Study on Energy Poverty in the Danube Region

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LIST OF ABBREVIATIONS

Abbreviation	Full Text
BIM	Building Information Model
CO_2	Carbon dioxide
CSOP	Consumer Stock Ownership Plan
EAP	Energy Agency of Plovdiv
EC	European Commission
EDEPI	European Domestic Energy Poverty sub-Index
EEPI	European Energy Poverty Index
EESC	European Economic and Social Committee
EFSI	European Fund for Strategic Investments
EP	European Parliament
EPC-label	Electronic Product Code label
EPOV	Energy Poverty Observatory
EPS	Expanded Polystyrene
ERDF	European Regional Development Fund
ESCO	Energy Service Company
ESMAP	Energy Sector Management Assistance Program
ETEPI	European Transport Energy Poverty Sub-Index
EU	European Union
EU-SILC	European Union – Statistics on Income and Living Conditions
EUSDR	European Union Strategy for Danube Region
FI	Financial Instrument
GDP	Gross Domestic Product
HBS	Household Budget Survey
HEA	Home Energy Advisor
HVAC	Heating, ventilation, and air conditioning
IEA	International Energy Agency
INSITER	Intuitive Self-Inspection Techniques
KPI	Key Performance Indicator
MEPI	Multidimensional Energy Poverty Index
NECP	National Energy and Climate Plan
NECP	National Energy and Climate Plan

NGO	Non-Governmental Organization
nZEB	nearly Zero Energy Building
PA2	Priority Area 2
PnP	Plug and Play
RES	Renewable energy source
SDG	Sustainable Development Goal
SILC	Statistics on Income and Living Conditions
SME	Small and Medium-sized Enterprise
SSO	Student Switch Off project
WBG	World Bank Group

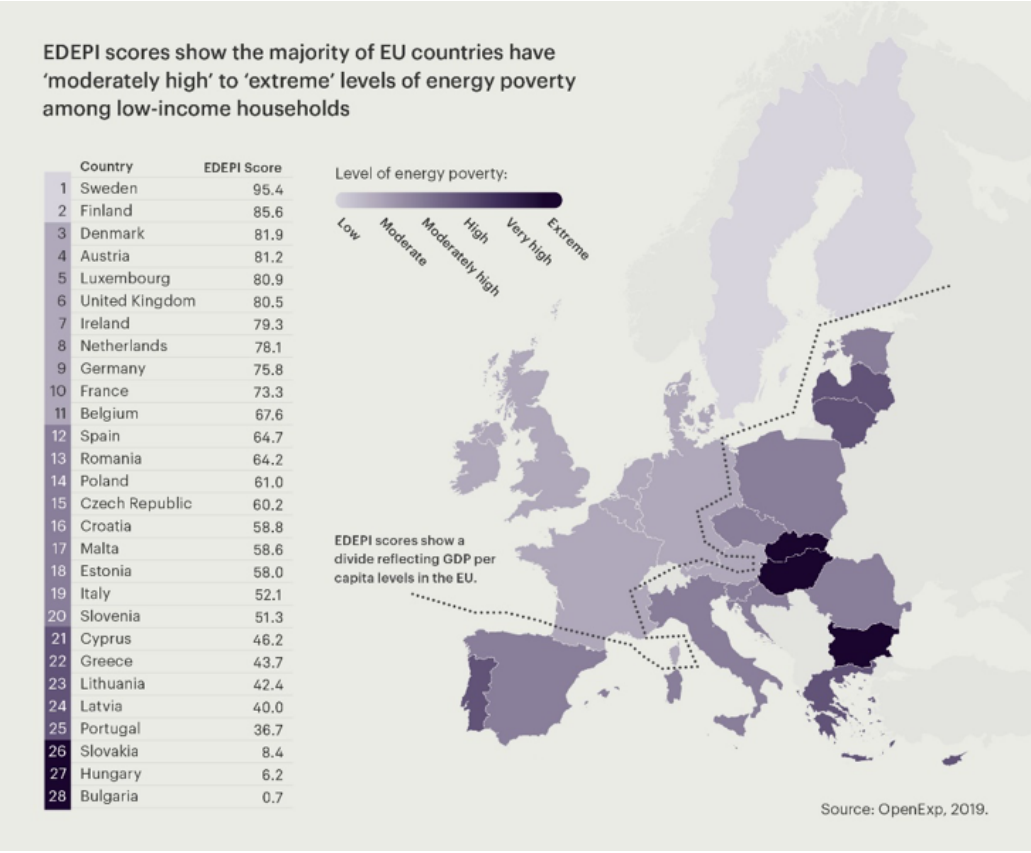
INTRODUCTION

Cold home, leaking roof and “eat or heat” dilemma. These are just a few examples of a phenomenon called energy poverty. People often associate energy poverty and its risks with developing countries. However, the estimated number of people at risk of energy poverty in the European Union is between 10 % and 25 % of the population[1] (1).

Energy poverty is a complex and multidimensional problem, lying at the intersection of three factors: household income, energy costs and the energy efficiency of the housing stock (2). These factors are also mentioned in the definition widely used in the European context:

> *“A situation where a household or an individual is unable to afford basic energy services (heating, cooling, lighting, mobility and power) to guarantee a decent standard of living due to a combination of low income, high energy expenditure and low energy efficiency of their homes”*. (3)

As the Danube region is a relatively large area that includes countries with different historical influences, cultures, wealth or living standards, the energy poverty rate varies significantly between these countries (see Figure 1).



	Country	EDEPI Score
1	Sweden	95.4
2	Finland	85.6
3	Denmark	81.9
4	Austria	81.2
5	Luxembourg	80.9
6	United Kingdom	80.5
7	Ireland	79.3
8	Netherlands	78.1
9	Germany	75.8
10	France	73.3
11	Belgium	67.6
12	Spain	64.7
13	Romania	64.2
14	Poland	61.0
15	Czech Republic	60.2
16	Croatia	58.8
17	Malta	58.6
18	Estonia	58.0
19	Italy	52.1
20	Slovenia	51.3
21	Cyprus	46.2
22	Greece	43.7
23	Lithuania	42.4
24	Latvia	40.0
25	Portugal	36.7
26	Slovakia	8.4
27	Hungary	6.2
28	Bulgaria	0.7

Figure 1: Level of energy poverty in Europe according to EDEPI sub-index (4).

[1] It depends on the form of energy poverty and the indicators that were used. This figure does not include data from non-EU Member states in the Danube region (Bosnia and Herzegovina, Moldova, Montenegro, Serbia, Ukraine).

Even though the topic of energy poverty is gaining wider attention only recently, the topic has been known and studied for almost 40 years. The first articles were written by Dr. Brenda Boardman of the University of Oxford in the 1980s (5). However, rapidly rising energy prices and higher household dependence on electricity lead to wider acknowledgement of the importance of this issue in recent years.

Assignment

This study on energy poverty in the Danube region was commissioned by the Office of the Government of the Czech Republic and is part of the EU Strategy programme for the Danube Region (EUSDR), Priority Area 2 – Sustainable Energy.

Study requirements include:

- Easily understandable to wide spectrum of recipients (policy makers, officers, NGO representatives, public service designers etc.).
- Focus on replicability and transferability of good examples.
- Applicability across all Danube region countries.

Structure of the document

The document is structured into eleven chapters. The first two chapters define the geographical and legal framework of energy poverty in the context of the EU and the Danube region.

The first two parts are followed by chapters describing energy poverty in closer detail, focusing on its definitions, measurements and benchmarking.

The next two chapters describe factors contributing to energy poverty and its impact on quality of life.

The following two chapters summarize types of energy poverty measures and organizations dealing with energy poverty internationally, nationally and locally.

The most comprehensive part of the study is a chapter on “Good Practice Examples”. The aim is to provide various examples on current international projects on energy poverty, including good practice examples. The chapter covers various types of measures that are implemented across local and international levels.

Concluding chapters provide an overview and recommendations for replicating good practices. It includes recommendations for those who would like to replicate successful measures in new contexts.

1 SPECIFICATION OF THE DANUBE REGION

The Danube region is an area spanning over 14 countries, covering a land of more than 800,000 square kilometres, with a population of around 115 million people.

States in the region have different geographies, historical developments, economic prosperity or the standard of living of their citizens. These are just a few examples that do not allow this area to be viewed as a homogeneous whole, especially not the field of energy poverty which is a complex issue that encompass various areas of human life.

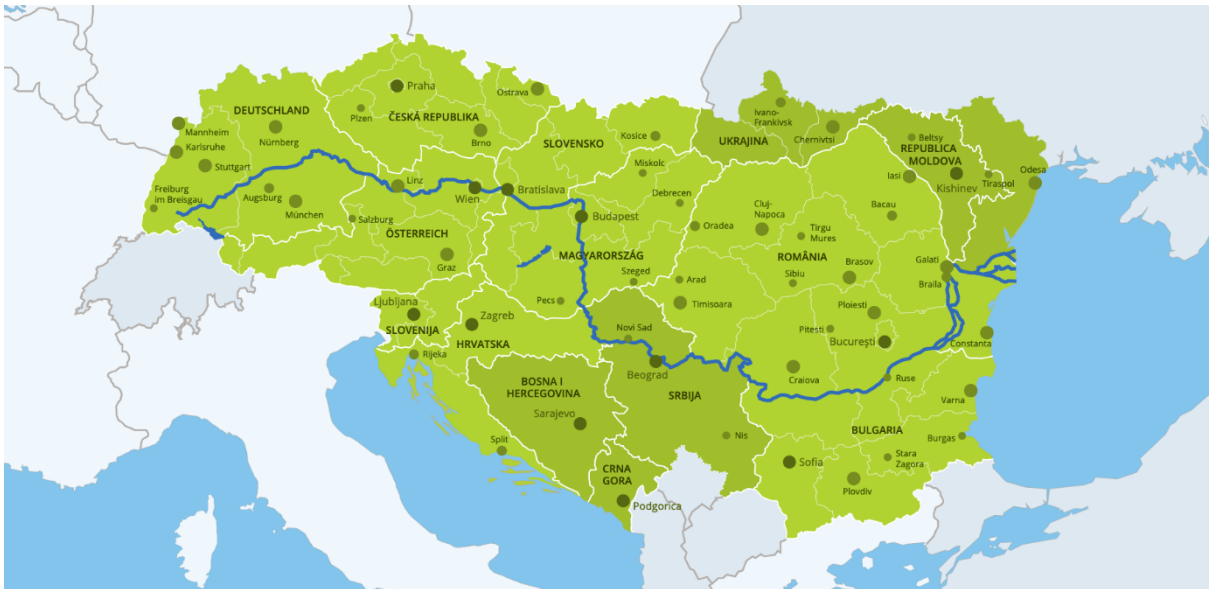


Figure 2: Danube region: EU Member States and Non-EU Member States (6)

The countries in the Danube region consist of both the EU Member States and non-EU countries. The authors of the study "Socio-Economic Assessment of the Danube Region: State of the Region, Challenges and Strategy Development" are further dividing the Member States into three subgroups based on a comparison of socio-economic indicators. This division also reflects the EU integration process and current economic performance.

Table 1: Five subgroups according to socio-economic indicators, EU integration process and current economic performance (7).

