Energy/**F**uel and human **Po**verty: public policy and **Re**commendations in **S**outhern **E**urope **(EFPORE-SE)**

The research project is implemented in the framework of H.F.R.I call “Basic research Financing (Horizontal support of all Sciences)” under the National Recovery and Resilience Plan “Greece 2.0” funded by the European Union –NextGenerationEU (H.F.R.I. Project Number: 016638).

Energy/Fuel and human Poverty: public policy and Recommendations in Southern Europe

Project information	
Project acronym	EFPORE-SE
Type of program	ELIDEK
Project ID	16638
Starting date	01/03/2024
Duration	22 months

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Energy/Fuel and human Poverty: public policy and Recommendations in Southern Europe

Document information

Title	D 2.2 Key research questions and statistical methodology
Related Work Package	2
Type	DEMO
Dissemination level	Public
Completed on	31/12/2024
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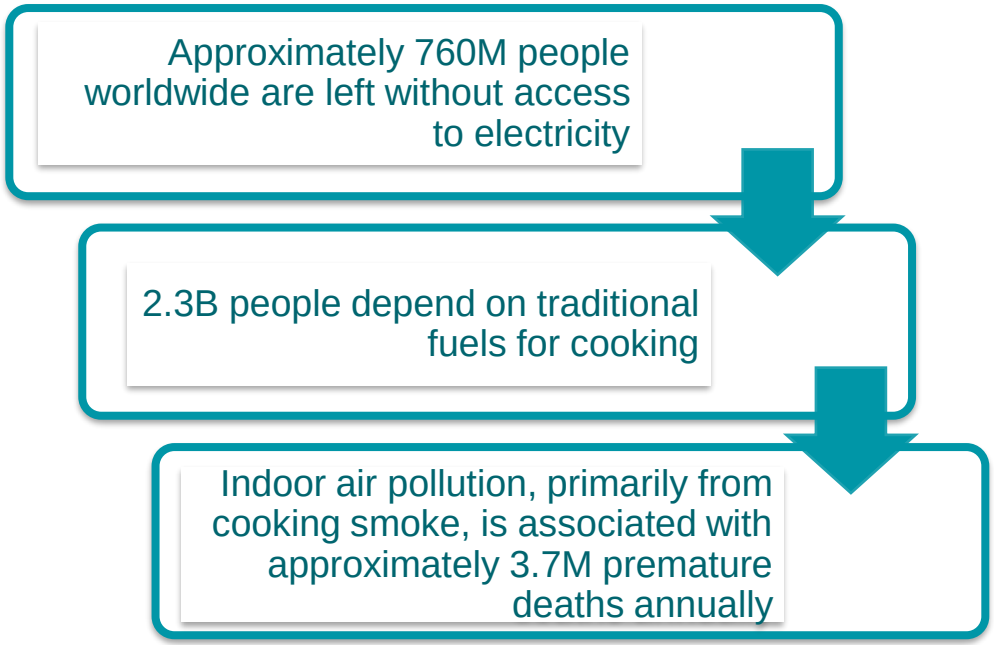
An introduction to energy poverty

Worldwide numbers and global focus

International organizations concentrating:

- the World Health Organization,
- the World Bank,
- the United Nations with the program "Sustainable Energy for All" in 2001,
- the 7th Sustainable Development Goal in 2015



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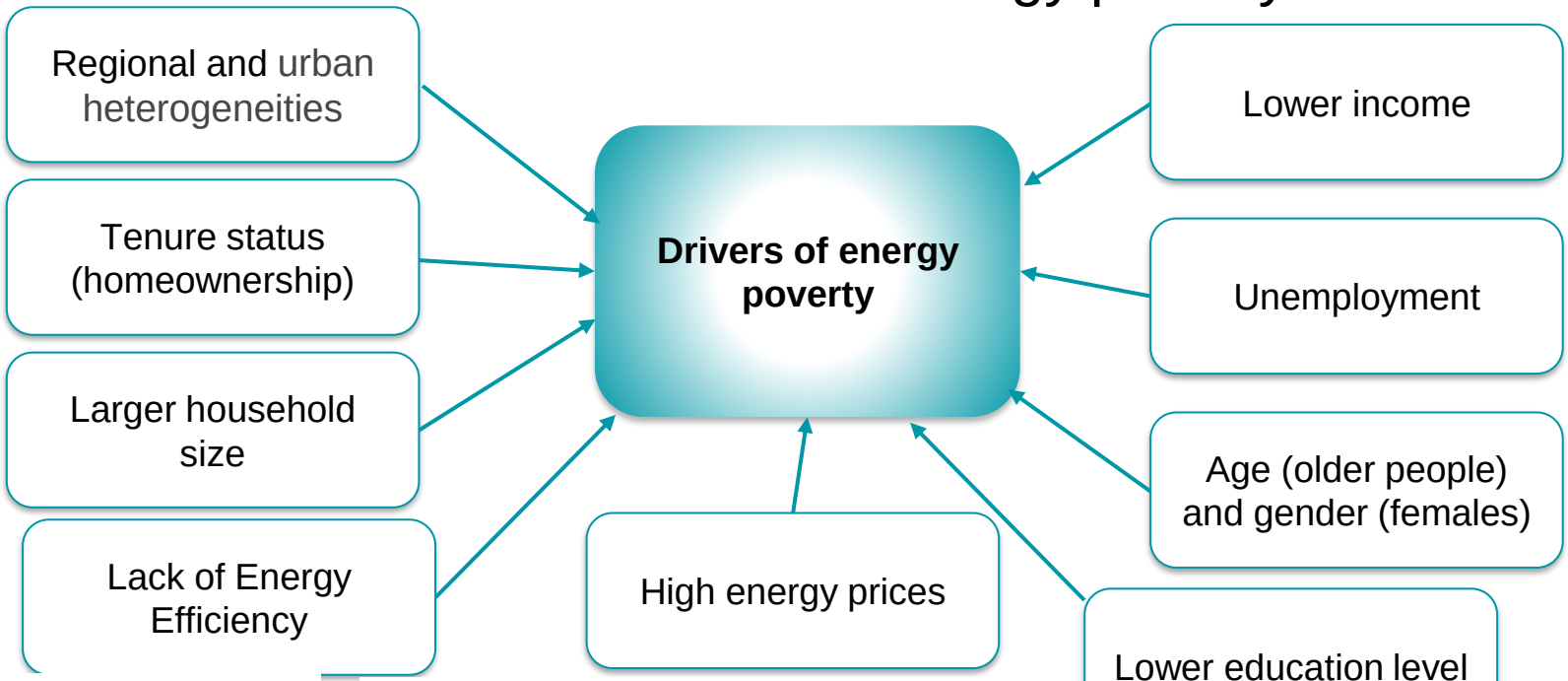
An introduction to energy poverty



