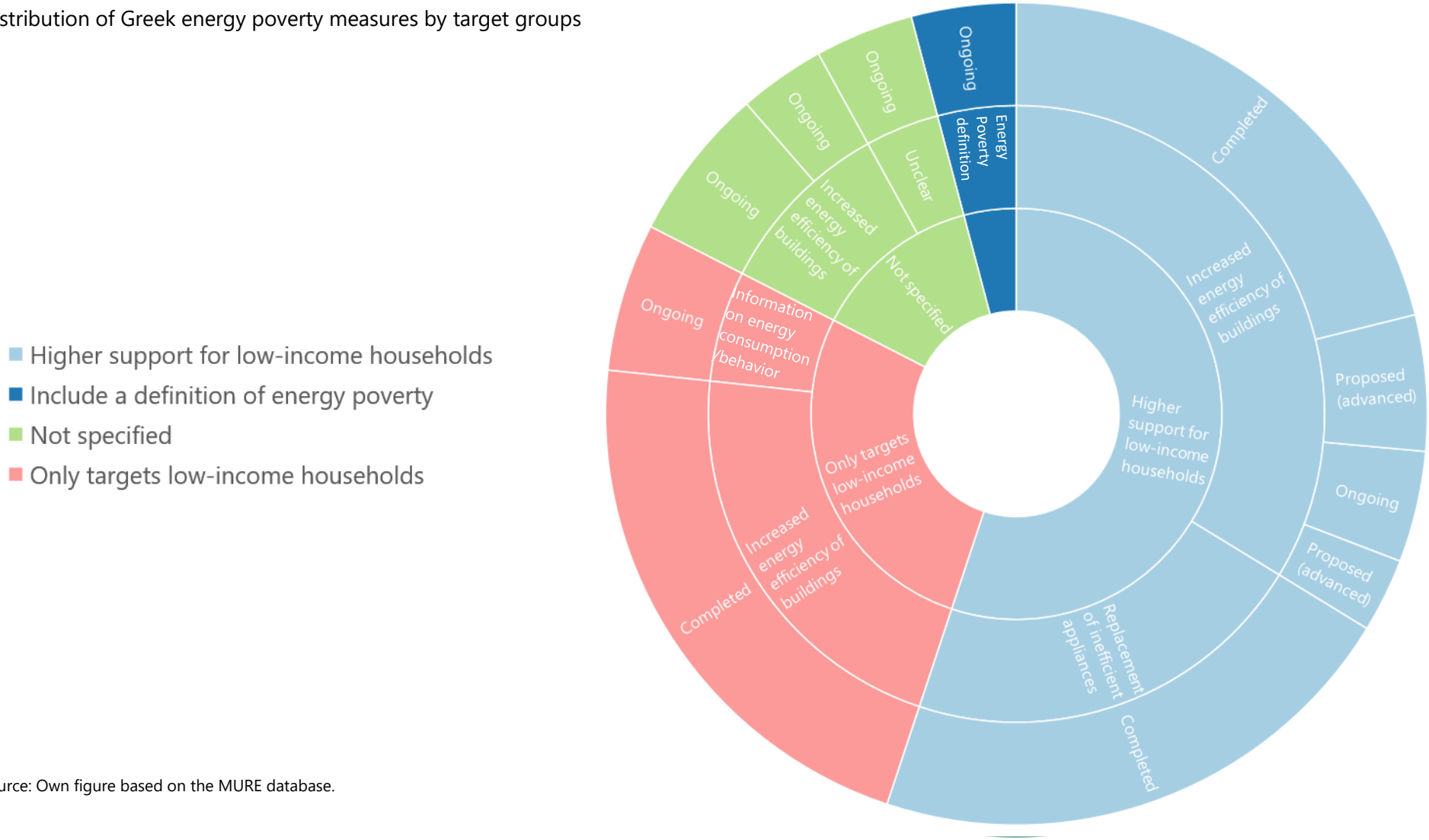
Greece stands out for its focus on energy poverty via policy designs directly targeting low-income households. Since 2011, several measures to increase energy efficiency of residential buildings were introduced and are reported in the MURE database. Most of the programs were exclusively or strongly targeted at low-income households and thus alleviate energy poverty through energy efficiency intentionally. Figure 10 shows the exclusivity and emphasis on low-income households. A program to be highlighted is *Saving at home* (HOU-GR0677), which started in 2011 and was followed by *Saving at home II* (HOU-GR0684) in 2018 and ended in 2020. In total, the projects required an overall budget of €548.2 Million and resulted in total energy savings of 97.6 ktoe. The goal was to target low-income households to support energy efficiency improvements, e.g. replacing windows or installing thermal insulation. Households were eligible if they were in a price band below 2,100 €/m2, complied with energy efficiency class D or lower, had a building permit and were not planned to be demolished. Additionally, low-income households received a higher funding based on their declared annual income. Residual costs were funded by interest-rate supported loans or with private funds. Since low-income households tend to be less creditworthy, an option to add a guarantor to improve creditworthiness was installed in March 2011 (COM et al. 2019). The third edition of this program started in 2023 and is yet to be reported in MURE.