EU Member States	Accession Countries	Neighbouring Countries
Member State Area 1	Bosnia and Herzegovina	Moldova
Austria	Montenegro	Ukraine[2]
Germany[3]	Serbia	

[2] Chernivetska Oblast, Ivano-Frankiviska Oblast, Zakarpatska Oblast, Odessa Oblast
[3] Baden-Württemberg, Bavaria

Member State Area 2		
Czech Republic		
Hungary		
Slovakia		
Slovenia		
Member State Area 3		
Bulgaria		
Croatia		
Romania		

Energy poverty is mainly influenced by three drivers 1) income, 2) energy prices and 3) the quality of buildings. These factors vary considerably across the Danube region.

- Household electricity prices are the highest in Germany (EUR 0.31 per kWh) and the lowest in Ukraine (EUR 0.04 per kWh).[4]

- When we look at the average income, we see comparable differences. While in Austria it is at 34 EUR per hour, in Bulgaria it is six times less – only 5.4 EUR per hour (8).

- According to EU-SILC Survey[5] the proportion of population living in a dwelling with a leaking roof, damp walls, floors or foundation, or rot in window frames or floor is the highest in Slovenia (22.7 %) and the lowest in Slovakia (5.1 %) (9). However, the comparison is incomplete, because some countries are missing from the survey (e.g. Bosnia and Herzegovina, Moldova and Ukraine).

[4] Household Electricity Prices during the first half of 2019
[5] Data from 2018.

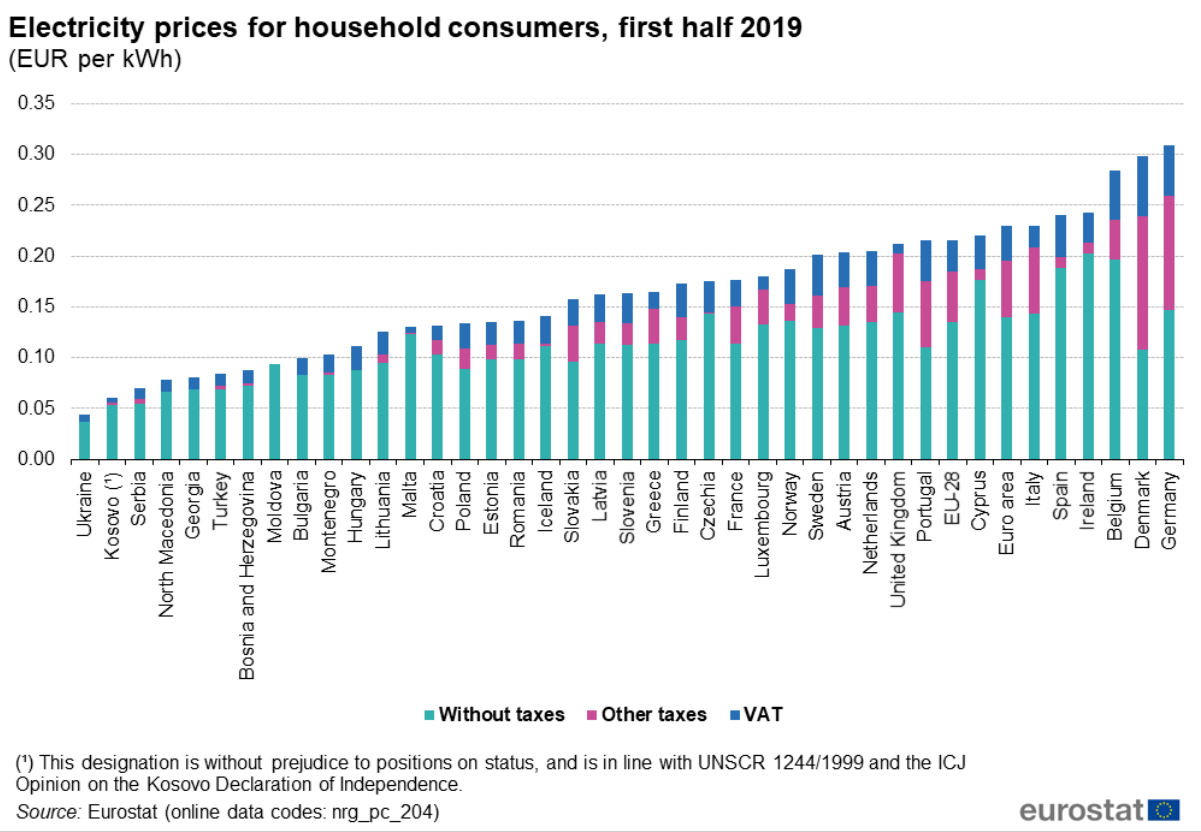


Figure 3: Electricity prices for household consumers, first half 2019 (EUR per kWh) (10).

The three primary drivers regarding energy poverty are influenced by many secondary drivers (e.g. GDP per capita, employment rate, type of economy, electricity consumption, corruption rate, climate conditions etc.) and these vary significantly across the Danube region. Such heterogeneity has become an important factor in alleviating energy poverty through the transfer of good practice into or within the region.

2 LEGISLATION

The transition of the European Union from fossil fuels towards clean energy is an ambitious goal aimed at reducing greenhouse gas emissions and at complying with the Paris Agreement (11) through National Energy and Climate Plans (NECPs) (12) made by each Member State. The process including several relevant legal acts does not look just at technical solutions, but it also takes customers into serious account. According to European Economic and Social Committee (EESC) social concerns should be addressed in full synergy with environmental and economic ones.

2.1 The Clean Energy for All Europeans Package

The main legal acts regarding energy poverty in the context of EU law can be found within the Clean Energy for All Europeans Package (13).

The Clean Energy Package also contains eight following EU Regulations and Directives[6]:

1. **Energy Performance of Buildings Directive (EU) 2018/844** (14)
2. **The recast Renewable Energy Directive (EU) 2018/2001** (15)
3. **The revised Energy Efficiency Directive (EU) 2018/2002** (16)
4. **Governance of the Energy Union and Climate Action (EU) Regulation 2018/1999** (17)
5. Regulation on Internal Market for Electricity (EU) 2019/943 (18)
6. **Directive on Common Rules for the Internal Market for Electricity (EU) 2019/944** (19)
7. Regulation on Risk-Preparedness in the Electricity Sector (EU) 2019/941 (20)
8. Regulation establishing a European Union Agency for the Cooperation of Energy Regulators (EU) 2019/942 (21)

The implementation of the Clean Energy for All Europeans Package represents an important milestone towards Energy Union (22).

Other EU regulations and directives directly mentioning energy poverty are as follows:

- **Regulation on the European statistical programme 2013-17, by extending it to 2020 (EU) 2017/1951**

> *"In line with the "European Energy Union" priority of the Commission, and, to the greatest possible extent based on existing data, particular focus will be given to statistics related to energy consumption, energy efficiency, renewable energy sources, energy dependence, aspects of energy poverty and security of supply and the circular economy. Furthermore, energy statistics will need to support the 2030 climate and energy framework that aims to make the Union's economy and energy system more competitive, secure and sustainable* (23)*."*

[6] Following legal acts (**marked in bold**) directly mention the term "energy poverty": Directive (EU) 2018/844, Directive (EU) 2018/2001, Directive (EU) 2018/2002, Regulation (EU) 2018/1999, Electricity Directive – Directive (EU) 2019/944.

- **Regulation on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement (EU) 2018/842**

  "The conclusions of the European Council of 19-20 March 2015 noted that the Union is committed to building an Energy Union with a forward-looking climate policy on the basis of the Commission's framework strategy, whose five dimensions are closely interrelated and mutually reinforcing. Moderation of energy demand is one of the five dimensions of that Energy Union strategy. Improving energy efficiency can deliver significant reductions in greenhouse gas emissions. It can also benefit the environment and health, improve energy security, cut energy costs for households and companies, help alleviate energy poverty and lead to increased jobs and economy-wide economic activity. Measures which contribute to an increased uptake of energy-saving technologies in buildings, industry and transport could be a cost-effective way of helping Member States achieve their targets under this Regulation." (24)

- **Directive on the reduction of national emissions of certain atmospheric pollutants (EU) 2016/2284**

  "Flexibilities

  [...] 4. A Member State shall be deemed to comply with its obligations under Article 4 for a maximum of three years, where non-compliance with its emission reduction commitments for the relevant pollutants results from a sudden and exceptional interruption or loss of capacity in the power and/or heat supply or production system, which could not reasonably have been foreseen, and provided that the following conditions are met:

  [...] (b) the Member State concerned has demonstrated that the implementation of measures and policies additional to those referred to in point (a) would lead to disproportionate costs, substantially jeopardise national energy security, or pose a substantial risk of energy poverty to a significant part of the population." (25)

2.2 The European Green Deal

In December 2019 the European Commission introduced the European Green Deal (26), a complex strategy that sets a new ambitious goal for EU to become climate-neutral by 2050. This package of measures should enable European citizens and businesses to benefit from sustainable green transition. This plan needs to be considered when alleviating energy poverty, since three of the Green Deal policy areas (Clean Energy, Building and Renovation, Sustainable Mobility) are highly relevant to the topic. The Green Deal is an important act, because it will lead to changes in EU legislation and revision of NECPs.

3 DEFINITION OF ENERGY POVERTY

The term “energy poverty” can be easily understood as a deficiency in energy supply that has negative consequences. Such definition is rather vague and does not cover all aspects of this phenomenon thus it is not useful for designing and implementing efficient policy measures. To bring even more confusion, some countries use the term fuel poverty, which overlaps with the term energy poverty only partially.

A very frequently cited definition used by the European Commission is also criticized as vague (27), unfortunately, there is no other commonly used definition of energy poverty among European countries.

> *“A situation where a household or an individual is unable to afford basic energy services (heating, cooling, lighting, mobility and power) to guarantee a decent standard of living due to a combination of low income, high energy expenditure and low energy efficiency of their homes”*. (3)

There are only a few countries that officially defined energy poverty on the national level (Cyprus, France, Ireland, Scotland, Slovakia, United Kingdom). Certain forms of unofficial definitions can be found in several other countries (e.g. Austria, Italy, Malta) (28).

An example of a good definition that also includes a specific threshold comes from Ireland, and uses the expenditure method of measuring energy poverty, whereby *“a household that spends more than 10% of their income on energy is considered to be in energy poverty”* (29).

A better common definition of energy poverty applied across European countries could bring clarity into understanding the scope of this topic, especially considering the domain of mobility in the definition. Mobility is included in the definition by the European Commission[7], but it is not mentioned in all national-level definitions. However, before any definition is accepted by other countries, it is necessary to consider local specific conditions (27).

The existence of a definition of energy poverty is not very widespread among European countries, but almost all European countries have one important element already defined. It is a target group – vulnerable customers in the energy markets. This obligation is based on the Electricity Directive (2009/72/EC) (30).

[7] The right to access essential services such as transport is stated in „The European Pillar of Social Rights in 20 principles“ (78).

4 ENERGY POVERTY INDEXES

There is a strong need to compare regions in terms of quantified risks and prevalence of energy poverty. There are several indexes for this purpose. The European Energy Poverty Index (EEPI) is a good example. EEPI[8] addresses the need to measure, compare and monitor the development of energy poverty in the long term.