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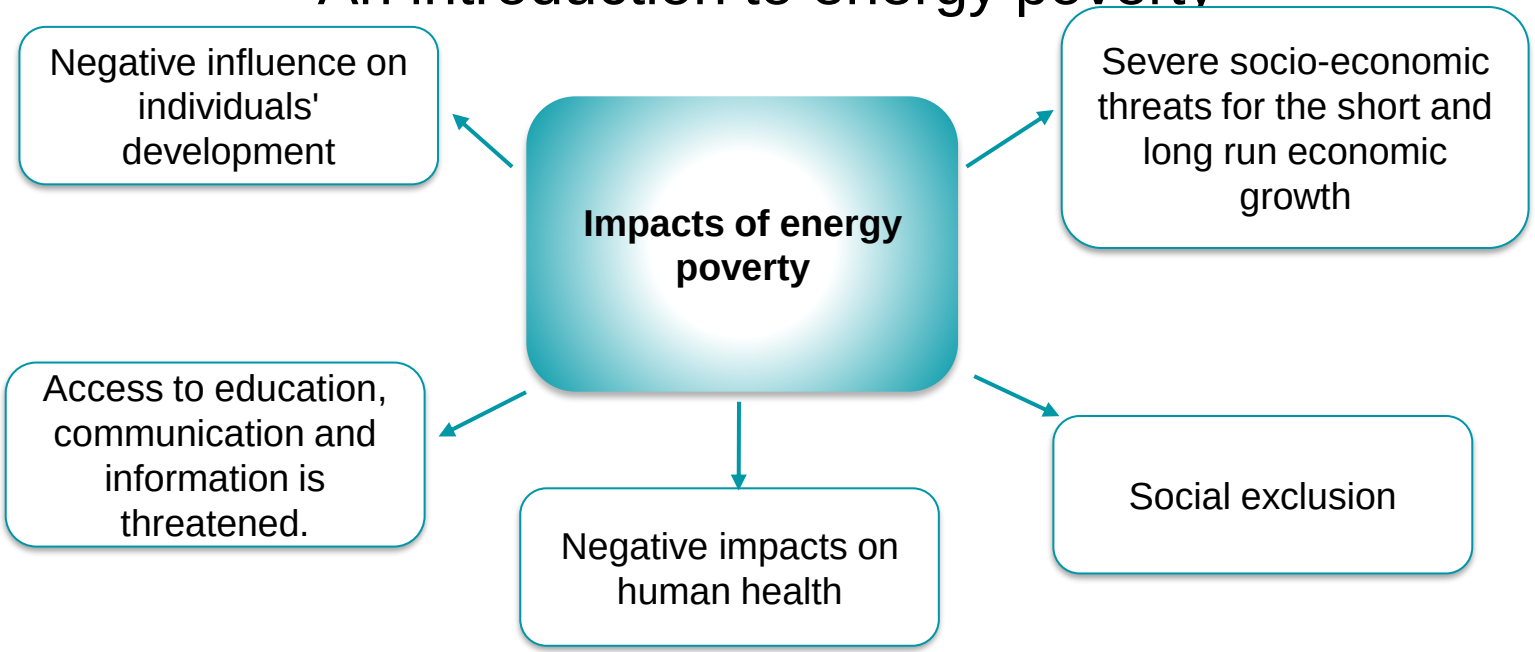
An introduction to energy poverty



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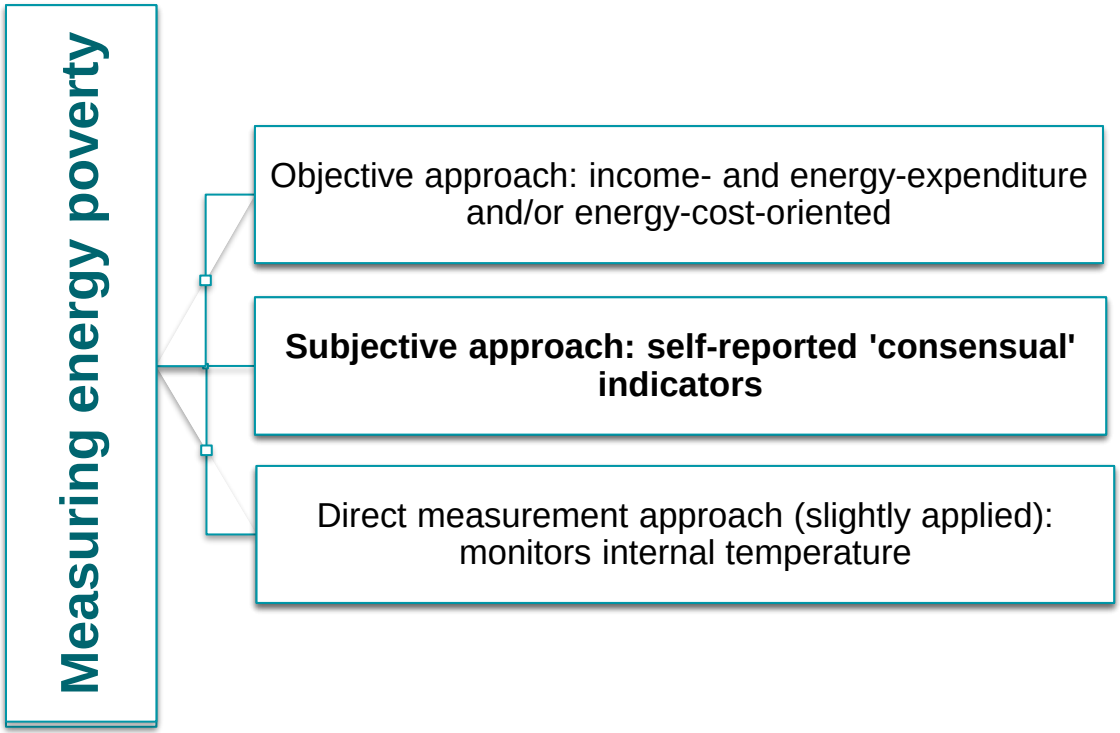
Energy poverty measuring approaches



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Energy poverty indicators: the challenges

Indicators should be expanded and more inclusive.

