ENPOR

Actions to Mitigate Energy Poverty
in the Private Rented Sector

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Energy Poverty Dashboard User Guide: Final Version

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1
INTRODUCTION

The Energy Poverty Dashboard (EPD) is an integral part of the ENPOR project ('Actions to Mitigate Energy Poverty in the Private Rented Sector'), which seeks to provide an in-depth examination of energy poverty policies for the Private Rented Sector (PRS) across the European Union (EU), whilst supporting the adaption and implementation of policies tailored to the specific needs of the sector. The project also seeks to understand and monitor various dimensions of energy poverty in the PRS, while providing a structured knowledge exchange platform and policy recommendations that can be upscaled to a wide range of contexts.

The EPD aims to provide a pan-European platform for the spatial visualisation and quantification of energy poverty patterns in the PRS across Europe, as well as associated actions to address the issue. It responds to the lack of Europe-wide data on the PRS, as well as the need for spatial and temporal disaggregation of relevant information and interventions. It also establishes an online space for sharing knowledge and good practice.

In line with ENPOR's grant agreement, the EPD presents relevant aspects of energy poverty in the PRS across a range of indicators (including physical health and well-being), which can be used to investigate structural factors that underpin inequalities in the PRS. Mapped policies that target the PRS and their links to other social dimensions, in tandem with the indicator data, can aid policymakers to define suitable measures for energy poverty alleviation in the sector. The Dashboard also provides novel methods to collect and represent data on policies aimed at addressing the specificities of the PRS, and provides a range of resources pertinent to alleviating energy poverty in the sector.

This guidance document describes the content of the dashboard, and the information that a user needs to benefit from the EPD content. It also discusses the data – particularly the indicators presented in the dashboard.

The Dashboard can be accessed using the following URL: ***https://energypoverty.info***.

The ENPOR project acknowledges the work of Studio Mothership, a UK-based web design company, in building the EPD.

2
DATA, FEATURES AND FUNCTIONS OF THE DASHBOARD

The EPD data is twofold. The first element is Eurostat, SILC and Household Budget Survey (HBS) indicator data displayed to show visual trends and patterns. The second is to display policies and measures that are working to tackle energy poverty in the PRS across Europe.

2.1 The Dashboard – Indicator Data

- The EPD webpage opens onto a map of Europe displaying indicator data cartographically, to visually show patterns and trends in energy poverty levels over space and time. There is a Zoom function, to allow the user to zoom in and out as necessary. Clicking on a country or region automatically zooms the user in to that area.

- **Figure 1** below details the different functions available which allow the user to view and select different data which appear on the map. A detailed description of the indicators available to the user are outlined in **Section 3**.

- With regards to the scale of data, the user can toggle under the NUTS Level tab, between National, NUTS1 and NUTS2 levels (depending on data availability).

- Users can also toggle under Reference Group tab, between **Population** data (representing the whole of the population in the country or region), **Private Rented Tenant** data (representing the data within the number of privately renting households in that country or region*) and* Share of Energy Poor Tenants in the Energy Poor Population.

- The data scale at the bottom of the dashboard shows the percentage for each indicator in each country or region. The darker the colour, the higher the percentage. Where the country or region appears white, there is no data for that indicator, NUTS level or year.