Arguably, this is the only index intended to compare the Member States of the European Union, which not only tracks dwellings but also transport.[9] *"The European Energy Poverty Index (EEPI) is a composite indicator that scores and ranks Member States' progress in alleviating domestic and transport energy poverty as well as their nexus. The EEPI is composed of two sub-indexes, the European Domestic Energy Poverty sub-Index (EDEPI) and the European Transport Energy Poverty Sub-Index (ETEPI)* (31)*."*

Other indexes that capture energy poverty occurrence can be found, but they are either focused on areas other than Europe (e.g. Africa, Asia) or they consider only the situation regarding dwellings and do not consider transportation into their calculation.

[8] Developed by OpenEXP, global network of independent experts.
[9] Other indexes are usually designed for regions outside Europe, e.g. MEPI (Multidimensional Energy Poverty Index) developer by Oxford University (79).

5 ENERGY POVERTY INDICATORS

Energy poverty indexes – as a single figure – are useful for quick comparison between regions, but do not provide deeper insight into complex factors influencing energy poverty risks and prevalence in a given region. Energy poverty is a complex and multidimensional phenomenon, it should be examined using a combination of multiple indicators (32) to better understand the situation on specified level (EU, country, region etc.) and with a specific purpose.

Probably the most comprehensive report on energy poverty indicators in the context of the EU is the report "Selecting Indicators to Measure Energy Poverty" (33) prepared by Trinomics. The 178 indicators from various energy poverty metrics, EU projects, scientific papers and other literature are divided into six categories.

Categories of indicators (33)**:**

- Demographics
- Income/expenditure
- Outcomes
- Physical infrastructure
- Policy-based
- Energy demand

The Figure 4 below shows the proposed set of metrics by Trinomics that could be used across all 28 Member States to compare energy poverty.

Approach	Metric	Data requirements
Expenditure-based using actual expenditure	**2M: Share of energy expenditure** (compared to equivalised disposable income) **above twice the national median**	HBS: • Equivalised income • Taxes • Energy expenditures
	Low Income High Cost (LIHC): If the energy expenditures are above the median level and if they spend this amount, their residual income is below the poverty line	
	HEP M/2 Exp (Hidden energy poverty): Absolute energy expenditure below half the national median	
Consensual-based	Inability to keep the house warm **(Warmth).**	SILC

Figure 4: Set of recommended energy poverty metrics[10] (33).

[10] HBS (Household Budget Survey), SILC (Statistics on Income and Living Conditions)

6 FACTORS CONTRIBUTING TO ENERGY POVERTY

According to various reports there are three main factors that contribute to energy poverty: 1) Low incomes, 2) Poor thermal efficiency and low-quality housing and 3) High and rising energy costs (34). However, their causes must be sought in a wide range of social changes and phenomena.

The main social issues further affecting energy poverty include (35):

- Low income
  - Unemployment
  - Unqualified and low paid jobs
  - Property seizures
  - Regional situation

- Poor thermal efficiency and low-quality housing
  - Strong link between bad housing, energy demand and poverty – particularly for vulnerable groups
  - Inability to reach subsidies or loan for energy efficiency improvements

- High and rising energy prices
  - Increase of fuel prices
  - Deregulation and privatization that lead to perception of energy as a general commodity rather than public good (36)
  - Tax on climate protection policies (37)

Other factors that play important roles, but are not often cited as one of the main causes of energy poverty, are interpersonal variables such as age, education, health and possible health restrictions, discrimination, family situation and social ties. Some of these factors are included in the term “vulnerable consumer”.

Although it is not listed as one of the main factors of energy poverty, knowledge and ability to acquire essential information about cost-effective solutions are very important factors. There are several projects aimed at closing the knowledge gap by including information on support programmes and subsidies or low-cost measures to reduce energy consumption. These include the ASSIST (38), SAVES2 (39) and Stromspar-Check (40) projects.

7 IMPACT OF THE ENERGY POVERTY ON QUALITY OF LIFE

Energy poverty and quality of life are relatively complex terms that are not widely agreed on in the definition or full enumeration of the areas they cover. Therefore, for the purposes of this chapter, the Eurostat framework “8 + 1 dimensions of quality of life” (41) is used to define the term quality of life.

8+1 dimensions of quality of life framework:

1. Material living conditions
2. Productive or main activity
3. Health
4. Education
5. Leisure and social interactions
6. Economic security and physical safety
7. Governance and basic rights
8. Natural and living environment
9. Overall experience of life

To define the term energy poverty and present various affected energy services, a matrix depicting the emergence of domestic energy deprivation (see Figure 5) developed by Stefan Bouzarovski and Saska Petrova (42) is used. This matrix helps to identify services that are used in a common household and that are dependent on the energy supply (right column).

Energy poverty is not caused only by availability or affordability of some services. An important role is also played by efficiency or inefficiency, and flexibility of energy services that meets the needs of a household. The household's energy needs, which are not satisfied due to various social, cultural, economic or health reasons, should not be overlooked. Lastly, there are cases, where insufficient information (for example regarding energy-saving solutions) may be to blame.

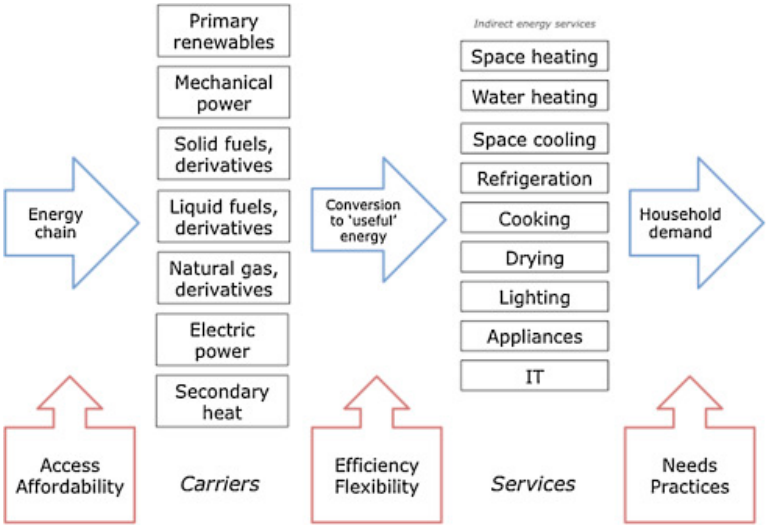


Figure 5: Dimensions influencing the delivery of energy services to the home, and the emergence of domestic energy deprivation (42).

The threat or presence of energy poverty negatively affects the environment of the household and thus its members. When we look at the "8 + 1 dimensions of the quality of life" and analyse their sub-dimensions, we can clearly see that consequences of energy poverty influence every dimension. In conclusion, the negative impact of energy poverty on humans is complex and affects all major areas of quality of life.

Table 2: "8 + 1 dimensions of quality of life", it's sub-dimensions and examples of energy poverty (41).

Dimensions	Sub-dimensions	Examples
1. Material living conditions	• Income • Consumption • Material conditions	*Household needs to choose between heating or a healthy diet or does not have enough money left for securing material goods.*
2. Productive or main activity	• Quantity of employment • Quality of employment • Other main activity	*Unstable supply of electricity makes it more difficult to use information technology and, for example, to look for work or to acquire knowledge to improve skills.*
3. Health	• Life expectancy • Number of healthy life years • Subjective assessment of own health	*Living in cold or unhealthy household can cause respiratory problems and shorten life expectancy.*
4. Education	• Educational attainment • Self-assessed and assessed skills • Participation in life-long learning • Opportunities for education	*Bad living conditions caused by energy poverty negatively affects children's performance at school.*
5. Leisure and social interactions	• Leisure activities (quality and quantity) • Social interactions (activities with others, for others, receive of social support and social cohesion)	*With high energy bills, there is a little or no money left for leisure activities.*
6. Economic security and physical safety	• Physical safety (e.g. crime rate) • Economic safety	*High energy bills and low income threaten economic safety in case of any sudden expenses.*
7. Governance and basic rights	• Trust in institutions and public services • Discrimination and equal opportunities • Active citizenship	*Individuals with low-income experience inequality and can have less trust in institutions and public services.*
8. Natural and living environment	• Subjective indicators (e.g. individuals' own perceptions of noise levels or the existence of pollution • Objective indicators (e.g. the amount of pollutants present in the air)	*Heating or cooking appliances, that causes pollution, do not allow users to maintain their environment clean and healthy.*
9. Overall experience of life	• Life satisfaction • Affect (a person's feelings or emotional states) • Eudaemonics (a sense of having meaning and purpose in one's life, or good psychological functioning)	*Long-term discomfort or deprivation negatively affect physical and emotional state of a person.*

In this chapter, the selected consequences of energy poverty on the quality of life of an individual were presented. Both terms (energy poverty and quality of life) encompass a large number of social areas. The list is therefore not complete and does not take into account all possible factors and consequences.

8 MEASURES TO REDUCE ENERGY POVERTY

Energy poverty is a complex phenomenon. It is mainly influenced by **five factors** (see chapter Factors contributing to energy poverty):

1. Low income
2. Poor thermal efficiency and low-quality housing
3. High and rising energy prices
4. Personal factors
5. Knowledge and ability to acquire information about cost-effective solutions

At the same time, these five factors partially overlap with the areas targeted by most energy poverty reduction measures. Based on a literature review and analysis of several projects aimed at energy poverty, we present **five types of measures**:

A. Legislation and regulations
B. Counselling and Social Work
C. Subsidies
D. Technical solutions
E. Other types of measures

This chapter presents examples for each of these five types of measures mentioned above that are used across the Danube region.

8.1 Legislation and regulations

The group of measures related to legislation is based primarily on EU regulations, EU directives and their transposition into national law. Probably the two most important terms anchored in the law are “energy poverty” mentioned in the Energy Performance of Buildings Directive (EU) 2018/844 (14) and “vulnerable customers” mentioned in the Electricity Directive (2009/72/EC) (30).

Austria, Croatia and Slovakia are the only three EU Member States from the Danube region, which have transposed measures from the Energy Performance of Buildings Directive into national law so far (43). All member states have transposed the Electricity Directive (2009/72/EC) into their national laws already in 2011 (44).

In-depth analysis and developments of recommendations on legislative proposals is also a frequent outcome of international energy poverty projects. Projects EMPOWERMED (45), EVALUATE (46), FINERPOL (47), PAVE (48), REACH (49) and SCORE (50) can serve as good examples.

8.2 Counselling and Social work

Most tools in this category focus on information, communication and guidance. The examples include media campaigns, energy labels on appliances, or training specialists who can help with energy savings in households – so called Home Energy Advisors (HEA). Examples of the HEAs network are the projects SAVES2 (focused on students) (39) and Stromspar-Check (focused on unemployed) (40). A good practice example from outside the Danube region is a programme in the United Kingdom called "Find energy grants and ways to save energy in your home" (51).

Furthermore, energy ombudsman and their activities can be included in this category. For example, the energy company Wien Energie defines the role of energy ombudsman as follows: *"The ombudsman assists clients who are classified as living in social hardship because of precarious income, health, housing, or family situation, an acute life crisis or debt. They are assisted over a longer period. Through networking and cooperation with public and private social institutions as well as (political) decision-makers, the ombudsman devises realistic solutions for each individual hardship case"* (52).