Further qualification of energy needs and differences in vulnerable households should be evaluated.

Significant gaps between energy poverty indicators.

Disaggregated research could provide more reliable findings

Hidden energy poverty and persistent energy poverty need further treatment.

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EFPORE-SE primary goals

- Develop strategies to assess energy poverty levels,
- Identify vulnerable households in Southern Europe,
- Enhance public policies and approaches to address energy poverty issues.

The research team will explore energy poverty in four Southern European countries:

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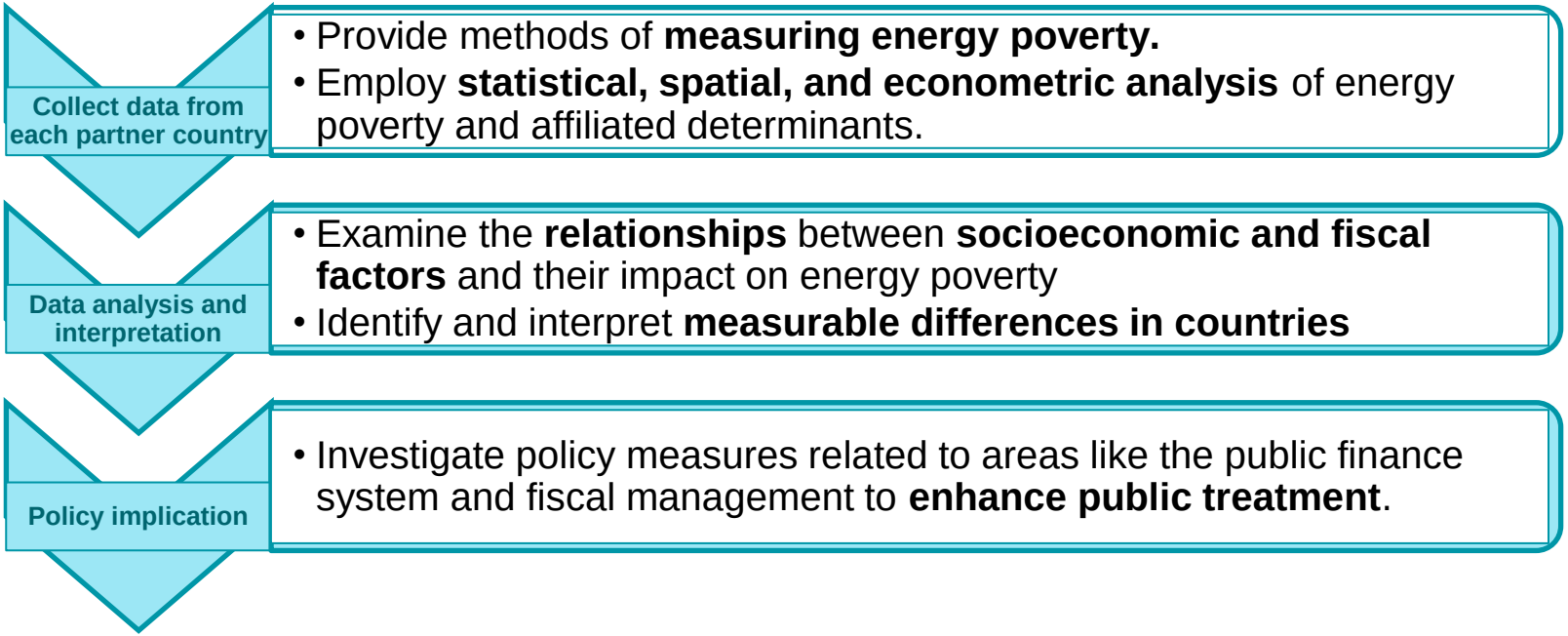
EFPORE-SE general objectives



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EFPORE-SE specific objectives

1

Provide an overview of households' energy consumption in Greece, Italy, Spain and Portugal.

2

Identify specific indicators defining vulnerable population.

Highlight key differences among countries.

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EFPORE-SE specific objectives

3

Develop and launch an **interactive website** where all project outcomes – deliverables are published.

Households from each partner-country **anonymously** respond to the questionnaire incorporated, providing several significant data like socioeconomic, demographic, regional location, heating systems and other dwelling characteristics.

Following the commands provided and taking into consideration the economic status and other conditions of each country, the **platform assesses households' energy poverty status**.

Furthermore, citizens are provided with **various recommendations concerning meeting their energy needs**, which will be adopted to the specific household's requirements and conditions.

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EFPORE-SE specific objectives

4

Provide a comprehensive overview of how energy needs impact energy poverty.

Understand how societies respond to major economic and social disruptions while attempting to meet energy needs.

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EFPORE-SE critical research questions

1. What are the disparities and/or similarities between the four Southern European countries investigated in the energy poverty occurrence?

2. Which households are considered vulnerable to energy poverty in South European countries?

3. Are common and specific characteristics drivers of the energy poverty between and within countries?

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EFPORE-SE critical research questions

4. What specific characteristics should energy poverty indicators employ to be more inclusive, reveal hidden energy poverty and permanent energy poverty status?