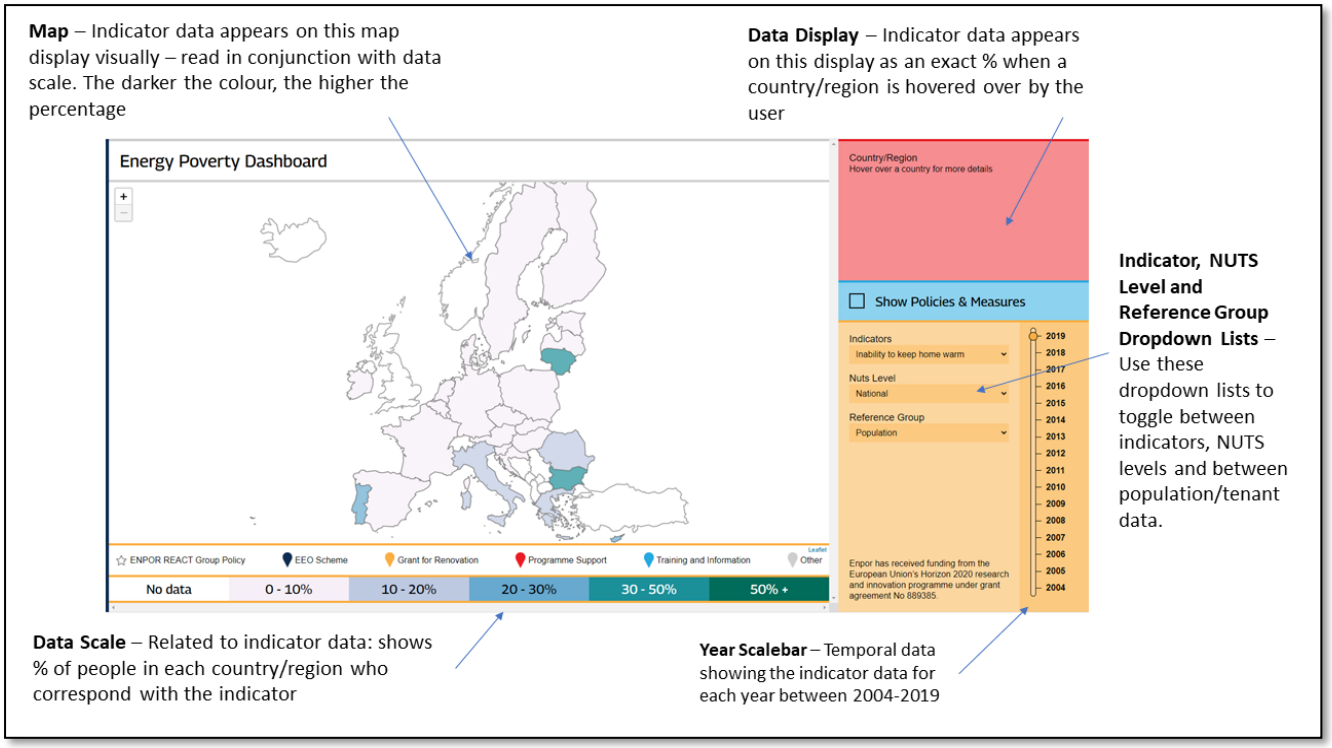

Figure 1 - Diagram of Indicator Data Functions

The Data Display panel not only shows the specific indicator data when a country or region is hovered over by the user, but also displays, when 'Tenant' is selected from the Reference Group dropdown menu, whether the percentage difference between the general population and the PRS population is statistically significant. **Figure 2** shows this in more detail. More information on how the statistical significance is calculated is provided in **Section 3**.

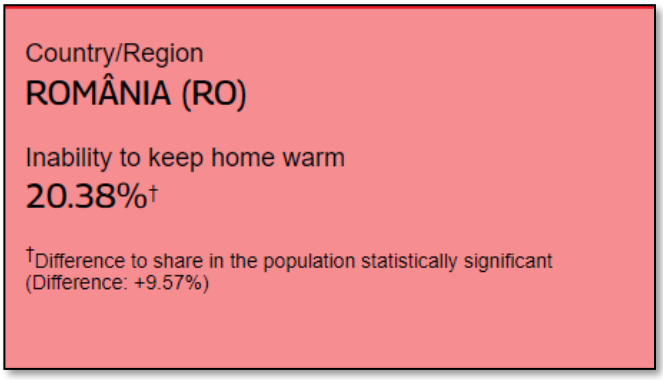

Figure 2 - Display panel showing statistical significance and difference between tenant and general population

2.2 The Dashboard – Policies and Measures

Selecting the Show Policies and Measures box on the right-hand side of the EPD brings up pins on the map, each representing a policy or measure that in some way tackles energy poverty in the PRS.

Figure 3 below details the different functions available which allow the user to view and select different policies and measures.

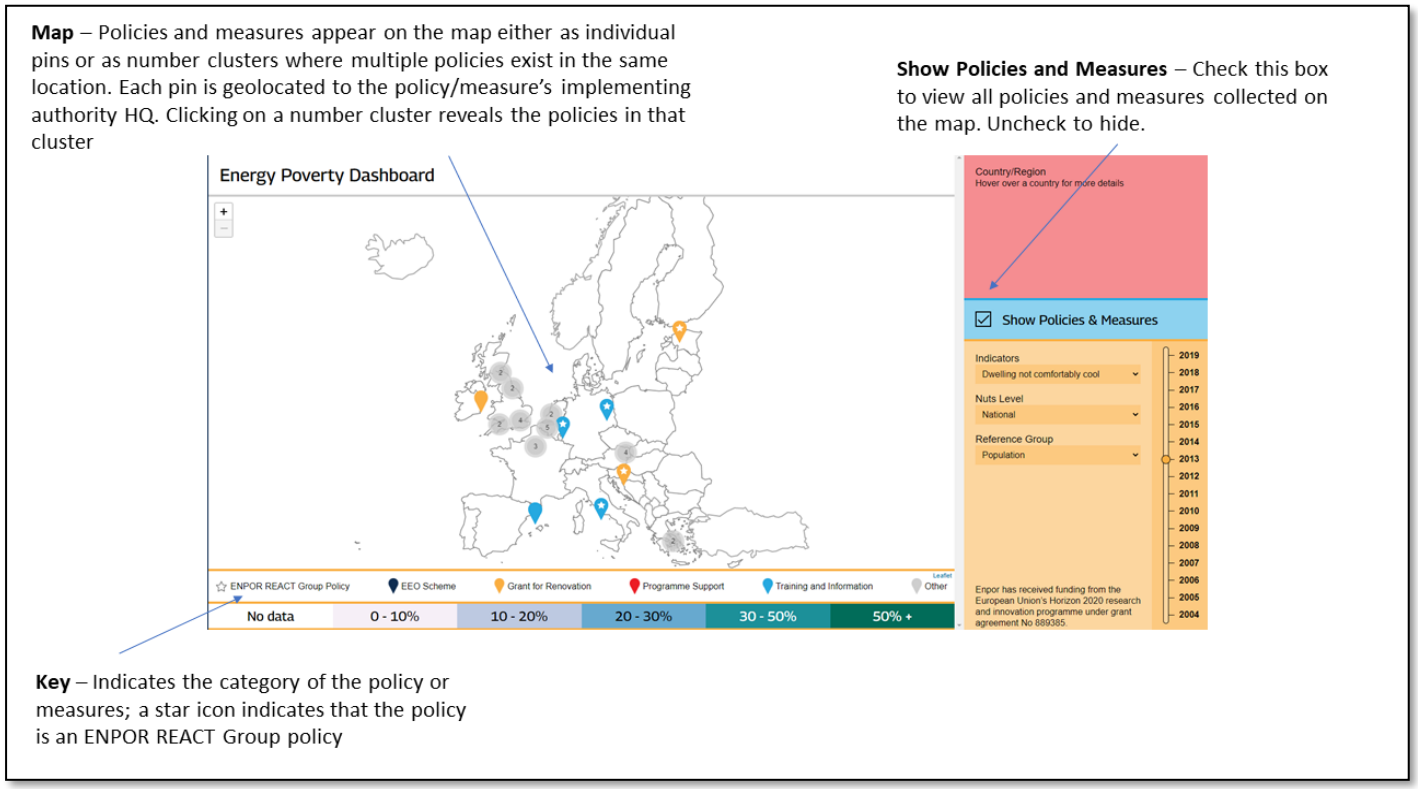

Figure 3 - Diagram of Policy & Measure Display Functions

When a user selects a policy/ measure pin from the map, a module is brought up containing various information regarding that policy (see **Figure 4** below). The module contains