8.3 Subsidies

All states in the Danube region provide some form of subsidies to reduce the consumption of non-renewable energy in households to improve the energy efficiency of buildings, heating sources and other appliances.

When speaking about building efficiency the majority of energy losses are caused by heat leaking from heated rooms through the envelope and by high infiltration of cold air caused by a major leak and openings in the envelope. Building refurbishment leads to increased energy efficiency (53).

Obsolete methods of heating cause large heat losses but also air pollution. Investing in replacing equipment with more efficient alternative does not only reduce primary energy consumption but also contributes to better public health.

Subsidies can also support the installation of renewable energy sources such as photovoltaic panels. Renewable energy sources increase the self-sufficiency of the household while reducing the consumption of fossil fuels.

It is apparent that various types of subsidies are available to households in the Danube region. However, the crucial challenge remains whether low-income families will also be able to reach them. One of the typical problems is their repayment, for example, as households at risk of energy poverty often cannot pay in advance the money they have arranged. The solution could be that repayment to investment funds will be gradually obtained from the energy savings. It will require a short payback period of measures (less than 10 years). Such an approach is similar to the Energy Performance Contracting method (27).

8.4 Technical solutions

Technical solutions partially overlap and are coupled with solutions involving subsidies since households often receive subsidies for various technical measures or equipment replacement. It is not usually the case to receive subsidies for so-called soft measures, such as consultations. However, technical measures can be implemented without subsidies. Typical technical solutions include thermal insulation of the envelope, replacement of windows and doors, or replacement of the heating source.

Improvement of the buildings' technical condition can be made by owners of rental housing in addition to households themselves. Thus, private and public organizations can help reducing energy services costs for tenants and directly help addressing energy poverty.

The above measures can be implemented additionally as improvements to buildings´ technical conditions. Other approaches such as near-zero energy or passive houses are aimed at the lowest possible energy consumption, usually from the very beginning of a project and typically in new development projects. Another category are so-called positive energy buildings which produce more energy than they consume, usually measured in a year cycle. A good example of a positive energy building is the PAVE project (48) realized by the city of Litoměřice (CZ).

8.5 Other types of measures

The last category includes other measures aimed at energy poverty. This includes, for example, the solution applied in the SCORE project (50). The main aim of the project is to promote the co-ownership of renewable energy solutions. The project particularly highlights the potential of the democratic participation model for inclusion of women and low-income households in the scheme. *"The participation of under-represented groups as prosumers through financial empowerment rather than social protection is a core element in the fight against energy poverty* (50)*."*

In the case of energy poverty reduction, a combination of multiple types of measures is of the utmost importance. It appears that countries that support more types of measures are more successful at reducing energy poverty (54). This can be explained by reaching more target groups when diverse measures are applied.

Energy poverty has many manifestations and can vary both within regions and within a city. Thus, national measures are important, as well as regional ones, that can bring greater efficiency in tackling energy poverty (54).

9 ORGANIZATIONS TACKLING ENERGY POVERTY

The following list presents the main organizations working in the Danube region to reduce energy poverty. It is not a comprehensive and exhaustive list, but a cross-section of active actors at various levels – international , national, regional and local.

The introduction of each organization includes a description of its main activities in relation to energy poverty, the target group it works with, and the scope of operation and activities.

9.1 International level

International Energy Agency (IEA)

Website	*www.iea.org*
What do they do?	**The IEA works with governments and industry to shape a secure and sustainable energy future for all.** The IEA is at the heart of global dialogue on energy, providing analysis, data, policy recommendations, and applicable solutions to help countries provide secure and sustainable energy for all. The IEA was created in 1974 to help co-ordinate a collective response to major disruptions in the supply of oil. While oil security remains a key aspect of its work, the IEA has evolved and expanded significantly since its foundation. Taking an all-fuels, all-technology approach, the IEA advocates policies that enhance the reliability, affordability and sustainability of energy. It examines the full spectrum issues including renewables, oil, gas and coal supply and demand, energy efficiency, clean energy technologies, electricity systems and markets, access to energy, demand-side management, and much more (55).
What is the target group?	**The main target group are governments.** Secondary target group are international organizations.
What is the scope?	**IEA is a global organization.** Since 2015, the IEA has opened its doors to major emerging countries to expand its global impact, and deepen cooperation in energy security, data and statistics, energy policy analysis, energy efficiency, and the growing use of clean energy technologies.

Ashoka – The Social Innovation to Tackle Energy Poverty Solution Accelerator

Website	*tackleenergypoverty.ashoka.org*
What do they do?	Ashoka builds and cultivates a community of change leaders who see that the world now requires everyone to be a changemaker; Ashoka co-creates (together with Schneider Electric Foundation) The Social Innovation To Tackle Energy Poverty Solutions Accelerator. The aim of the Accelerator is to identify and support projects ideas of young innovators as well as mature projects in the field of energy poverty in five European countries: Poland, Czech Republic, Hungary, Romania and Bulgaria. After two selection stages, 15 finalists are selected to join a 5-months acceleration program, which helps them improve their strategy and amplify their positive impact on society and on the environment (56).
What is the target group?	The main target group of Ashoka is social entrepreneurs. The accelerator targets active members of the general public with innovative ideas. Then supported ideas and projects are in the field of energy poverty. In each country, one winner is selected by a jury and awarded 3,500 EUR.
What is the scope?	Ashoka is a global organization. The accelerator operates in five European countries: Poland, Czechia, Hungary, Romania, and Bulgaria.

Energy Sector Management Assistance Program (ESMAP)

Website	*www.esmap.org*
What do they do?	ESMAP is a partnership between the World Bank Group (WBG) and 18 partners to help low- and middle-income countries reduce poverty and boost growth. It does so through environmentally sustainable energy solutions. ESMAP's analytical and advisory services are fully integrated within the WBG's country financing and policy dialogue in the energy sector. Through the WBG, ESMAP works towards accelerating the energy transition required to achieve Sustainable Development Goal 7 (SDG7) and to ensure access to affordable, reliable, sustainable and modern energy for all (57).
What is the target group?	The main target group are the low and middle-income countries. Specifically, the program targets governments and NGOs.
What is the scope?	It is a global initiative, focusing on low- and middle-income countries. It is implemented by regional WBG units.

ENGAGER

Website	*www.engager-energy.net*
What do they do?	The ENGAGER Action seeks to bring about transformational change in the investigation and amelioration of household-level energy poverty in Europe. It facilitates the development of comprehensive, innovative and evidence-based policy frameworks. The significant extent of energy poverty in Europe means that ENGAGER addresses a major societal challenge that impinges on three inter-related aims: • How can energy poverty be understood and eradicated via multidimensional research and policy. • What are the conceptual and methodological complexities that underpin energy poverty. • What is the best way of overcoming limited knowledge on energy poverty in Europe (58).
What is the target group?	The main target groups are researchers (scientists) and practitioners. It enables them to grow their ideas by sharing and collaborating with their peers. This boosts their research, career and innovation.
What is the scope?	ENGAGER is a COST Action and it connects research initiatives across Europe.

EU Energy Poverty Observatory

Website	*www.energypoverty.eu*
What do they do?	The principal aim of the Energy Poverty Observatory (EPOV) is to engender transformational change in knowledge about the extent of energy poverty in Europe, as well as innovative policies and practices to address it. It is a initiative by the European Commission to help Member States in their efforts to combat energy poverty. It exists to improve measuring, monitoring and sharing of knowledge and best practice on energy poverty (59).
What is the target group?	The initiative is aimed at NGOs, policymakers and researchers. It provides guidance for policymakers and users, a database of indicators and policies on EP, examples of good practices and much more.
What is the scope?	EPOV provides digital tools and information accessible online. It provides a range of useful resources, including an indicator dashboard, evidence repository, catalogue of practical policies and measures, training material, list of members and discussion forums.

Covenant of Mayors for Climate & Energy

Website	*www.eumayors.eu*
What do they do?	The Covenant of Mayors is the world's largest movement for local climate and energy actions, launched in 2008 in Europe. The Covenant of Mayors for Climate & Energy brings together thousands of local governments voluntarily committed to implementing EU climate and energy objectives. Not only did the initiative introduce a first-of-its-kind bottom-up approach to energy and climate actions, but its success quickly went beyond expectations (60).
What is the target group?	The main target group are local and regional authorities. The initiative now gathers 9,000+ local and regional authorities across 57 countries drawing on the strengths of a worldwide multi-stakeholder movement and the technical and methodological support offered by dedicated offices.
What is the scope?	The Covenant of Mayors for Climate and Energy is open to all local authorities democratically constituted with/by elected representatives. It focuses mainly on the EU, but there are also members outside Europe.

Right to Energy Coalition

Website	*righttoenergy.org*
What do they do?	Right to Energy Coalition recognises energy as a basic human right; no one should ever have to choose between eating, lighting or warming one's home. They are advocating for a fair energy transition, leaving no one behind. The coalition was formed in 2017, with a specific objective of collaborating on the issue of energy poverty and including measures to alleviate it in the 2030 EU energy package (61).
What is the target group?	The coalition unites trade unions, anti-poverty organisations, social housing providers, environmental organisations, health organisations and energy cooperatives.
What is the scope?	The Coalition is an EU-wide initiative. They aim to work with members of the network and grassroots movements across Europe to share knowledge and to join forces at European, national and local level.
Who are the members?	• COFACE – Families Europe • SOS FUTUR • European Anti-Poverty Network • ENACT – The Energy Action Project • Energy cities • EPSU

- Syndicat European Trade Union
- European Federation of Building and Woodworkers
- European Climate Foundation
- FEANTSA
- Fuel Poverty Action
- Greenpeace
- Friends of the Earth Europe
- HEAL
- Housing Europe
- REScoop.eu
- Socialplatform

9.2 National level

Chance for Buildings, Czechia

Website	*sanceprobudovy.cz/english-summary*
What do they do?	Chance for Buildings is an alliance formed by leading trade associations that supports energy-efficient and environmentally sustainable construction and renovation of buildings. It brings together Czech Green Building Council, Passive House Centre, Mineral Insulation Manufacturers Association, EPS Association and Energy Service Providers Association. It represents over 300 companies across the entire value chain of building construction and renovation (62).
What is the target group?	The main target group are Czech organizations focusing on energy efficient buildings and environmentally sustainable construction.
What is the scope?	Chance for Buildings advocates for proper implementation of relevant EU strategies and directives in Czechia. It follows and comments on EU and Czech climate-energy policies and laws. It helps to set proper minimal standards on construction in terms of energy efficiency, adaptation to climate change, quality indoor environment and sustainable materials. Chance for Buildings is the author of the Czech Building Renovation Strategy which is part of the National Energy Efficiency Action Plan prepared by the Ministry of Industry and Trade of the Czech Republic.

Focus Association for Sustainable Development, Slovenia

Website	*focus.si/english*
What do they do?	The work of the association focuses on sustainable development, climate change, energy, mobility and consumption. The activities encompass: organizing round tables and workshops, projects, awareness-raising, cooperation and networking, following the work of the government, its institutions and local communities, analysing the developments in the fields of their activity, media work, participation in the decision-making processes on the national and international level, street actions and any other activity that contributes to the aim of Focus (63).
What is the target group?	The target group is the general public.
What is the scope?	The association is active in Slovenia. Focus Association for Sustainable Development is an independent, non-governmental, non-profit and apolitical association of individuals.