5. Is current policy implication sufficient? How could authorities better address energy poverty?

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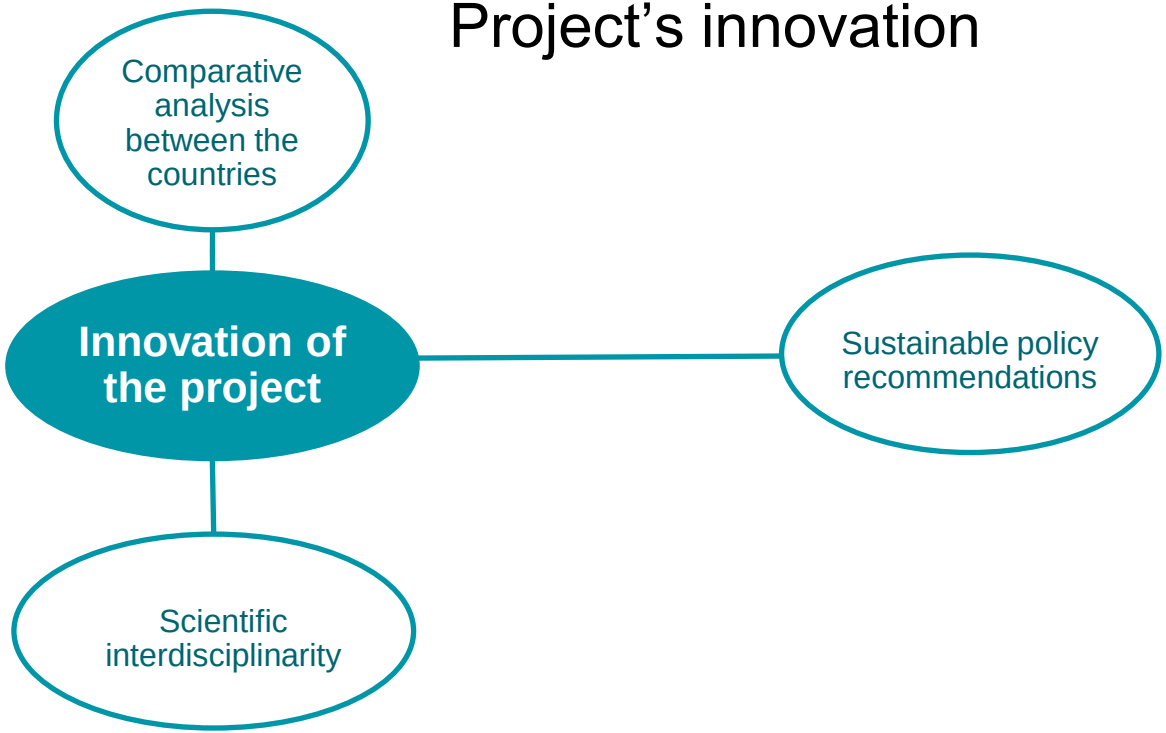
Project’s innovation



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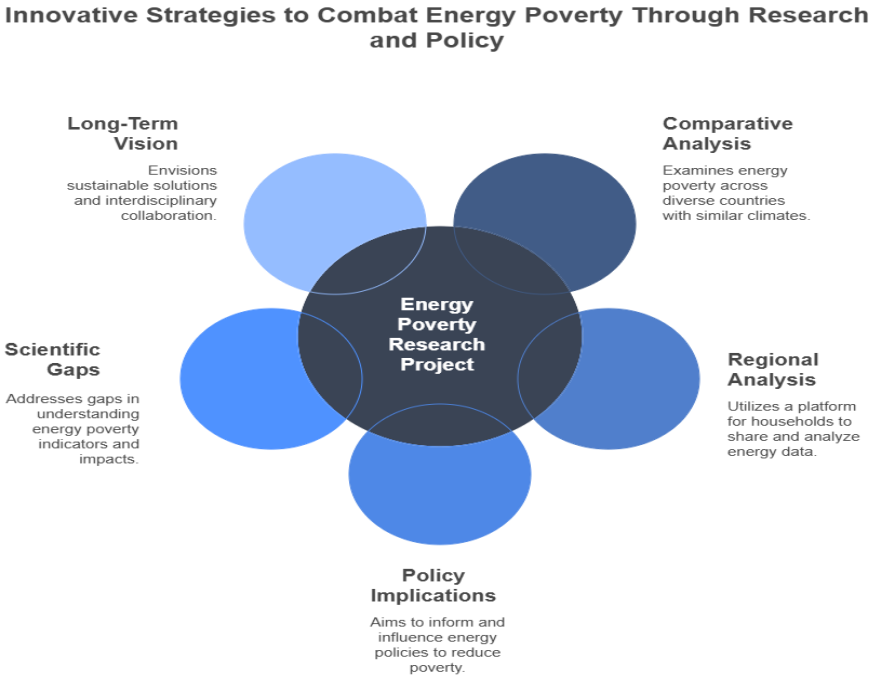
Project’s innovation



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Research methodology – The research team

- The research team is divided into five small groups for better management.
- Designated members from Greek universities collaborate with key representatives from each partner country. Each group is led by a designated leader:

	Group 1 (Host)	Group 2	Group 3	Group 4	Group 5
Organi-zation	Harokopio University of Athens (host)	Biccoca University, Milan	Nova University of Lisbon	Rovira i Virgili University, Reus	Panteion University, Athens
Group leader	Prof. Sardianou	Asst. Prof. Di Foggia	Prof. Gouveia	Prof. Arauzo-Carod	Prof. Bithas
Subject	Investigation in Greece	Investigation in Italy	Investigation in Portugal	Investigation in Spain	CBA (cost benefit analysis)

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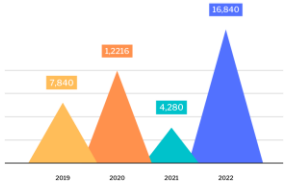
Research methodology - Basic considerations

Area under investigation

- Southern European countries: Greece, Italy, Portugal, Spain

Time period covered

- Annual observations between 2012-2023



Data retrieval

- EUROSTAT macro-data
- National statistical authority of each partner country (EU-SILC)
- EPAH (Energy Poverty Advisory Hub)