- The policy/measure title.
- Its category according to the ENPOR project.
- The scale (whether it is implemented at a national, regional or local scale).
- The year the policy commenced, and ended, if it is no longer being implemented.
- The name of the policy implementing authority and where it is headquartered.
- Weblinks containing further information for the user to follow up on.
- A brief description of the policy or measure.

Figure 4 provides an example of a policy module that has been opened in the EPD.

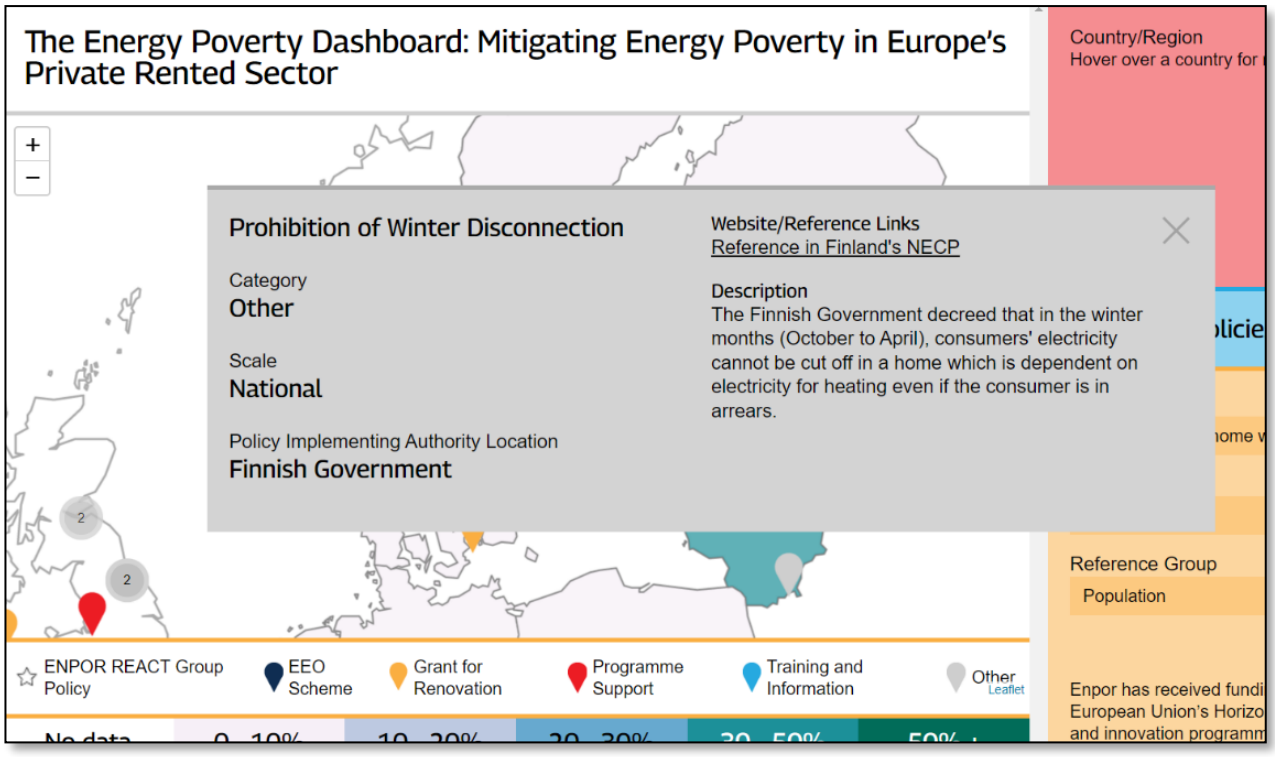

Figure 4 - Example of Policy Module

3
ADDITIONAL PAGES

3.1 Additional Pages - Submit a Policy

The EPD allows users to submit policies and measures that tackle energy poverty that they are aware of in the PRS in any European country. Users should navigate to the item “Submit a New Policy/Measure”.

Figure 5 demonstrates how this can be done.