9.3 Regional or local level

Energy Agency of Plovdiv, Bulgaria

Website	*www.eap-save.eu*
What do they do?	Energy Agency of Plovdiv (EAP) initiates and coordinates projects aimed at reducing energy consumption and the use of efficient and renewable energy technologies. Established in 2000, EAP is a science-based organization developing and implementing technical, environmental and social innovations in the field of energy efficiency and renewable energy sources (RES), energy-efficient engineering solutions, advanced renewable biofuels and materials. The activities of EAP include: energy and environmental modelling, management and planning at local and regional level; energy and environmental analyses, emissions inventories, energy auditing of buildings and small and medium-sized enterprises (SMEs), designing of energy efficiency measures implementation; development of sustainable energy communities/smart cities; emissions inventories and

	monitoring; testing of biofuels, compost and bio-wastes; development of new energy-efficient and renewable/clean energy technologies; ISO 50001 and carbon footprint consultations; technical support and advice, pilot projects implementations. Development of training and education materials is also among its main priorities (64).
What is the target group?	The main target group are municipalities. The secondary target group is the general public. EAP promotes energy efficiency and renewable energy sources, develops action plans, and performs feasibility studies promoting sustainable energy development. EAP also develops energy concepts and projects for municipalities and for (SMEs), arranges financing, and provides expertise and consultation.
What is the scope?	EAP is focusing on Bulgaria, Plovdiv region in particular.

10 GOOD PRACTICE EXAMPLES

This chapter presents selected projects that aim to reduce energy poverty. All projects concern the Danube region, whether given the place of implementation or the origin of a partner organization. These projects are among the largest activities addressing energy poverty. Unfortunately, most projects at a local or regional level are not well presented and difficult to find.

The examples will cover the following types of measures:

a) Legislation measures and regulations
b) Counselling and Social work
c) Subsidies for improving the energy efficiency of buildings
d) Technical solutions
e) Other type of measures

List of projects and associated type of measures are mentioned in the following table.

Table 3: List of examined projects and associated type of measures.

	Legislation measures and regulations	Counselling and Social work	Subsidies for improving the energy efficiency of buildings	Technical solutions	Other
EMPOWERMED	•	•	•	•	
EVALUATE	•	•	•	•	
FINERPOL	•		•		
PAVE	•	•		•	
P2ENDURE				•	
REACH	•	•		•	
REFURB				•	
SAVES2		•			
SCORE	•	•			• [11]

Although in most cases these are large-scale international projects, their impact is often directed at multiple levels. This overview is presented in the table below for clarity. Projects that operate at all levels, from municipal to regional and national to international, are not an exception.

[11] Financing renewable energy sources by local community.

Table 4: List of examined projects and their geographical scope.

	International level	National level	Regional level	Municipal level
EMPOWERMED	•	•	•	•
EVALUATE	•	•	•	•
FINERPOL	•			
PAVE		•	•	•
P2ENDURE	•			
REACH	•	•	•	•
REFURB	•			
SAVES2	•	•		
SCORE	•	•		

Each of the examples is accompanied by a recommendation regarding the transferability and replicability of the solution within the Danube region.

Structure of the project overview:

- Basic information (name, website, coordinator, geographical scope, type of measures)
- Project summary
- Notes on transferability and replicability.

EMPOWERMED

Project name	Empowering women to take action against energy poverty in the Mediterranean – EmpowerMed (45)
Website	*Not available yet*
Coordinator	Focus Association for Sustainable Development
Geographical scope	☒ International level ☒ National level ☒ Regional level ☒ Municipal level

Location of the project implementation	• Vlora, Albania • Zadar, Croatia • Koper, Slovenia • Padova, Italy • Marseille, France • Barcelona, Spain
Type of measures	☒ Legislation measures and regulations ☒ Counselling and Social work ☒ Subsidies for improving energy efficiency of buildings ☒ Technical solutions ☐ Other
Project summary	**The** project builds networks with local actors in pilot regions and transfers knowledge and experience to build the capacity of all involved actors for implementing practical measures. The core of the project is implementation of practical measures to tackle energy poverty, such as community approaches, household visits, do-it-yourself approaches, support for small investments and health workshops. The impacts and success of the implemented measures are assessed and analysed to support the formulation of policy recommendations, which is advocated among key actors to stimulate policies tackling energy poverty. Project results and outcomes are disseminated among the target groups to ensure a wide reach-out at the local, national and EU level. The main objective of the project is to contribute to energy poverty abatement in the Mediterranean. The goal is achieved through: a) Implementing a set of practical energy efficiency and RES measures, tailored to empower households in energy poverty and specifically focused on women and health. b) Assessing their efficiency and impacts to formulate policy recommendations. c) Promoting policy solutions among key actors for stimulating action against energy poverty at local and EU level. The main target group are households affected by energy poverty. The project will pay special attention to women and women-led households affected by energy poverty and households affected by energy poverty with highlighted health issues.

The main impact of the project is 10,200 women and men empowered to tackle energy poverty in 6 pilot areas with primary energy savings of about 6.5 GWh/year. Moreover, the project reduces CO_2 emissions by 1,600 tCO_2/year. There are the following additional results:

- 160,000 EUR of investments in sustainable energy
- 780,000 EUR of economic savings
- 50 women and men free of debt or disconnection
- Engaging over 1,000 key actors
- At least 60 % of female participants on average throughout the project activities

Contributions to policy and best practice development on energy poverty – 8 policies/measures recommended.

EVALUATE

Project name	EVALUATE – Energy Vulnerability and Urban Transitions in Europe (46)
Website	*urban-energy.org/evaluate*
Coordinator	University of Manchester
Geographical scope	☒ International level ☒ National level ☒ Regional level ☒ Municipal level
Location of the project implementation	• Budapest, Hungary • Gdansk, Poland • Prague, Czech Republic • Skopje, North Macedonia
Type of measures	☒ Legislation measures and regulations ☒ Counselling and Social work ☒ Subsidies for improving the energy efficiency of buildings ☒ Technical solutions ☐ Other

Project summary

The EVALUATE project represents the first comprehensive investigation of multiple social and spatial dimensions of energy poverty and vulnerability within Eastern and Central European cities. The research examined the ways in which this condition is produced and mitigated through the interaction of relevant decision-making institutions in the energy, social welfare, health and housing domains. It undertook extensive research with over 5,000 decision-makers, practitioners and households based in the region and beyond.

The main objective is to examine the institutional and political drivers of energy poverty. Within this broad goal it is necessary to establish which types of households suffer from energy poverty, and to what extent and explore the implications of low-carbon energy transitions for energy poverty.

The main target group are households. The secondary target groups include policymakers, advocacy groups, and practitioners.

The EVALUATE project provided a novel blueprint and roadmap for combatting energy poverty in the EU and beyond. It proposed innovative approaches to understand and reduce the negative effects of domestic energy deprivation as a systemic issue. The project raised the public awareness of energy poverty and improved the effectiveness of relevant policies at the EU, member state and local level. EVALUATE was one of 20 EU-funded research projects (among a total of 230) chosen to be presented at the high-level conference on 'EU Research and Innovation in our daily life', held in Brussels in November 2018. EVALUATE's policy impact is demonstrated, inter alia, by the citation of its research outcomes within four key reports published by the European Commission (EC) and European Parliament (EP), in the build-up to a concerted European energy poverty policy.

Notes on replicability and transferability

The project goal was to perform a study on energy poverty in 4 European countries, all belonging to Danube region. The study was carried out in 4 cities and included 2,400 interviews with local citizens focused on their energy consumption and related subject.

The outcomes of the project show the difference between less and more developed countries where energy poverty turns to fuel poverty and might cause health or well-being issues for the citizens.

Since the project aim is to study and to map energy poverty, the replicability of the project methodology is not affected by the country. However, the findings will be different in every country involved and the level of considered energy or fuel poverty must be indicated.

When using results of the analysis directly as a source for projects, it is also important to consider differences between individual

subregions and cities within involved countries, which can be significant.

The survey carried out in the project is well described and thus can be performed in any other country within the Danube region.

FINERPOL

Project name	FINERPOL – Financial Instruments for Energy Renovation Policies (47)
Website	*www.interregeurope.eu/finerpol*
Coordinator	Extremadura Energy Agency (Spain)
Geographical scope	☒ International level ☐ National level ☐ Regional level ☐ Municipal level
Location of the project implementation	• Spain • United Kingdom • Greece • Czech Republic • Portugal • Italy
Type of measures	☒ Legislation measures and regulations ☐ Counselling and Social work ☒ Subsidies for improving energy efficiency of buildings ☐ Technical solutions ☐ Other
Project summary	The project is focusing on using financial instruments in supporting energy efficiency. Based on the analysis of about 100 examples of good practice and financial instruments in seven regions, more than 300 meetings of partners and stakeholders at interregional events facilitating knowledge exchange. The action plans include improvements to the definition of financial instruments and their

implementation in the following two years is being monitored and evaluated.

The FINERPOL project aims to increase the rate of refurbishment of buildings to improve their energy efficiency, by improving access to investment finance. In the participating regions, project partners promote new policies, or improvement of existing policies, to create better financial instruments. The project focuses on Financial Instruments (FIs) supported by ERDF funds or national equivalents and integrated with EC funding initiatives such as EFSI (European Fund for Strategic Investments), national funds, or public-private partnership investments.

The key target group of the project are the managing authorities of operational programmes. The secondary target groups are ESCOs, regional governments, energy services providers, financial institutions as well as house owners.

One of the key results is the map of best practice examples of using financial instruments to support energy efficiency. The best practice examples will help to use financial instruments more effectively. Increasing investment in energy efficiency and renewable energy for buildings is a major challenge, requiring substantial up-front investments (estimated at 38 billion EUR during 2011-2030). The European Union provides support for the creation of funding instruments, especially Financial Instruments (FIs) supported by ERDF funds and integrated with EC funding initiatives, tools from the European Investment Bank or from public and private partnerships.

Notes on replicability and transferability

The ongoing project aims at education in the area of financial tools for the refurbishment of buildings to support energy efficiency.

The project targets municipalities, ESCOs, government, energy service providers, building owners and financial institutions to find the best tool for body to finance energy performance refurbishment. European as well as national funding instruments were introduced within the project and 100 good practice examples and 300 meetings of partners and stakeholders were established to find out and promote the suitable financial tools.

The replicability phase on a national level in Danube region is strongly dependant on local funding tools available in the country and condition for applications. Furthermore, the legislation issues related to procurement process play a role in successful project exploitation and can cause a barrier in a refurbishment process.

Implementation of the financial supporting tools varies in Danube countries and thus the availability of the tools and conditions will vary between countries as well and can hardly be generalized in the same way as for the EU member states.