These programs enable *Structural Change*, by improving the residential building stock, which is a major factor for energy poverty in Greece (Dagoumas et al. 2014; Papada et al. 2016). Hence, energy poverty is not only alleviated but also prevented in the long run. Moreover, an increased awareness for energy efficiency effects can be assumed (COM et al. 2019). By experiencing the multiple impacts of energy efficiency, the information barrier is lowered. Further research on rebound effects and behavioral effects remains to show how households incorporate the newly gained information in future decisions, for example to what extend energy efficiency is factored in into buying decisions. Given the information and awareness dimension of the Action Plan, campaigns will raise attention as well.

Given the *National Energy Poverty Action Plan* of 2021, Greece tackles energy poverty with several measures, including the programs reported in MURE. It is remarkable that Greece focuses on energy poverty in the aftermath of the economic recession in the recent decades.

Figure 10: Greek energy poverty measure distribution

Distribution of Greek energy poverty measures by target groups



Source: Own figure based on the MURE database.

3.4 Case Studies

3.4.1 Finland

Finland serves as an example for the Nordic countries where energy poverty is predominantly an issue of adequate heating, however, recent warmer summers also raise the issue of cooling (Castaño-Rosa et al. 2022). Nevertheless, energy poverty seems to be a smaller issue; the share of households unable to keep their homes warm is consistently under 3% throughout 2005 to 2022, with a value of 1.4% in 2022 (EPOV 2020). At the same time, energy expenditure indicators exceed the EU average. However, rents in Finland often include energy cost and thus expenditure-based indicators do not represent energy poverty issues well. 69.5% own their homes and 30.5% are tenants according to the EU-SILC survey of 2022, which almost equals the EU average (Eurostat 2024c). The EU-SILC survey also accounts for a very low level of *population living in dwellings with a leaking roof, damp walls, floors or foundation, or rot in window frames or floor*, with 4.5% in 2020. Nevertheless, the Finish government is aware of the issue. Two studies on energy poverty were initiated by the government and published in 2013, 2015, and 2018 as well as included in the NECP 2019 and draft of the updated NECP 2023 (Ministry of Economic Affairs and Employment of Finland 2019, 2023). Based on this research, the Finish government acknowledged the issue and intentionally decided to address energy poverty via social policies.

However, there are energy poverty measures in place, such as the *Disconnection prohibition in Winter*. This measure ensures that no household, no matter their energy bill debt, can be disconnected from October 1st until April 30th (EPOV 2020). This measure is easily accessible and very effective at the same time and may function as an example to other countries. Furthermore, information websites on energy efficiency and conservation behavior have a long history, dating back to 1993. The most popular website is Motiva Oy with about 2 million visits in 2022. Those websites are accompanied by the *Consumer energy advice* (HOU-FI0585) program and *Regional energy advice to citizens, municipalities and SMEs* (GEN-FI0118). The comprehensive program *Subsidies for energy efficiency in buildings* (HOU-FI0577) focuses on low-income households and has been running since 2003. However, this program is not seen as the main tool to tackle energy poverty.

Climate change does raise a new dimension to energy poverty in Finland. Homes in Finland are not as robust when it comes to heat (Castaño-Rosa et al. 2022). In addition, increasing energy prices due to Russia's war of aggression against Ukraine let the Finish government introduce further assistance to cover energy expenditures. According to the NECP of 2023, the government introduced subsidies throughout October 2022 to March 2023 (Ministry of Economic Affairs and Employment of Finland 2023). However, the draft of the updated NECP 2023 does not mention activities to help prepare households for warmer temperatures. Finland, a Nordic country with intense winter climatic conditions, thus has acknowledged the issue of energy poverty and spreads awareness via websites and programs. Ultimately, however, energy poverty in Finland is primarily addressed through social policy. This strategy was re-emphasized in the draft NECP in 2023.