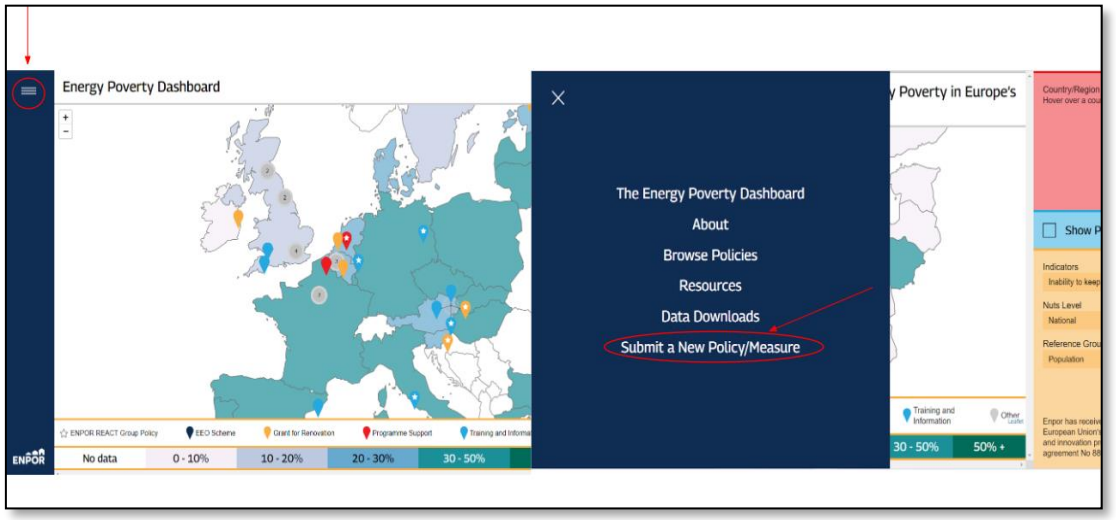

Figure 5 - How to Navigate to the "Submit a New Policy/Measure Page"

Once on the "Submit a New Policy/Measure" page, the user can fill out the simple webform. Compulsory fields are the policy/measure's name, the country it pertains to, a short description and a weblink to further information. Other optional fields can be filled in if the user is aware of these details.

Figure 6 shows how this can be done.

Once submitted, the policy is sent through to the ENPOR team, who moderate and review the submissions. This ensures that the policies submitted are not duplicates, and that they are relevant to the European PRS.

The information is then uploaded to the EPD and is available to be viewed by all website visitors.

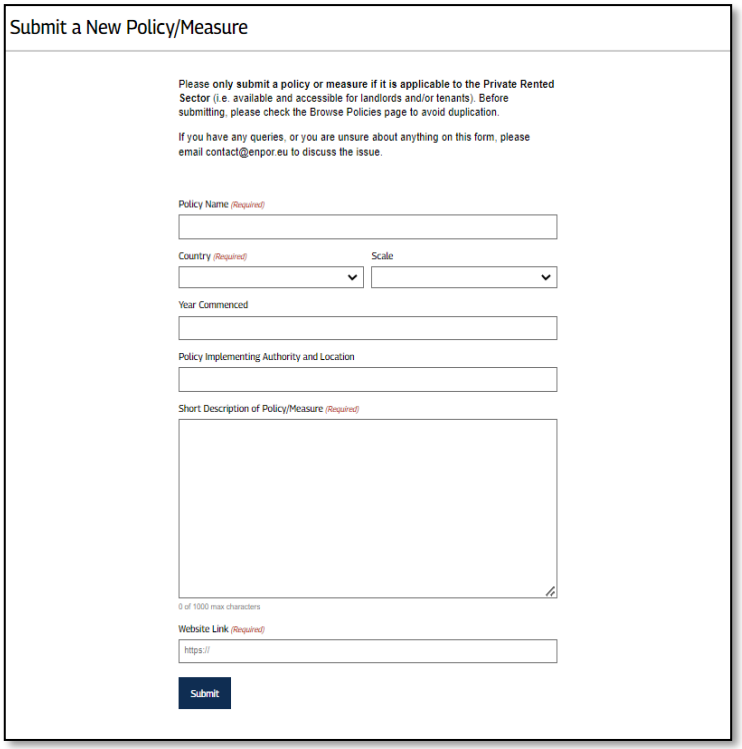

Figure 6 - The "Submit a Policy/Measure" Webform

3.2 Additional Pages - Browse Policies

An update to the Dashboard since January 2022 has been the addition of a "Browse Policies" page. This allows users to view all the policies contained within the Dashboard simultaneously, and in an alternative format to the map-and-pin format of the EPD itself.

The policies are divided into their respective countries of implementation, and then subdivided by category of policy, which are colour-coded for visual ease – see **Figure 7**.

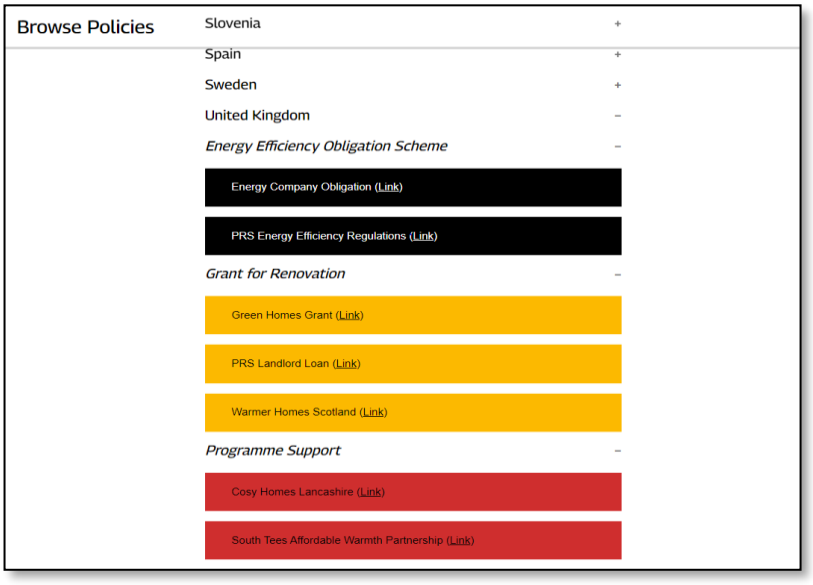

Figure 7 - Sample of UK policies in the "Browse Policies" page

3.3 Additional Pages – Resource Hub

The third element of the EPD is the Resources page, designed to be a resource hub for research, academic papers, projects and other useful information related to energy poverty in the PRS and more broadly.