PAVE

Project name	PAVE – First Active Public Building in the Czech Republic (48)
Website	*Not available yet*
Coordinator	City of Litoměřice
Geographical scope	☐ International level ☒ National level ☒ Regional level ☒ Municipal level
Location of the project implementation	City of Litoměřice
Type of measures	☒ Legislation measures and regulations ☒ Counselling and Social work ☐ Subsidies for improving the energy efficiency of buildings ☒ Technical solutions ☐ Other
Project summary	Project PAVE is a building-level project focusing on the rebuilding an old military dormitory into a modern apartment building. The main goal of the project is to change municipal practice in the field of energy savings and "smart" solutions and to demonstrate the possibilities of complying with the ongoing energy transformation and the related new set of European directives on energy efficiency in buildings. The main target groups were the homeowners and local or national authorities. The methodology of a project divided into four work packages is envisioned to have an impact on the local and national level to promote deep refurbishment and a combination of advanced technologies (adaptive and mitigating measures). Apart from the work package aiming at the dissemination of outcomes, processes and knowledge transfer of experience gained during the preparation and implementation of the project at regional,

national and international levels, the above-mentioned set of work packages consists of three technical parts:

(1) Integrated project planning considering innovative solutions for energy savings and smart solutions in energy. Some of the technical solutions included in the building project are water heat recovery, PV roof and façade with energy storage, outdoor water pond for evaporative outdoors cooling rainwater harvesting on the building envelope and so on.
(2) Implementation of a demonstration project – construction and subsequent operation. Here the above-mentioned innovations had to be combined with a new architectural design of the building and its adaptation onto new thermal and social standards.
(3) Long-term monitoring and evaluation of building operation, incl. energy production of the building and user behaviour.

Notes on replicability and transferability

According to the project team, the project is a valuable opportunity to work on a combination of innovative technologies and preparation of a complex project for refurbishment in passive/active energy standard. As for the negative experience, the team identifies the lack of information and motivation of local stakeholders in deep refurbishment approach.

Local specifics of the project are mostly in the economic feasibility of the pilot project and local awareness the balance of which can highly influence the market demand for such solutions.

The project can be replicated in other regions/countries and depending on the above-mentioned economics/awareness balance, its implementation can be easier or more difficult.

The public funding of this project offers more possibilities to spread the awareness to other public stakeholders and has the potential to encourage policymakers to support energy-positive development.

P2ENDURE

Project name	P2ENDURE – Plug-and-Play product and process innovation for Energy-efficient building deep renovation (65)
Website	*www.p2endure-project.eu*
Coordinator	DEMO Consultants B.V.

Geographical scope	☒ International level ☐ National level ☐ Regional level ☐ Municipal level
Location of the project implementation	• Italy • The Netherlands • Denmark • Germany
Type of measures	☐ Legislation measures and regulations ☐ Counselling and Social work ☐ Subsidies for improving energy efficiency of buildings ☒ Technical solutions ☐ Other
Project summary	The aim of ongoing P2ENDURE project is to upscale and implement the state-of-art prefab Plug-and-Play systems combined with 3D-printed components, 3D laser and thermal scanning integrated with Building Information Model (BIM) for deep renovation implemented through “4M modular processes” (Mapping – Modelling – Making – Monitoring) for rapid and low-disturbance on-site assembly. From the technology point of view, the project brings a combination of the 4M modular process and PnP prefabricated deep renovation solutions. These, for example, include “Comfort Eye” (a low-cost sensing device), 3D scanning and printing, innovative procedure resulting from the INSITER (Intuitive Self-Inspection Techniques) project to determine the thermal transmittance degree, Micro-Electro Mechanical Systems array of microphones to detect acoustic leakages, prefab multifunctional textile-reinforced concrete panels. Smart energy-efficient windows for dynamic control of the solar gains, folding balconies and rooftop extension modules resulting from the SuRE-FIT (Sustainable Roof Extension Retrofit for High-Rise Social Housing in Europe) project are also included. The barriers the project team encountered were, for example, variable difficulty of integration of individual PnP solutions, lack of data on building energy performance, specific requirements for BIM models of buildings and building solutions for energy analysis or restrictions of implementation of innovative façade and roof solutions to historical buildings and therefore, improving the energy

performance of these buildings. The most important barrier was the unknown feasibility of the developed methodology.

Following key target groups were identified: the building users, producers of prefabricated multifunctional renovation elements, Companies in HVAC and engineering branch, social housing companies, policymakers, banks and developers.

The main results in terms of technical solutions dealing with energy poverty can be listed: setup of e-Marketplace, 4M process roadmap and implementation guidelines, a mobile app for building condition assessment, validation reports of reduced use of net primary energy and of renovation cost and time.

In all 7 evaluated installations, the energy savings were above 60% after implementation of optimized solutions. The highest evaluated saving was 71%.

Technology Commercialization Platform was created as a part of the project to increase its impact. This platform is composed of members from several EU countries representing various stakeholders interested in applying or marketing the P2ENDURE results.

Notes on replicability and transferability

P2ENDURE is an ongoing project by the time of publication of this study. The results of the post-renovation monitoring show that the introduced tools and methodology lead to a building compiling with the study for the European Parliament's Committee on Industry, Research and Energy study: Energy Efficiency for Low-Income Households which sets a minimum primary energy saving objective of 60% compared to pre-renovation. According to the measurements of the pilot installations, these savings are up to 71%.

The project with its aim for the whole EU market is clearly meant to be replicable in other European regions including the Danube region. Some of the previously mentioned difficulties can be more significant in the Danube region. The BIM method of design, for example, is not as widely spread in this region, which may cause difficulties with creating a reliable digital model of the buildings for pre-renovation modelling and the analysis of retrofit solutions. The lack of building performance data in the current state might also be more serious than in the pilot cases.

These barriers can be overcome in the similar manner as they have been tackled in the project and thus there is a high potential for replication.

REACH

Project name	REACH – Reduce Energy Use and Change Habits (49)
Website	*reach-energy.eu*
Coordinator (organisation)	Focus Association for Sustainable Development
Geographical scope	☒ International level ☒ National level ☒ Regional level ☒ Municipal level
Location of the project implementation	• Slovenia • Croatia • Bulgaria • Macedonia
Type of measures	☒ Legislation measures and regulations ☒ Counselling and Social work ☐ Subsidies for improving the energy efficiency of buildings ☒ Technical solutions ☐ Other
Project summary	The project maps the local and national situation in the field of fuel poverty. Following the analysis, the know-how and skills for energy advising are transferred by training the project partners first and then the teachers and students of vocational schools. Promotion campaigns for visits to fuel poor households are developed and implemented together with local actors in 5 pilot areas. This helps to organize and implement the visits for fuel poor households to empower them to reduce energy and water use and provide them with post-visit support where needed. The next step is to shape recommendations for decision-makers on how to structurally tackle fuel poverty and stimulate them to engage in fuel poverty abatement (through organizing debates on fuel poverty, meeting with decision-makers, etc.). The aim of the REACH project is to contribute to fuel poverty abatement at both practical and structural levels. This aim is in line with the overall goals of the action: to empower fuel poor households (vulnerable consumers) to take actions to save energy and change

their habits, and to establish fuel poverty as an issue that demands structural solutions at local, national and EU level.

The project is focused on three target groups – poor households; local, national, and EU decision-makers; and local actors that can address the energy poverty. First, the Action will empower poor households to reduce energy use by providing them with free energy advice and package of devices to reduce their energy and water use. The second group consists of local, national and EU level decision-makers, for whom the action will deepen their understanding of fuel poverty and equip them with solutions to address the problem. The last target group are local actors that can help address fuel poverty (such as social services, local authorities, schools, etc.), who will be engaged in helping fuel poor households and shaping long-term solutions in their neighbourhoods.

Altogether, 1,564 households were visited and 6,650 free energy and water saving devices installed (by more than 200 students). The investment of about 30 EUR per device resulted in over 65 EUR of annual savings in the visited households, or over 560 EUR saved in the lifetime of devices. In total 48,200 EUR was invested in energy saving devices that could save over 840,000 EUR over the lifetime of devices. During the lifetime of the installed devices, the visited households will save on average 1.9 MWh of electric energy, 5.9 MWh heat energy, 113 m^3 of water and over 2.4 t of CO_2 emissions. This means savings of 14.17 GWh or 1,218 toe, over 163,000 m^3 of water and 3,747 t of CO_2 at the project level.

Notes on replicability and transferability

The project successfully finished in 2017 with very good results in terms of achieved energy and water consumption reduction. Project has been focused on former Yugoslavia countries as well as Bulgaria. These regions could be considered as regions with higher energy poverty. All the countries are part of Danube region and thus the project is very relevant to this study. The project is not focused only on energy usage but also on savings in water consumption.

The replicability of the approach taken in this project is dependent on the level of country development and economy situation of the citizens. The approach successfully introduced in Macedonia doesn't have to be applicable in more developed countries of Danube region such as Austria or Germany.

The educational part of the project is replicable in almost every country of Danube and will have for sure positive impact. Also, the increasing of energy and water consumption-awareness among the wide public is a step which can be easily applicable in many countries. The impact of providing energy and water saving devices for households is not certain in every country.

The results of the project are very interesting and well described on the project webpage as well as in the reports. The achieved savings are presented and show a good example to follow in other Danube region countries.

The current level of economy situation of the citizens has to be taken into account in exploitation of the project methodology and approach.

REFURB

Project name	REFURB (66)
Website	*go-refurb.eu*
Coordinator	Vlaamse Instelling Voor Technologisch Onderzoek N.V.
Geographical scope	☒ International level ☐ National level ☐ Regional level ☐ Municipal level
Location of the project implementation	• Belgium • Denmark • The Netherlands • Germany • Estonia • Slovenia
Type of measures	☐ Legislation measures and regulations ☐ Counselling and Social work ☐ Subsidies for improving energy efficiency of buildings ☒ Technical solutions ☐ Other
Project summary	The project aims to create compelling offers for individual types of homeowners as the main target group in order to persuade them to start an energy renovation of their dwelling. For each country represented in the consortium, a separate compelling offer system has been created. The main issue that the project identified is the fragmentation of the renovation process. Each supplier only delivers

a fraction of the renovation work and in general, does not take responsibility for the overall success of the renovation (i.e. the desired energy reduction level). Hand in hand with the financial limitations of the homeowners, the lack of a structured way to obtain complete information and to evaluate the benefits of a renovation has been identified on the demand side.

In Belgium, the way of creating a compelling offer was to create an online tool. It was tailored for the Leiedal region. The concept behind the design of the tool is the model of the customer journey to renovation. “My Energy Compass” is designed to convince homeowners to start with their customer journey to renovate their house and to nudge them to the other steps in the customer journey.

It consists of a regional interactive map, where the data available about individual buildings are summarized into a rough estimate of the EPC-label. A finer estimate of the building’s EPC-label can be created thanks to a well-structured online form gathering the data about the building. After this estimate, a tailored renovation plan is compiled aiming for an nearly zero energy building’s (nZEB) result. The results can then be consulted with an independent counselling company.

In one year of operation there have been more than 2,500 visitors and more than 1,000 renovation plans have been created (in a region with approximately 300,000 inhabitants). Other cities and regions within and outside Flanders are interested to adopt the approach of Leiedal, including the tool.

Notes on replicability and transferability

The way of persuading people to start an energy renovation of their homes is to give them structured and complete information about the costs and benefits of the renovation itself. The information must be easily available. That means that if the information is already available, it must be easy to access and to comprehend, or if some information has to be provided by the homeowners, its input has to be easy and clear. Still at the end of the information input, a well-structured output is a must.