3.4.2 Ireland

In Ireland, the share of households who are *unable to keep their homes adequately warm* is 6.8% in 2022, which is a substantial increase from 3.1% in 2021. Ireland still ranges below EU average of 9.3% in 2022. 10.6% of households have *arrears on utility bills*, exceeding the EU average of 6.9%. Ireland is at EU average on the indicators of *High share of energy expenditure in income (2015)* and *Low absolute energy expenditure (2015)* (EPOV 2020). According to the EU-SILC survey of 2022, 70.4% of Irish people own their homes, while 29.6% are tenants (Eurostat 2024c). Further, 16.6% of

the Irish *population is living in dwellings with a leaking roof, damp walls, floors or foundation, or rot in window frames or floor* in 2020, exceeding the EU average of 14.8% (Eurostat 2024d). Ireland has a longer history of tackling energy poverty and has continuously issued energy efficiency programs to address energy poverty throughout the 2010s (ADEME et al. 2024). Their programs often include higher support for vulnerable households. A program to be highlighted is the *Warmer Home Scheme* (HOU-IE0705), which started in 2002. In the following 21 years, over 135,000 homeowners used the scheme to upgrade their homes (EPOV 2020). By 2020, the program could account for 355 GWh of primary energy savings. The Irish government has been aware of the issue for a long time and still persistently works to improve the situation, primarily through several successful energy efficiency measures.

3.4.3 Latvia

Latvia performs relatively well compared to the EU average in the EPOV Member State Report in 2019 (EPOV 2020). In 2022, 7.1% of households were *unable to keep their home adequately warm*; and 5.9% of households had *Arrears on utility bills*. The country has recently started to address energy poverty through energy efficiency policy, while before energy poverty was addressed with social policies. In 2022, Latvia's share of owners is 83.1%, exceeding the EU average of 69.1% (Eurostat 2024c). Further, the EU-SILC survey found that 17.5% of the *population* is *living in dwellings with a leaking roof, damp walls, floors or foundation, or rot in window frames or floor,* exceeding the EU average of 14.8% in 2020 (Eurostat 2024d). Since 2016, the country has installed six energy efficiency measures to address energy poverty. One completed program, *Increasing Heat Energy Efficiency in Social Apartment Buildings* (HOU-LV0783), ran from 2008 to 2015. The remaining programs included in the MURE database started in recent years, the earliest of them in 2016. Besides, the Latvian government conducted a research project on energy poverty in Latvia in 2018, which will be included in the upcoming NECP 2021–2030 (EPOV 2020). According to the NECP draft of 2023, Latvia's research and discussion on further action is still ongoing (Ministry of Climate and Energy of Latvia 2023).

With the measure *Increasing Heat Energy Efficiency in Social Apartment Buildings,* Latvia primarily targeted energy poverty by addressing social housing. Municipalities and municipal institutions can apply for the subsidy, whilst eligible projects range from soft activities such as energy audits to construction works such as thermal insulation. Eligible projects must achieve 20% savings in heating energy and should be monitored for 3 years after completion. In total, 55 apartment buildings were renovated, requiring a budget of Mio. € 6.995. Overall, heating energy consumption decreased by 44% on average, thus exceeding the criteria and resulting in energy savings of 4.2 GWh.

3.4.4 India

India serves as a contrasting example to the case studies on the EU countries, being an emerging country with very diverse living conditions. In developing and emerging countries such as India, energy poverty is strongly linked to having no access to energy in the first place. Also, almost a quarter of the world's 2.8 billion people who use solid fuels for cooking live in India. Especially rural households tend to have an unstable or no connection to energy infrastructure and use traditional energy sources, such as wood, for heating and cooking (Kumar et al. 2019). In 2020, 36% of the Indian population live in urban areas, out of which 49% live in slums (World Bank Open Data 2024a, 2024b).

Given the great variety in energy systems in India, ranging from old wood stoves to electric appliances in kitchens, challenging the root causes of energy poverty is complex. From 1983 to 2005, consumption patterns in rural areas had hardly changed, whereas in urban households there was a trend to replace traditional fuels (Bhide et al. 2011). For instance, fuelwood was consistently

used by at least 86% of rural households during that period. Therefore, the effects of energy poverty and energy deprivation in India exceed the effects of energy poverty described earlier, i.e. thermal comfort and resulting health benefits, social impact and overall well-being. Traditional combustion energy systems lead to higher levels of particulate matter and emissions, causing severe health and environmental issues. Especially in rural India, children and women are disproportionally affected, which adds a gender dimension to energy poverty (IEA 2021; Kumar et al. 2019).