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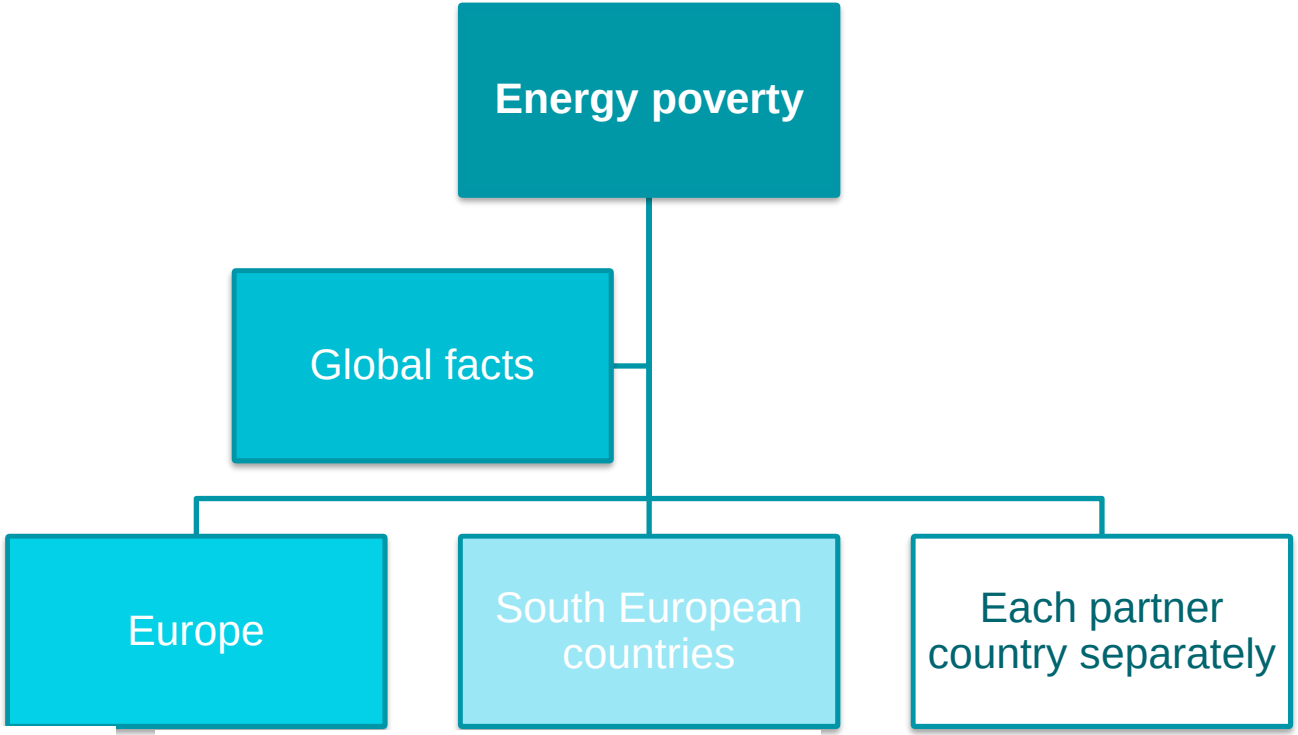
Research methodology – Step 1



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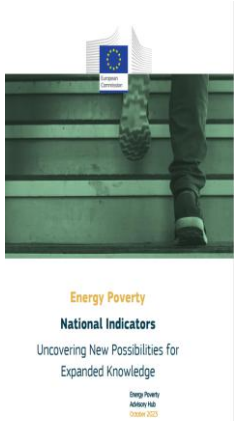
Research methodology – Step 1

Global facts:

- General definitions, statistical data
- Drivers and impacts

Europe:

- Existing policy implication, Commission Directives, Green deal, EPAH.
- Energy poverty indicators presentation and comparative analysis.
- Drivers and impacts, previous empirical results



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Research methodology – Step 1

South European countries

Each partner country separately

- Drivers and impacts, previous empirical results.
- Study available microdata and select variables
- On-line meetings with collaborating Universities to understand what microdata is available from each partner-country
- Observe variables' disparities between the countries and between annual observations. Study the methodological guidelines for EU-SILC.
- Specify the dependent and independent variables and investigate if data availability is common and overlapping for all countries.

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Statistical methodology – Step 2

2.1. Data processing

- ✔ Categorization of available information by year and by relevance for each country.
- ✔ Specification and description of energy poverty indicators.
- ✔ Definition of economic, energy consumption and other thresholds for each country.

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Statistical methodology – Step 2

2.2. Descriptive statistical analysis

For all four partner-countries as a group and for each one separately:

- Socioeconomic macro-level variables, and variables related to human poverty[1] (EUROSTAT)
- Energy poverty indicators (EUROSTAT, EPAH)
- Energy poverty indicators at micro-level (EU SILC)
- Variables (microdata) affecting energy poverty occurrence (i.e. income, education etc. – EU SILC)
- General demographic characteristics (EUROSTAT)

[1] In this project, human poverty is proxied by the components of the AROPE (At Risk of Poverty or Social Exclusion) indicator, as defined in the EU-SILC dataset. The AROPE indicator combines three major dimensions: (i) relative income poverty, using the EU's at-risk-of-poverty threshold; (ii) enforced lack of socially perceived necessities, expressed by the severe material and social deprivation indicator; and (iii) weak labour market attachment, concerning population living in (quasi-)jobless households.

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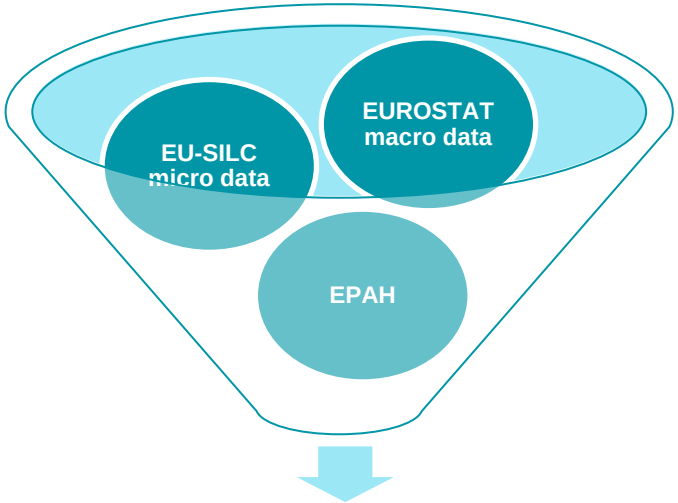
Statistical methodology – Step 2



Comparative analysis within and between the countries and between the type of data source

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Statistical methodology – Step 2

2.3 Econometric analysis

Econometric tests hypothesis for all four partner-countries as a group and for each country separately, employing regression models.

Purchase the powerful statistical software STATA, which is a package widely used for data analysis, management, and visualization.
STATA allows users to manage large datasets efficiently, supporting panel, time-series data and cross-sectional datasets and providing specialized econometric capabilities.