Replicability of the Leiedal’s approach is documented by other regions’ interest in implementing proposed solution. Even though the map tool is not crucial in the renovation plan compilation, the curiosity about how an individual home compare to the other homes can be the initial push to renovation planning. The online interactive map relies on a digital and structured information about existing buildings. In case that the building permit digitalization is not as strong in some of the Danube region countries, it would rely on the manual input by the homeowners interested in the potential of their buildings.

SAVES2

Project name	SAVES2 – Students Achieving Valuable Energy Savings 2 (39)
Website	*saves.unioncloud.org*
Coordinator	National Union of Students of the United Kingdom

Geographical scope	☒ International level ☒ National level ☐ Regional level ☐ Municipal level
Location of the project implementation	• Bulgaria • Cyprus • Greece • Ireland • Lithuania • Romania • United Kingdom
Type of measures	☐ Legislation measures and regulations ☐ Counselling and Social work ☐ Subsidies for improving energy efficiency of buildings ☐ Technical solutions ☒ Other: behaviour change / raising awareness
Project summary	SAVES 2 draws on the habit discontinuity hypothesis which states that individuals are more amenable to make changes in their lifestyles during moments of change. Consequently, young people who move to study at university are likely to form new habits, for example, around energy use and these can have considerable long-term benefits to them by minimising their future energy expenditure and associated carbon emissions. There are two separate campaigns within the framework of the SAVES2 project, one for the students living in university dormitories and the other one for students living in privately rented housing. The Student Switch Off (SSO) campaign targets approximately 40,000 students living in dormitories each year, where they don't have financial incentives to save energy (rent is all-inclusive), encouraging them to take energy-saving actions that they have control over. SAVES 2 staff conduct face-to-face activities in dormitories (e.g. door-knocking, stalls) to raise awareness about SSO, saving energy and climate change. SSO is made fun through

gamification; students have the opportunity to get involved with social media competitions and quizzes on a regular basis. At the end of the year, the dormitory that saves the most energy wins a celebration event. To widen the reach, students can train as SSO ambassador volunteers, gaining skills in communication and increasing their knowledge around climate change.

Student Switch Off+ (SSO+) is mostly a virtual campaign and aims to target 100,000 students living in privately rented housing over 3.5 years. Activities include emails with energy saving advice and training (including practical tips, changing energy providers, getting smart meters) with a focus on energy performance certificates for those students looking to move.

The project is still on going. Yet, it has already been able to demonstrate significant reductions in energy consumption by both groups of students.

Pre-post intervention surveys with students were conducted throughout the campaign, and these show that in all participating SAVES 2 universities, the vast majority of respondents (72 % overall) agree that SSO made them more aware on what they can do to save energy in their everyday life. For SSO+ in 2018/2019, the majority of survey respondents (68 %) stated the campaign has influenced them in a positive way, helped them reduce their energy costs (35 % of respondents) and has increased awareness on energy performance certificates (51 % of respondents) and smart meters (49 % of respondents).

Notes on replicability and transferability

The ongoing project is focused on energy savings achieved by students living in dormitories. The project involved more then 100,000 students within 3.5 years, persuading them to perform measures for energy savings. The project increases the students' energy-awareness even without direct impact on the paid bills. The project results claim energy savings in the range of 10% which seems to be a good result if we think that overall material investment is zero and change of the behaviour is only triggered by increased energy consumption awareness and gamification. This is a positive finding that savings can be achieved not only by introducing expensive technologies but also by simple education of the citizens without any positive benefit on their energy bills.

Project methodology seems to be replicable in any country specifically considering students living in dormitories.

There should not be any major obstacles in replication between various countries and it can be presumed that the expected impact will be quite similar. The way of promoting the measures will influence the final achieved consumption reduction.

SCORE

Project name	SCORE (50)
Website	*www.score-h2020.eu*
Coordinator	European University Viadrina Frankfurt (DE)
Geographical scope	☒ International level ☒ National level ☐ Regional level ☐ Municipal level
Location of the project implementation	• Italy • The Czech Republic • Poland
Type of measures	☒ Legislation measures and regulations ☒ Counselling and Social work ☐ Subsidies for improving the energy efficiency of buildings ☐ Technical solutions ☒ Other: Financing of renewable energy sources by local community
Project summary	**The** SCORE project facilitates consumers to become prosumers of renewable energy, firstly in three pilot regions in Italy, Poland and the Czech Republic, secondly in cities across Europe following the pilot projects. It applies Consumer Stock Ownership Plans (CSOPs) utilising established best practice updated by inclusive financing techniques and combined with energy efficiency measures. The project helps to activate local authorities and consumers by demonstrating the positive impact co-ownership has on consumer behaviour. It shows the ability of this democratic participation model to include women as well as low-income households, in particular unemployed. The project also helps to empower consumers and municipalities in a capacity-building program through the launch of an interactive online "RE Prosumer Investment Calculator" and seminars in the five partner countries (DE, IT, BG, PL, CZ). Finally, the project helps to formulate policy recommendations to promote prosumership and to remove barriers for consumers to become active market players at the EU and national levels. The main aim of the SCORE project is to facilitate the co-ownership of renewable energy for consumers. The project particularly highlights the potential this democratic participation model holds for

the inclusion of women and low-income households. The participation of these under-represented groups as prosumers through financial empowerment rather than social protection is a core element in the fight against energy poverty. The project helps to formulate policy recommendations at the EU and national level to promote prosumership with a particular focus on the inclusion of women and low-income households and the removal of barriers for consumers to become active market players.

The primary target group consists of consumers. The secondary target group include national and EU authorities.

The project is ongoing, up to 2021, there are no tangible results yet. Supposed impact on the EU and national level is to promote local energy cooperatives and propose changes in legislation.

Notes on replicability and transferability

The project is running until the year 2021. The aim of the project is to tackle energy poverty by implementing RES sharing approach with a focus on the engagement of women and low-income households. While the project is still running it emphasises the positive approach of some municipalities to prepare a space for such projects.

The project encountered barriers as it showed that the legislation is not well prepared for energy production sharing and the economy of such an approach is strongly dependant on local energy policies and rules for the energy market stakeholders.

Replicability of the project approach is strongly dependent on the situation on the energy market in every country in Danube region. The local energy prices, the possibility of energy feeding into the grid, energy feeding prices, RES price guarantees and local legislation are the most impactful parameters which can ruin the economy of the proposed solution in certain countries.

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10.1 Collections of good examples

In this study, we focused on projects that are implemented by countries from the Danube region. For further inspiration, we recommend following publications that contain numerous projects described in detail.

Atlas of Energy Poverty Initiatives in Europe (67)

It was produced by Ecoserveis, a non-profit consultancy specialised on energy management issues. The publication contains 65 initiatives across the European Union. Apart from the project description most entries also include lessons learned and an indicator that shows the difficulty of transferability. The overview of all initiatives mentioned in this publication is also available as an interactive map[12].

Good Practices to end Energy Poverty (68)

The office of Tamás Meszerics (Member of the European Parliament) initiated and edited this collection of best practices via the Greens/European Free Alliance group of the European Parliament as a side project to the Energy Poverty Handbook (34). It contains 15 projects divided into 5 categories:

- Large-scale interventions – retrofitting
- Energy Advice
- Smart Metering
- Financial Support to Energy Poor Families
- Bottom-up Projects.

EU Energy Poverty Observatory (69)

Special attention should be also paid to the website EU Energy Poverty Observatory, that was established within the EVALUATE project (46) and that is probably the most comprehensive source of information on energy poverty in Europe. It includes a catalogue of various documents regarding energy poverty (scientific articles, policies, measures, educational materials etc.), list of upcoming events or guidance for policymakers.

[12] Map of Energy Poverty Initiatives in Europe 2016 is available online.

11 HOW TO REPLICATE GOOD PRACTICES

The purpose of the following text is to help decision-makers learning from available examples and adopting existing solutions. It presents terminology and principles that can be used to handle the replication process and implementation of selected measures in a local context.

Best practice or good practice

In theory, best practice is a solution or method that offers the best results in given conditions. Such a practice is hard to establish, and the term best practice is often used as a synonym for any “good” practice or “effective” practice (70). A good practice is a solution or method, that has been proven to work in a given situation and context and might be useful in a similar situation elsewhere. However good practise doesn’t claim to be the best one possible and without flaws. Decision-makers should actively look for sources of inspiration and share the experience with others in order to avoid repeating mistakes and to **replicate success.**

Replication and scaling-up

Replication is a process of implementing an existing solution into a new context. Projects tackling energy poverty can replicate the entire procedure, policy, complex solution or just a specific step, measure or tool from another project.

It is not just the result (technology, policy, measure) that can be replicated. Sometimes the most valuable lessons can be found in a process of assessing the problem and developing the solution. Replicating this process can lead to a significantly different result which works better for a given context.

Successful replication requires a good understanding of both solutions to be replicated and the **specific context** in which they are being implemented.

Scaling-up is a process of taking a measure or solution that has been proven on a smaller scale and implementing it on a large scale.

Local context

Local context represents a set of conditions in a given time and place. Solutions that worked well in one place at a given time do not have to fit elsewhere at all, or they might require significant modifications. A replicated solution needs to be adapted to fit the local context, but sometimes local context needs to be changed as well. For example, processes in involved organizations, funding schemes or legislation can be changed in order to support new solutions. A good way to ensure this is **stakeholder engagement**.

Stakeholder engagement

Stakeholder engagement is a process of involving all relevant stakeholders in projects that require an understanding of local context and a systematic, collaborative approach to tackle a complex phenomenon such as energy poverty. Stakeholder engagement should aim to:

- Inform stakeholders about the aim of the project and planned activities
- Improve understanding of stakeholders needs and capabilities
- Involve stakeholders in co-design of solutions and evaluation
- Encourage stakeholders to participate in the implementation
- Support mutual understanding, cooperation and sharing

The process should involve representatives of all stakeholders who can be impacted by the project/programme and/or who can influence its outcomes. At the beginning of the planning phase of each project, stakeholder analysis should be performed based on which participation and communication strategy should be developed.

Stakeholder engagement can be carried out various levels of public administration: national, regional, city or neighbourhood. There can be an interaction of stakeholder ecosystems on different levels. For example, a national stakeholder ecosystem can initiate a pilot project with its own stakeholder/innovation ecosystem on a local level.

Various methods of stakeholder engagement can be combined over the life span of a project including repeated meetings with key stakeholders, interviews and surveys. The project team should include skilled facilitator and/or social scientists to select and implement appropriate methods. Stakeholder engagement should have defined link to other project activities and decision-making.

Stakeholder engagement can be combined with socio-economic analysis but should not be replaced by it nor it should be a substitute for it.

Sources of inspiration for stakeholder engagement methods:

1) TOOLBOX OF SMART PARTICIPATORY METHODS & TOOLS (71)

Description: A complex step-by-step guide to the participatory design process. The toolbox covers all important steps and offers a checklist and insights for all of them. It includes a library of participatory methods. The toolbox is designed for advanced users, which means that you need at least some basic experience with participatory processes (like participatory workshops).