Throughout the years, the Indian government has implemented several measures to improve energy access. The goals are to improve energy systems overall and to introduce renewable energy technologies to promote sustainable development. In 2017, the Indian government launched the *Saubhagya Electrification Scheme*, which aims to electrify disconnected rural and poor households. The measures include last mile connectivity in rural areas or solar photovoltaic off-grid systems where connection is not feasible or cost-effective, as well as last mile connectivity exclusively for poor households in urban areas. In 2021, 28 million households were electrified under the *Saubhagya* program (Indian Ministry of Power 2023).

India consistently tackles energy deprivation, resulting in good trends (Deb et al. 2023; IISD et al. 2021). In 2000, 60.3% of India's population had access to electricity, increasing to 99.6% in 2021 (World Bank Open Data 2023b). The share of the Indian population with access to clean fuels and technologies for cooking increased from 22% in 2000 to 71% in 2021 (World Bank Open Data 2023a). Increasing access to electricity, urbanization and a growing manufacturing sector result in higher energy demands, which is primarily covered with coal power plants. In 2021, coal power plants accounted for 44.6% of India’s energy mix (IEA 2024). Challenges will remain, especially as India will further grow in the upcoming decades. The IEA projects rapid urbanization, with 70% of new constructions in urban areas (IEA 2021).

However, the Indian government is on a promising trajectory when it comes to clean cooking and access to electricity (IEA 2020). Along with that, the demand for renewables increased, promising a combined effort to combat energy poverty and energy deprivation. Given the developing nature of the Indian energy system, there are immense opportunities for prevention of energy poverty. It remains to be seen how India balances a growing energy demand, decarbonization and social dimensions of energy accessibility.

4 Conclusion

Energy poverty remains to be an urgent issue, as 9.3% of EU households were unable to keep their homes adequately warm in 2022. In this paper, energy efficiency policies that address energy poverty are qualified by time, impact and financial volume. Along with the emphasis on energy efficiency in the *EED* and *EPBD* regulations of the EU, policies on energy efficiency upgrades for appliances or buildings, as well as information campaigns prove to be dominant popular paths towards alleviating energy poverty. Furthermore, a strong focus on low-income households allows for a targeted use of financial means and resources.

Analyzing the reported energy poverty measures in MURE shows a focus on energy efficiency improvements of buildings, as respective measures are most popular across EU Member States. This aligns with the EPBD revision which will demand further action to increase energy performance of buildings in the EU (EU 2023c, 2024). In addition, information campaigns and renewable energy system support schemes are among the most frequent policies. Since the MURE database does not include social policies addressing energy poverty, it represents the current state of energy poverty alleviation, however a change according to the revised EED and EPBD reporting obligations will only be visible in analyses after 2025.

In any case, the policy mix addressing energy poverty must consider the variety of forms of energy poverty in specific countries that are attributable to different challenges, building and legal standards, climatic conditions, access to energy systems, and overall living conditions. The case studies conducted in this analysis visualize the multi-dimensionality of this issue. In addition, India, as a country in the global South, offers a different perspective, as Indian households range from rural, un-electrified households to urban households with (un)reliable access to energy.

Greece was examined more in-depth due to their recent focus on energy poverty and the amount and types of measures addressing low-income households. Bundled within the *National Energy Poverty Action Plan* of 2021, Greece coordinates measures to systematically address energy poverty. They concentrate on energy efficiency of buildings, their main driver of energy poverty, alongside awareness campaigns and preventive measures.

In conclusion, the EU draws a multi-faceted picture. However, the EU Commission is aware of the issue and enacted a revision of the *Energy Efficiency Directive (EED)* in 2023, as well as a revision of the EPBD (EU 2023c, 2024). The effects of this recast will come into fruition in the upcoming years. They can not only help to increase energy efficiency levels in the EU and its Member States, but also to improve the policy mix to tackle energy poverty and to reduce the counteracting impact of pure social policies on energy efficiency progress. It remains to be seen to what extent this will increase the EU's resilience and guide the Member States towards the goal of a just energy transition.

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7 Abbreviations

Abbreviation	Meaning
CO_2	Carbon Dioxide
EED	Energy Efficiency Directive
EPAH	Energy Poverty Advisory Hub
EPBD	Energy Performance of Buildings Directive
EPOV	Energy Poverty Observatory
ETS	European Trading System
EU	European Union
EU-SILC	European Union Statistics on Income and Living Conditions
LIH	Low-income households
NECPs	National Energy and Climate Plans
RED	Renewable Energy Directive

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