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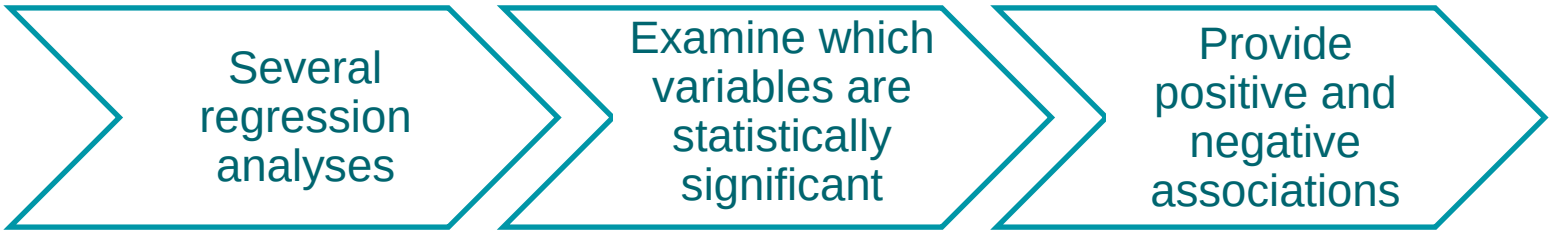
Research methodology – Step 2

2.3.1 Econometric analysis – the dynamic relationships



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Research methodology – Step 2

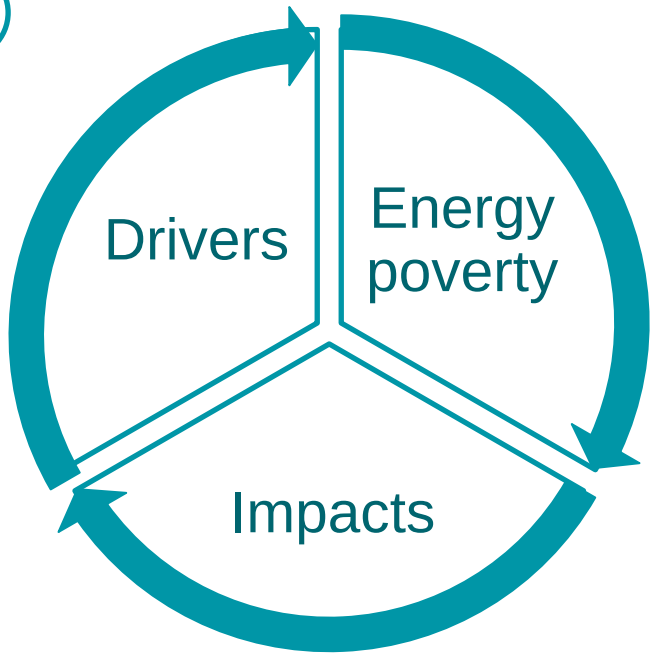
2.3.2 Econometric analysis – investigate potential causalities

Possibility of permanent energy poverty.

Energy poverty creates unequal circumstances and decreases prosperous wellbeing.

Impacts to social and individual prosperity (i.e. income, education, health and many others), increasing the risk to overcome energy poverty itself.

Impacts and drivers overlap (vicious cycle)



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Research methodology – Step 2

2.3.3 Econometric analysis – the pandemic impact

The time period covered for the econometric analysis accounts for 2018-2022 and 2018-2023, depending on data availability.
The research team examines the impact of COVID-19 on households' energy consumption and energy poverty occurrence.

- Before COVID-19 analysis
- After COVID-19 analysis
- Pandemic impact evaluation concerning the differences in energy poverty occurrence and the relationships between the variables

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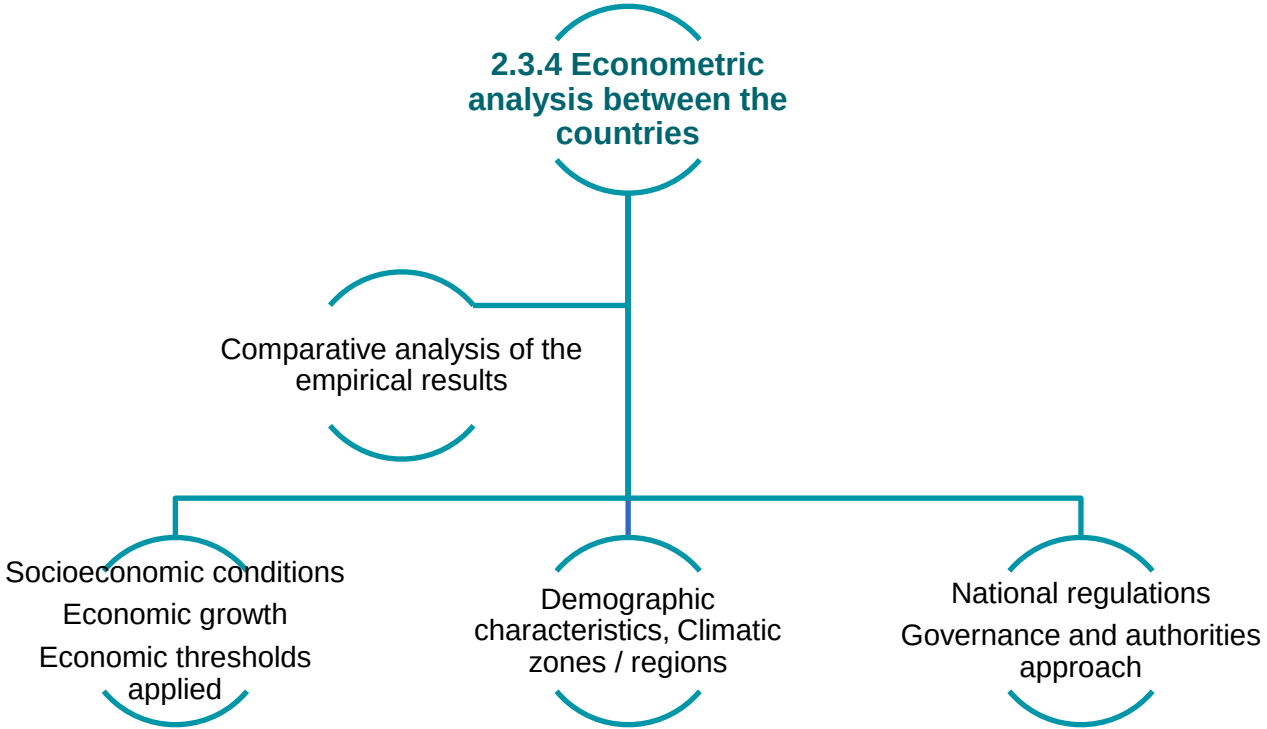
Research methodology – Step 2