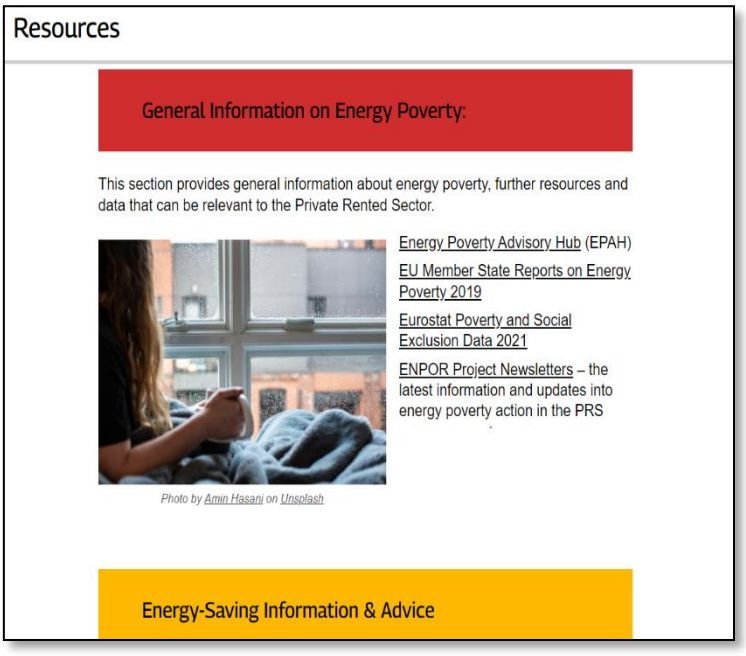

Figure 8 - Snippet of the EPD Resources Page

Following an update to the page, the information is now split into the following categories:

- **General Information on Energy Poverty**: This section provides general information about energy poverty, further resources and data that can be relevant to the Private Rented Sector.
- **Energy Saving Information and Advice**: This section provides quick links to country-specific energy advice such as energy-saving tips, accessible infographics, information and support for households, which are also applicable for tenants in the Private Rented Sector in those countries.
- **Academic Papers**: This section provides users links to relevant academic resources and papers published in the domain of the private rented sector, housing provision, energy efficiency, retrofitting, and policies.
- **EU Projects Tackling Energy Poverty**: This section provides links to other EU projects – both ongoing and ended – that are working in the sphere of energy poverty and energy efficiency.

This page is designed to be a dynamic and regularly updated page as new research is conducted and as the ENPOR project progresses.

3.4 Additional Pages - Data Downloads

All indicator and policy data on the EPD is free, open access and downloadable for users to browse.

Navigating to the Data Downloads page (see **Figure 9**), EPD users can download the latest user guide, indicator data and policy data.

There is also a note of when the data was last updated by the ENPOR team.

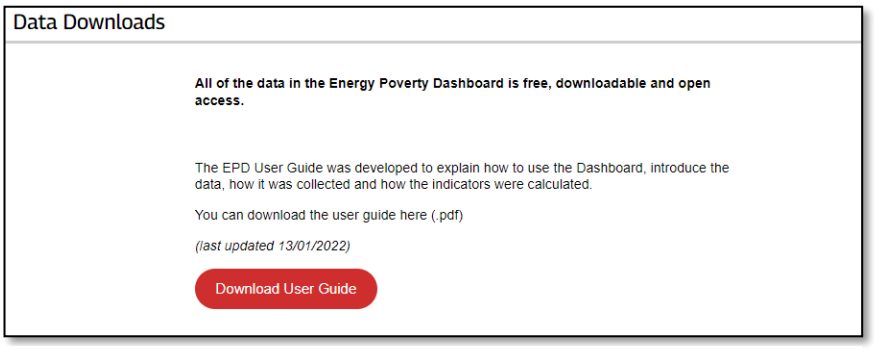

Figure 9 - The Data Downloads Page

4
DATABASE AND INDICATORS USED

4.1 EU-SILC Data Indicators

The EU-SILC survey is collected EU-wide and has widespread data coverage; all EU-member states have data availability from 2010 and most since 2004 (Thema & Vondung, 2020).

4.1.1 Consensual EU-SILC Data Indicators

Consensual SILC data indicators included in the EPD are as follows:

- **Inability to keep home warm** (ESTAT indicator ilc_mdes01) – the share of a population not able to keep their home adequately warm, based on the question "can your household afford to keep its home adequately warm?"
- **Arrears on utility bills** (ESTAT indicator ilc_mdes07) – the share of a population having arrears on their utility (water, electricity, gas, heating, etc.) bills, based on the question "in the last twelve months, has the household been in arrears, unable to pay on time due to financial difficulties for utilities?"
- **Presence of leak/damp/rot** (ESTAT indicator ilc_mdho01) – the share of a population with either leak (leaking roof), damp (damp walls/floors/foundation) or rot (rot in window frames or floor) (or all three) in their dwelling.
- **Dwelling not comfortably cool** (ESTAT indicator ilc_hcmp03) – based on the question "is the dwelling sufficiently insulated against the warm" and/or "is the cooling system efficient enough to keep the dwelling cool". Data collected within ad-hoc modules for 2007 and 2012 only.