2) OPEN INNOVATION TOOLKIT (72)

Description: Toolkit for innovation project which offers methods for participatory design and human-centred design. It can be useful for complex with some level of innovation of any kind (technology, processes, legislative). It helps to engage with stakeholders in creating a solution which is design with future users in mind.

3) CO-DESIGN THE ACTIVE CITY (73)

Description: List of participatory design methods focused on city or neighbourhood level. This toolbox is especially useful for municipal or community projects tackling energy poverty.

New approaches and innovative measures can be verified by engaging stakeholders in pilot projects and living-labs.

Pilot projects and living-labs

Pilot projects and living labs are a great way of evaluating and optimising a new solution or adopting an existing solution to a significantly different context. This means they can be used to generate new know-how or to generate local evidence enabling evidence-based decision making and driving further changes and development.

A pilot project is a project where a suggested solution is being tested in a controlled and limited way in real-life conditions. Living-lab is an ecosystem established in order to provide a platform for developing and testing solutions in real-life conditions. For example, urban labs are established way of testing measures or technology in the context of a city (the lab itself is usually limited to a specific district and selected stakeholders) (74). Living labs can be specialised on a specific area of innovation (transport, energy, social services).

Any pilot project or experiment within living-lab should have defined scope and specific objective(s). There are several questions that should be answered before initiating a pilot project:

- Are we developing a new solution, or modifying existing ones?
- What was done elsewhere? What can we learn from previous projects?
- What is the motivation for the pilot project? What needs to be verified?[13]
- Who should be involved and how?
- What is the scope of the project?[14]
- How will the process be monitored?
- How will the impact be assessed?
- How will the outcome be used?

Key to successful pilots or experiments within living labs is the ability to **assess the impact** of a solution and **capture the know-how** the process generated.

Impact assessment and monitoring

Any project with the potential to generate new knowledge or evidence should be monitored and evaluated and every single project should have its key performance indicators (KPIs) defined.

Impact assessment aims to evaluate to which extent a given project or measure fulfil its goals. The result of the impact assessment can be used for future decision making. It requires the project goals to be defined in terms of measurable indicators. The project team should seek existing methodology for impact assessment or indicators to enable comparison of the project with other projects of the same kind. We recommend aligning the projects with terminology and indicators proposed by the EU Energy Poverty Observatory. (59)

[13] It is very common mistake to test “everything” in one project. It is a step-by-step procedure and the key is to identify where to start (where is the boundary of our existing knowledge) and where to end (what can be covered with given resources and time).

[14] Sometimes a quick experiment can be enough to verifiy the basic functionality of the solution and narrow the focus for further development and testing.

Monitoring aims to capture the evidence and lessons emerging over the whole course of the project and enables its proper evaluation. Monitoring is particularly important in pilot projects. Recording the process and evaluating what worked and why is the key to developing guidelines for replication and scaling-up. There should be measures within the project plan for capturing important lessons. This can be different for different types of measures and pilot projects.

Sharing and networking

Developing and testing a new solution can be difficult and resource-consuming, more so if everyone would start from a scratch, worked on their own and kept the result for themselves. We should seek opportunities to learn from others´ success and mistakes and to share our own experience and know-how.

One way of doing so is to participate in international, national or regional platforms and initiatives or at least to follow their work and interact with them. We already mentioned the EU Energy Observatory where anyone can find inspiration for their projects, get links to other relevant organizations on an international and national level or share their own projects. Other platforms can be more relevant for a specific type of stakeholder (e.g. Covenant of Mayors). Some can be useful to share the local experience.

Each project should start with a review of good practice and each project should have a dissemination plan and resources dedicated to sharing results of the project.

Because official project documentation and impact assessment rarely tell the whole story, the best way of learning and sharing is through direct contact. If you are interested in a project and need more information – contact the coordinating institution. If you have a measure or project you want to share, think of where you could present it and who could profit from the know-how then most. It doesn´t always have to be on an international forum dedicated to energy poverty.

11.1 Recommendations for replicating the success

1. **Involve key stakeholders from the start**

Key stakeholders should take part in defining the problem and local needs. This can improve their further involvement in the project and acceptance of its outputs. Every project should start with a proper stakeholder analysis to ensure all key stakeholder will be identified.

In projects tackling energy poverty, it is crucial to represent the interest and needs of the most vulnerable households. This can be done in collaboration with social workers or NGOs, who can help to identify and engage them.

2. **Analyse local factors contributing to energy poverty**

It is important to gather data about the status quo in a local context of the project. This is crucial for prioritization and targeting of measures as well as for impact assessment. The

better the initial analysis is, the more precise will be your understanding of the local factors influencing energy poverty as well as existing resources and mitigating factors.

The analysis should combine expert assessment with objective socio-economic data. The EU Energy Poverty Observatory offers indicators that can be used for initial analysis as well as for impact assessment.

3. Learn from others

The key to replication is to identify the right solutions, breaking them down to understand what made them successful and transferring them to the local context. Look actively for inspiration and gather enough information to understand the solutions and policies you intend to adopt. You can combine inspiration from several sources but keep in mind, they could come from various contexts and their success can depend on different factors.

Contact organizations and individuals with first-hand experience with the measure and ask them for advice or additional information. If relevant, organize an on-site tour with key stakeholders to increase their understanding of selected measure and engagement in the project.

4. Look for indirect ways to reduce energy poverty

Energy poverty does not have to be tackled by single-purpose initiatives only. Try to incorporate energy poverty into policies in other areas like Smart city strategies, social housing, home care, social work or energy management. Look into existing policies, funding schemes and training programmes and align them with other measures tackling energy poverty. Promote energy poverty and educate other policymakers.

An example of an indirect way of tackling energy poverty is a revision of current refitting funding schemes. They are often not accessible to the most vulnerable households due to the necessity of advanced payments or difficult administration and they are thus further increasing social divide.

5. Look for synergies

Identify organizations and projects working with your stakeholders in areas with potential to indirectly reduce energy poverty of your target group. Coordinate your activities, share data, provide feedback and incorporate each other's measures. Look for partners on a local level who might not deal with energy poverty or a related topic but understand the local context and can provide insight into the needs of local stakeholders.

In projects tackling energy poverty, synergies can be found with organizations in social work, energy managers, energy companies, municipal governments of local NGOs. Try to avoid exhausting your stakeholders by too many parallel structures and events. Coordinate stakeholder engagement activities with other organizations and consider creating joint events and platforms, where energy poverty is presented alongside other topics.

6. Create a localized model

Based on initial assessment and examples of good practice, create a model of the proposed solution. This model should demonstrate, how specific measures respond to problems

identified in collaboration with key stakeholders. Create feasibility study describing the process of implementation and organizational models. Name specific organizations and policies and create examples set in the local context. Let key stakeholders comment on the draft of the study to ensure the proposed measures are seen as realistic and feasible.

7. Experiment in real-life conditions

Start with small, inexpensive pilot projects providing local evidence and demonstrating key aspects of proposed measures to the stakeholders. Set key performance indicators and evaluation mechanism to make sure the evidence generated by the project will be captured. Try to simulate real conditions by involving various household and real professionals, who are expected to carry out the solution.

8. Evaluate and adopt the solution

Reserve enough resources for the evaluation of the solution and create space for improvement. Involve your stakeholder in the evaluation and work with them on revised measures. The evaluation process should not stop after the pilot phase. Collect continuous feedback and be ready to ready to react and adapt.

Adaptability is, especially in long-term projects and measures. The needs of your target audience or external factors can change and make your measures ineffective or counterproductive. Be open to support new measures enabled by technological development or by transformations of society.

9. Share what you learned

Look for ways of making your experience accessible to others and receiving feedback on your solutions. Create a dissemination strategy, participate in conferences and seminars or organize dissemination events of your own. Make sure your project is accessible online including contact information of people responsible for each deliverable. Share your project through EU Energy Poverty Observatory. Do not forget to share the project within your organization.

10. Work within a peer-group

Look for groups of organizations and professionals with similar focus and interests. Choose the right group based on which organization or specialization you represent. Your organization can become part of a national or international platform or develop a project proposal within a large consortium.

Your peer group or project consortium does not have to focus on energy poverty directly. For example, The Covenant of Mayors is a good way for city representatives to become part of an international platform, which has energy poverty within its focus among other topics. Individuals, organisations and projects focusing on energy poverty can be found on the website of The EU Energy Poverty Observatory. The directory involves national members, including countries of the Danube region.

SUMMARY

This study presents the energy poverty phenomenon in the context of Danube region. It describes the specifics of the vast Danube region, which affect the form and level of this phenomenon in individual countries. Differences between countries and a variety of energy poverty forms pose a major challenge in finding a unified approach to address energy poverty across the Danube region.

The chapter on legislation provides another manifestation of differences between countries in acknowledging this phenomenon. Even though there are several EU legal acts that mention energy poverty, this is not very often the case on the national level where energy poverty is mentioned rarely. Being enshrined in the country's legislative framework is an important step towards officially defining energy poverty and, consequently, taking measures to reduce it.

In addition to the three main factors 1) low-income, 2) high and rising energy prices and 3) poor thermal efficiency and low-quality housing, we identified two other factors that affect the risk of energy poverty. These are 4) personal factors and 5) knowledge and ability to acquire essential information about cost-effective solutions.

We utilized the standard tool used by Eurostat to assess the impact of energy poverty on quality of life. Our findings suggest that energy poverty negatively affects all major dimensions of quality of life defined by this statistical framework.

The study lists specific measures divided into five categories. Good practice shows that it is less useful trying to find the most effective measure across contexts, and that combining multiple types of measures often leads to more efficient and effective ways of tackling energy poverty. The study has shown that measures at the regional level cannot be ignored as they are often more effective than national measures.

It is crucial to work with experienced partners at appropriate levels (local or regional, national and international) in designing and implementing these measures. Therefore, we compiled a list of several selected organizations that deal with energy poverty at all levels.

The most comprehensive chapter is devoted to good practice examples. All nine are focused on the Danube region either as the place of implementation or as the country of origin of the partner organization. The description of each project contains basic information and project summary, but mainly practical notes on transferability and replicability. The section includes an assessment of transferability and replicability and a recommendation to its successful implementation.

The last chapter continues with the topic of portability and replicability. It presents principles that can be used to handle the replication process and to implement selected measures in a local context.

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ANNEX

Questionnaire: Projects tackling energy poverty in the Danube region

UNIVERSITY CENTRE FOR ENERGY EFFICIENT BUILDINGS CTU IN PRAGUE

Interreg Danube Transnational Programme

Projects tackling energy poverty in the Danube region

Project name	
Website	
Coordinator (organisation)	
Partners (organisations)	
Geographical scope	☐ International level ☐ National level ☐ Regional level ☐ Municipal level
Location of the project implementation (country, region, etc.)	
Project duration	
Project objectives What issues did the project aim to solve?	
Project description Please describe the project implementation process, methodology used etc.	
Target groups What were the main target groups?	
Type of measures	☐ Legislation measures and regulations ☐ Counselling and Social work ☐ Subsidies for improving energy efficiency of buildings ☐ Technological solutions ☐ Other, please specify:
Results and impact What were the project outputs? Did the project cause any positive changes? How did you measure the impact?	
Lessons learned What have you learned when implementing the project? Both in a positive and negative way.	
Replicability What were the local specifics? Could the project be replicable in any other region? What should be taken into account?	