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CBA methodology – Step 3

Cost-benefit analysis

Energy Efficiency & Socioeconomic Considerations

Understanding Household Energy Consumption

- **socioeconomic, demographic, dwelling, and energy performance** characteristics
- **environmental, social, and economic costs** of residential energy use

Case Study: Real-World Energy Cost Analysis

- Selection of **3 households from different areas in Greece**
- **Energy cost analysis** before and after PV installations
- Incorporates the **installation cost of PV systems**

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CBA methodology – Step 3

Cost-benefit analysis

Cost-Benefit Analysis & Energy Poverty Reduction

- Evaluates **return on investment (ROI) for PV installations**
- **Assesses long-term cost savings** and energy efficiency improvements
- Aims to **reduce energy poverty vulnerability** through sustainable solutions

Innovative Approach

- **Analysis conducted under real-life conditions**
- **Data-driven insights** to support policy recommendations and sustainable practices

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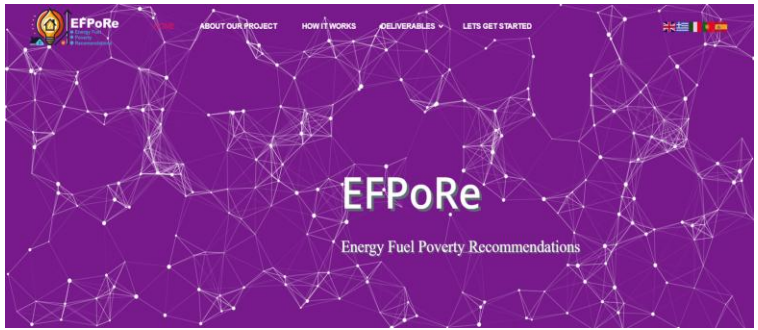
Dissemination

EFPORE-SE website – creating the website

Collaboration of the research team with IT personnel in order to create the dynamic website of the project: https://efpore.eu.

The draft version is shared with the research teams of partner countries.

On-line meetings with collaborative groups concerning the context of the website.



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Dissemination

EFPORE-SE website – creating the website

Reassuring the logos' visibility of directly affiliated organizations and EU programs.

Consultation from legal services to ensure full compliance with GDPR.

Furthermore, the platform reassures users that their participation is absolutely anonymous and no personal data will be used for any other reasons except of the project's objectives.

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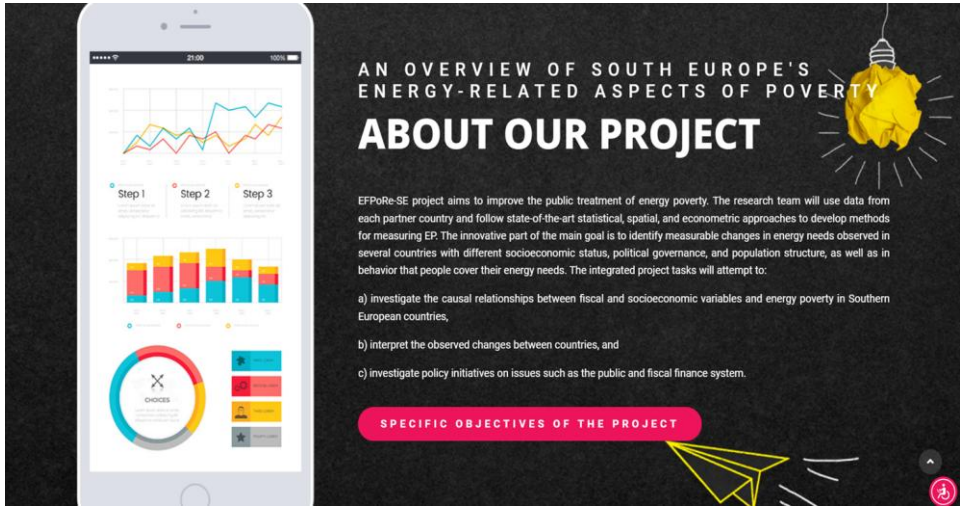
Dissemination

EFPORE-SE website – creating the website – home page

Home page describes what the project stands for.



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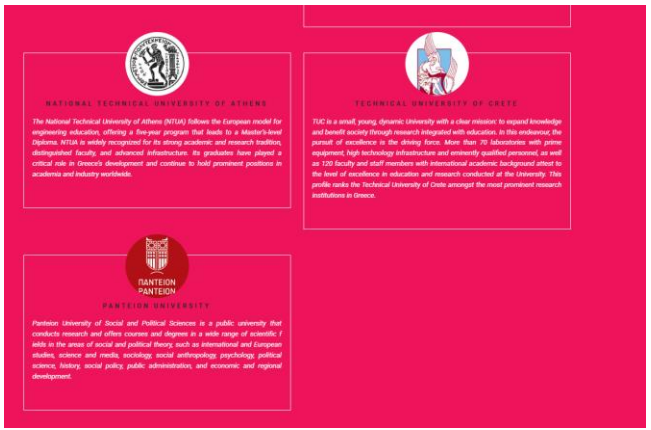
Dissemination

EFPORE-SE website – creating the website – home page

Home page also presents all collaborative Universities that contribute in the project.



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Dissemination

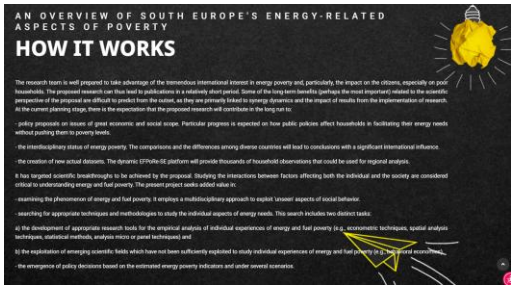
EFPORE-SE website – creating the website – “about our project” page

This section provides all necessary information concerning the specific objectives of the project.