4.1.2 Other EU-SILC Data Indicators

Other indicators derived from SILC data included in the EPD are as follows:

- **Poverty risk** (ESTAT indicator ilc_peps01) – the percentage of a population that is at risk of poverty or social exclusion, defined as having a household income that is below 60% of the median household income in a country/region.
- **Relative Risk of Asthma** – the share of a population with asthma due to dampness and mould in the building, calculated using a population attributable fraction of bad indoor conditions on asthma occurrence (PAF), based on data on exposure to leak, damp or rot (ESTAT indicator ilc_mdho01), a relative risk rate (cf. Quansah et al 2012) and applied to incidence rates of asthma within a country.
- **Size of rental sector** – the percentage of people which privately rent (i.e., do not own their homes or live in social housing) in a given country.

4.2 Expenditure-Based Household Budget Survey Data Indicators

Expenditure-Based Household Budget Survey Indicators included in the EPD are as follows:

- **High share of energy expenditure in income** (also known as 2M) – the proportion of households whose share of energy expenditure in their income is more than twice the national median share. This indicator captures how energy bills burden a household relative to its income.

- **Low absolute energy expenditure** (also known as M/2) – the share of households whose income and absolute energy expenditure is below half the respective national median values, capturing the underconsumption of energy relative to national mean energy expenditure. Those with expenditure below half the national median value are considered to be energy poor. National contexts and information on the energy performance of the building stock/respective regulation and social welfare policy may be needed to interpret this data.
- **Low income, high cost (LIHC) –** the share of households, whose energy expenditure is above the median energy expenditure in a country/region and whose income falls below the respective poverty risk threshold (below 60% of national median household income) after subtracting energy expenditure.

4.3 Share of Tenants in the Energy Poor Population (STEPP) Indicators

To complement the indicators listed in the preceding sections and to inform on the extent to which energy poverty in a country is localized in the PRS, a novel set of indicators reflecting the **S**hare of **T**enants in the **E**nergy **P**oor **P**opulation (thus called STEPP-indicators) according to the respective energy poverty indicator is calculated. To this end, the share of energy poor persons (or households for the expenditure-based indicators) in the PRS is multiplied with the size of the PRS (i.e., the share of the population living for rent) and divided by the share of energy poor persons (or households) in the overall population. Since information on the size of the PRS is only available at national level, so are the STEPP indicators.

4.4 Rented Private Housing Energy Poverty Indicator

A key element of the Dashboard is a specialised multidimensional indicator to capture energy poverty in the PRS. The indicator titled REPI (Rented Private Housing Energy Poverty Indicator) is expressed in the following form:

REPI = (a+b+(c/2))/3 * d

Where:
a = the share of people unable to keep the home adequately warm in the PRS.
b = the share of people reporting utility bill arears in the PRS.
c = the share of people reporting housing faults (damp, mould, rot in window frames or doors) in the PRS.
d = the share of people living in the PRS.

REPI essentially contains a composite energy poverty indicator (combining standard consensual measures of energy poverty, with a lower weighting for the share of people living in poor housing) and an indicator of the size of the PRS in a given area. REPI will have a higher value in cases where any of these values are higher, meaning that countries where energy poverty in the PRS is greater, and the size of the PRS is significant, will combine to yield an elevated score. Countries like Germany and the UK, which score relatively low on conventional energy poverty measures, record high values of the REPI.

5
DATA INFORMATION AND ISSUES

5.1 Tenure status assignment, Statistical significance, Reliability, Coverage and Other Data Issues

Statistical significance: In order to test whether the calculated differences in energy poverty levels among tenants and in the overall population are statistically significant (i.e., not a coincidental result of sampling), two-tailed one sample z proportion tests were run. In these, the hypothesis (H0) was tested for all countries, regions and years, that the share of energy poor persons/households is equal to the share in the overall population with a significance level of α=0.05 (i.e., at 95% confidence level). Where test results refuted the Null-hypothesis (i.e., the observed z value falls in one of the two most extreme α / 2 areas of the standard normal distribution) and the conditions for running the tests were met[1], the statistical significance of the displayed difference is indicated with a † next to the respective PRS value.

Reliability: Due to the disaggregation of data by tenure and NUTS-level, in some instances the underlying sub-sample becomes quite small, limiting the reliability of the displayed information. Where this is the case, an additional disclaimer has been integrated in the data display of the EPD. Reliability is considered a) low for (sub)population shares that are based on a sample equal to or smaller than 20 observations (n<=20) and b) limited for (sub)population shares based on sample equal or smaller than 50 observations (n<=50).

Temporal coverage: Due to its regulated nature the EU SILC dataset comprises yearly information for most indicators (apart from ilc_hcmp03) from 2004 until 2021. However, in the last year for which the EU SILC microdata is currently available (2021), the collection of the **Presence of leak/damp/rot** (ESTAT indicator ilc_mdho01) indicator has been suspended for unknown reasons. The national household budget surveys on the other hand are implemented by the Member States in differing intervals and are only assembled by Eurostat into a harmonised dataset in five-year intervals. Accordingly, information for these indicators is only available for the years 2010 and 2015 with the 2020 wave still pending release.

[1] 1. The data is a simple random sample drawn from the population (i.e., the observations are independent from each other), 2. The sample size is large enough for the test statistic z to be approximately normally distributed. The latter condition is fulfilled if the sample size multiplied with the population proportion or its complement both exceed the value 10.

Geographical coverage:

Geographical coverage of the data varies between databases, years and countries. **Table 1** provides an overview.

Table 1: Geographical coverage of the EPD indicators by database, year and level

Database	Year	National	NUTS1	NUTS2
HBS	2010	EU28	EU28 minus CZ, EL, IE, NL	CZ, IE
	2015	EU27	EU27	-
EU SILC	2004	AT, BE, DK, EE, EL, ES, FI, FR, IE, IT, LU, PT, SE	AT, BE, DK*, EE*, EL, IE*, IT, LU*	ES, FI, FR
	2005	EU28 minus BG, HR, MT, RO	AT, BE, CY*, DK*, DE, EE*, EL, HU, IE*, IT, LT*, LU*, LV*, PL, SK*	CZ, ES, FI, FR
	2006	EU28 minus BG, HR, MT, RO	AT, BE, CY*, DK*, DE, EE*, EL, HU, IE*, IT, LT*, LU*, LV*, PL, SK*	CZ, ES, FI, FR
	2007	EU28 minus HR	AT, BE, CY*, DK*, EE*, EL, HU, IE*, IT, LT*, LU*, LV*, PL, RO, SK*	CZ, ES, FI, FR
	2008	EU28 minus HR	AT, BE, BG, CY*, DK*, EE*, EL, HU, IE*, IT, LT*, LU*, LV*, PL, SE, SK*	CZ, ES, FI, FR, RO
	2009	EU28 minus HR	AT, BE, BG, CY*, DK*, EE*, EL, HU, IE*, IT, LT*, LU*, LV*, MT*, PL, RO, SE, SK*	CZ, ES, FI, FR
	2010	EU28	AT, BE, BG, CY*, DK*, EE*, EL, HU, IE*, IT, LT*, LU*, LV*, MT*, PL, RO, SE, SK*	CZ, ES, FI, FR, HR, UK
	2011	EU28	AT, BE, BG, CY*, DK*, EE*, EL, HR*, HU, IE*, IT, LT*, LU*, LV*, MT*, PL, RO, SE, SK*	CZ, ES, FI, FR, UK
	2012	EU28	AT, BE, BG, CY*, DK*, EE*, EL, HR*, HU, IE*, IT, LT*, LU*, LV*, MT*, PL, RO, SE, SK*, UK	CZ, ES, FI, FR
	2013	EU28	AT, BE, BG, CY*, DK*, EE*, EL, HR*, HU, IE*, IT, LT*, LU*, LV*, MT*, PL, RO, SE, SK*, UK	CZ, ES, FI, FR
	2014	EU28	AT, BE, BG, CY*, DK*, EE*, EL, HR*, HU, IE*, IT, LT*, LU*, LV*, MT*, PL, RO, SE, SI*, SK*, UK	CZ, ES, FI, FR
	2015	EU28	AT, BE, BG, CY*, DK*, EE*, EL, HR*, HU, IE*, IT, LT*, LU*, LV*, MT*, PL, RO, SE, SI*, SK*, UK	CZ, ES, FI, FR
	2016	EU28	AT, BE, BG, CY*, DK*, EE*, EL, HR*, HU, IE*, IT, LT*, LU*,	CZ, ES, FI, FR

			LV*, MT*, PL, RO, SE, SI*, SK*, UK	
	2017	EU28	AT, BE, BG, CY*, DK*, EE*, EL, HR*, HU, IE*, IT, LT*, LU*, LV*, MT*, PL, RO, SE, SI*, SK*, UK	CZ, ES, FI, FR
	2018	EU28	AT, BE, BG, CY*, DK*, EE*, EL, HR*, HU, IE*, IT, LT*, LU*, LV*, MT*, PL, RO, SE, SI*, SK*, UK	CZ, ES, FI, FR, PT
	2019	EU27	AT, BE, BG, CY*, DK*, EE*, EL, HR*, HU, IE*, IT, LT*, LU*, LV*, MT*, PL, RO, SE, SI*, SK*	CZ, ES, FI, FR, PT
	2020	EU27	AT, BE, BG, CY*, DE, DK*, EE*, EL, HR*, HU, IE*, IT, LT*, LU*, LV*, MT*, PL, RO, SE, SI*, SK*	CZ, ES, FI, FR, PT
	2021	EU27 minus PL, SK	AT, BE, BG, CY*, DE, DK*, EE*, EL, HR*, HU, IE*, IT, LT*, LU*, LV*, MT*, RO, SE, SI*	CZ, ES, FI, FR, PT

** Due to small size of these countries, NUTS1 level equals the national territory.*

Tenure status assignment, gaps and other data issues:

While in SILC tenure status is defined by a specific item, the HBS data does not comprise a similar variable. In order to disaggregate the expenditure-based indicators by tenure status, the latter is therefore assigned with view to household expenditure for rents. The HBS data comprises two expenditure categories for rent:

1. Actual rentals for housing (EUR_HE041), further disaggregated into *Actual rentals paid by tenants* (EUR_HE0411) and *Other actual rentals* (EUR_HE0412), and
2. Imputed rentals for housing (EUR_HE042), further disaggregated into *Imputed rentals of owner occupiers* (EUR_HE0421) and *Other imputed rentals* (EUR_HE0422)

To this end, households were identified as tenants if they had provided positive values only in the category "Actual rentals paid by tenants". Where no information was provided, entries in the superordinate category "Actual rentals" were used as an indicator. In the latter case, it was additionally verified that expenditure values did not match possible entries in the second subordinate category "Other actual rentals", which captures rent expenditures for other facilities not used as primary residence (e.g., garages)[2]. For observations with no expenditure data in either rent category (n=17,752), an assignment was not possible. Furthermore, the assignment was complicated by the existence of a significant number of observations with expenditure in different categories (i.e., actual rentals and imputed rentals for owner occupiers or households housed free) (n= 28,208), making up around 5% of the total HBS data set and between 0% to 79% of the different country subsamples (cf. Table 2).