EFPORE-SE website – creating the website – “how it works” page

This section provides useful information concerning the project’s means of application.

It is thoroughly explained how the project will contribute in the short and in the long-run:



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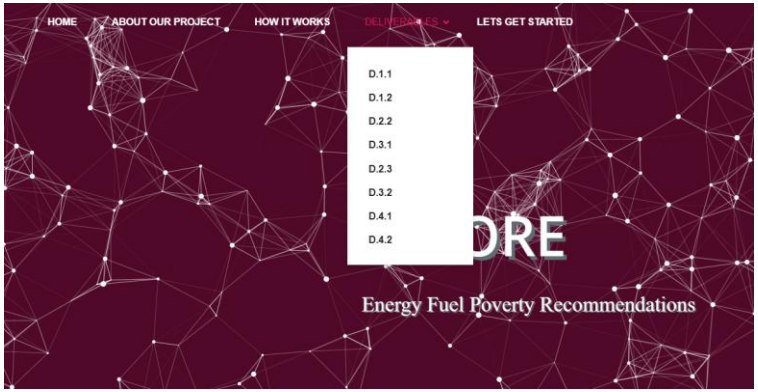
Dissemination

EFPORE-SE website – creating the website – “Deliverables” page

This section includes all project results.
The specific project’s deliverables are published, with the view to provide transparent work subject to public consideration and thoroughly explain the research team work.



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Dissemination

EFPORE-SE website – creating the website – “Let’s get started” page

This is the most substantial section of the platform, containing the interactive operation with the users.

After the official website operation, members of all partner countries disseminate the dynamic EFPORE-SE website, to ensure sufficient public interaction.

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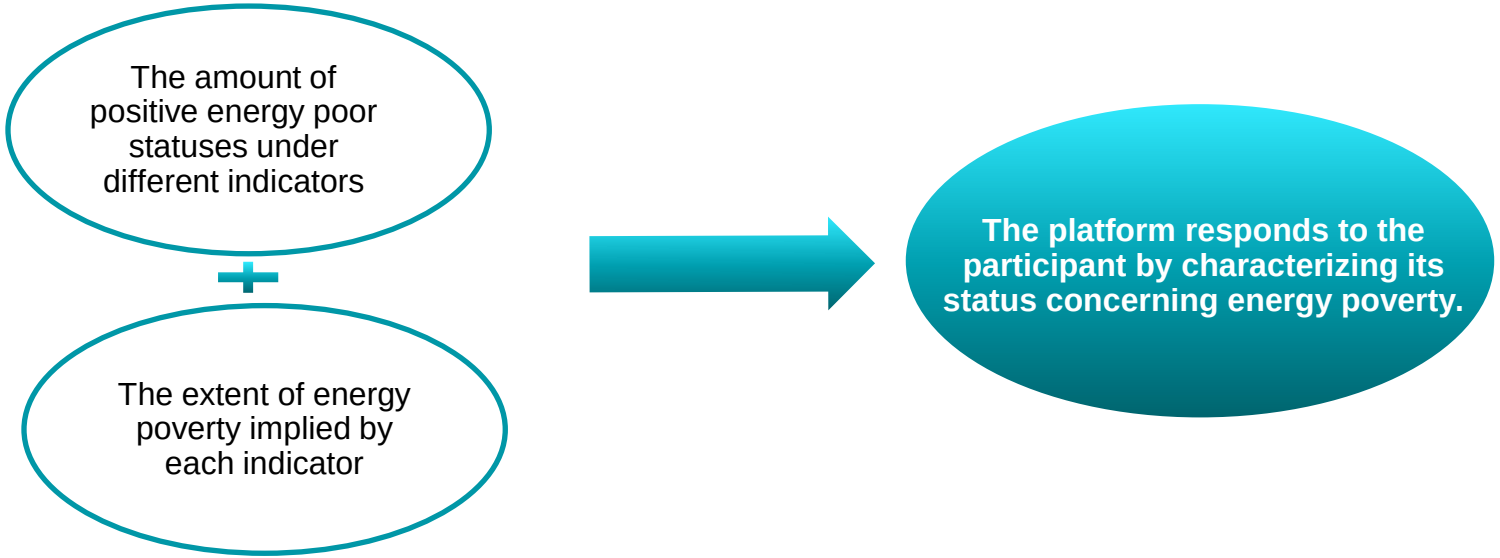
Dissemination

EFPORE-SE website – creating the website – “Let’s get started” page

After the questionnaire completion, the platform calculates each household’s vulnerability status according to several energy poverty indicators employed.



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Dissemination

EFPORE-SE website – “Let’s get started” page

The research team in collaboration with the IT team prepare a user-friendly questionnaire, aiming thousands of households to respond.

In order to evaluate households’ vulnerability under the **objective indicators**, the research team introduces the mathematical formulas shaping their substance.

The structure of **subjective indicators** follows the EU-SILC survey.

The questionnaire involves further information for demographic, spatial and econometric analysis.

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Dissemination of results

Dissemination of the empirical findings in the academic environment and in general public
Peer-reviewed publications and participation in international conferences
All project deliverables will be published in the EFPORE-SE platform.

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Dissemination of results

Dissemination of the empirical findings and policy implication
A public scientific workshop will be held at the Host University.
Institutes related to policy implication and other stakeholders will be invited in an open discussion.
The willingness of stakeholders to invest in the energy-efficient recommendations will be examined. Provision of the best case scenario concerning resource efficiency and initial investment of stakeholders' funds.
The workshop will highlight the association of energy poverty with public finance systems, socioeconomic effects (income, health), and environmental degradation.

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Challenges and limitations

- The first challenge accounts for the disparities in the energy sector of all partner countries. These differences imply long-term and macroeconomic influences. Nevertheless, evaluating these energy trends and their effects on residential energy consumption is still disproportionately insufficient given their significance.
- Although this project aims to shed light on this fact by involving an extended data-set of micro data, inconsistencies and insufficient information from partner countries may pose additional challenges.
- Furthermore, although the bottom-up process which is employed in the project provides better understanding of broader issues associated with energy poverty (like social exclusion and material deprivation), consensual approach has been criticized, mainly because participants may not reveal their actual living conditions.
- False responses or false-perceived conditions as well as cultural differences concerning "adequate warmth" may lead to biased considerations.

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