[2] For DE, no disaggregated data for Actual rentals was collected in 2015. In this instance, entries in the superordinate category were considered to indicate tenant status by default, possibly introducing some bias with view to the identification of tenants.

Here an assignment was undertaken by comparing the expenditures to defined threshold values in the respective categories, using the border value of the lowest 10%. In cases where expenditure for actual rents (paid by tenants) was above and expenditure for imputed rents was below the respective threshold value, tenant status was assigned or vice versa not assigned. The remainder was assigned an unclear tenure status. While this proceeding may introduce some uncertainty with view to the estimated energy poverty levels in the PRS, the extent is limited in most countries with view to a low share of double entries or the possibility of clear assignment in light of implausible entries in a category (such as is the case in SI, where data entries for actual rentals are below 200 € in the majority of cases). Eventually, in total 26,936 households could not be assigned a tenure status due to lacking expenditure data or ambiguous double entries.

Table 2: Overview of ambiguous observations in the HBS data

Country	Year	Size of sample (number of households)	Number of observations with double entries	Share of observations with double entries in the sample
AT	2010	6,534	209	3.2%
	2015	7,162	0	0.0%
BE	2010	7,177	20	0.3%
	2015	6,135	15	0.2%
BG	2010	2,982	0	0.0%
	2015	2,966	0	0.0%
CY	2010	2,707	263	9.7%
	2015	2,876	219	7.6%
CZ	2010	2,932	0	0.0%
	2015	2,929	0	0.0%
DE	2010	53,996	1,810	3.4%
	2015	52,412	5,197	9.9%
DK	2010	2,484	100	4.0%
	2015	2,205	175	7.9%
EE	2010	3,632	44	1.2%
	2015	3,395	3	0.1%
EL	2010	3,512	64	1.8%
	2015	6,150	88	1.4%
ES	2010	22,203	3,692	16.6%
	2015	22,130	3,269	14.8%
FI	2010	3,551	0	0.0%
	2015	3,673	208	5.7%

FR	2010	15,797	119	0.8%
	2015	16,978	125	0.7%
HR	2010	3,461	99	2.9%
	2015	2,029	42	2.1%
HU	2010	9,937	403	4.1%
	2015	7,185	146	2.0%
IE	2010	5,891	19	0.3%
	2015	6,839	17	0.2%
IT	2010	22,246	97	0.4%
	2015	15,013	502	3.3%
LT	2010	6,103	33	0.5%
	2015	3,443	26	0.8%
LU	2010	3,492	70	2.0%
	2015	3,167	129	4.1%
LV	2010	3,798	911	24.0%
	2015	3,844	586	15.2%
MT	2010	3,732	10	0.3%
	2015	3,691	0	0.0%
NL	2010	6,001	431	7.2%
	2015	14,408	765	5.3%
PL	2010	37,412	1,000	2.7%
	2015	37,148	292	0.8%
PT	2010	9,489	84	0.9%
	2015	11,398	78	0.7%
RO	2010	31,336	8	0.0%
	2015	30,625	8	0.0%
SE	2010	2,047	313	15.3%
	2015	2,871	518	18.0%
SI	2010	3,924	2,940	74.9%
	2015	3,750	2,956	78.8%
SK	2010	6,143	81	1.3%
	2015	4,785	24	0.5%
UK	2010	5,263	0	0.0%

Due to a lack of income data in both years (2010 & 2015) neither 2M nor LIHC could be calculated for IT. The same applies for LU in 2010. In addition, in EL, FR and IT, NUTS regions have been re-labelled for administrative reasons or actual boundary shifts (cf. **Table 3**). Although possibly introducing bias, to allow for a subnational comparison of energy poverty over time, older labels have been replaced with the newest ones. Where this occurs, a disclaimer is included in the Data Display.

Table 3: Changes of NUTS regions labels

Country	NUTS label (old)	NUTS label (new)	Change
EL	EL1	EL5	Boundary shift in 2013
	EL2	EL6	
FR	FR21	FRF2	Relabelled in 2016
	FR22	FRE2	
	FR23	FRD2	
	FR24	FRB0	
	FR25	FRD1	
	FR26	FRC1	
	FR30	FRE1	
	FR41	FRF3	
	FR42	FRF1	
	FR43	FRC2	
	FR51	FRG0	
	FR52	FRH0	
	FR53	FRI3	
	FR61	FRI1	
	FR62	FRJ2	
	FR63	FRI2	
	FR71	FRK2	
	FR72	FRK1	
	FR81	FRJ1	
	FR82	FRL0	
	FR83	FRM0	
IT	ITD	ITH	Boundary shift in 2010
	ITE	ITI	

6
FUTURE DEVELOPMENT OF THE DASHBOARD

Since the first iteration of this User Guide, released in January 2022, the EPD has been merged into the framework of a broader and more holistic energy justice hub, entitled the Global Energy Inequality Observatory, hosted by the University of Manchester. This page includes links to the ENPOR Energy Poverty Dashboard, as well as links to a European Community Retrofit Hub, and the Urban Energy Blog.

Moving forwards, the EPD will be managed in the following ways:

- Updated where possible with new Eurostat data as it becomes available
- Updated with new relevant policies as information on them becomes available
- Updated with new resources, including academic papers, relevant to the PRS, as they become available
- Promoted through available information channels so as to increase its visibility and popularity
- Managed in such a way as to viability of the EPD as a key energy poverty information resource beyond the lifetime of the project.

7
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