Best practice example of an Energy Poverty Action Plan of Greece and the role of effective energy efficiency measures in it

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Energy Community: Workshop on bridging energy efficiency and energy poverty in NECP policies and measures
26/06/2024

ABOUT CRES

The **Centre for Renewable Energy Sources and Saving (CRES)** is the Greek organisation for:

- Renewable Energy Sources (RES), Rational Use of Energy (RUE) and Energy Saving (S)

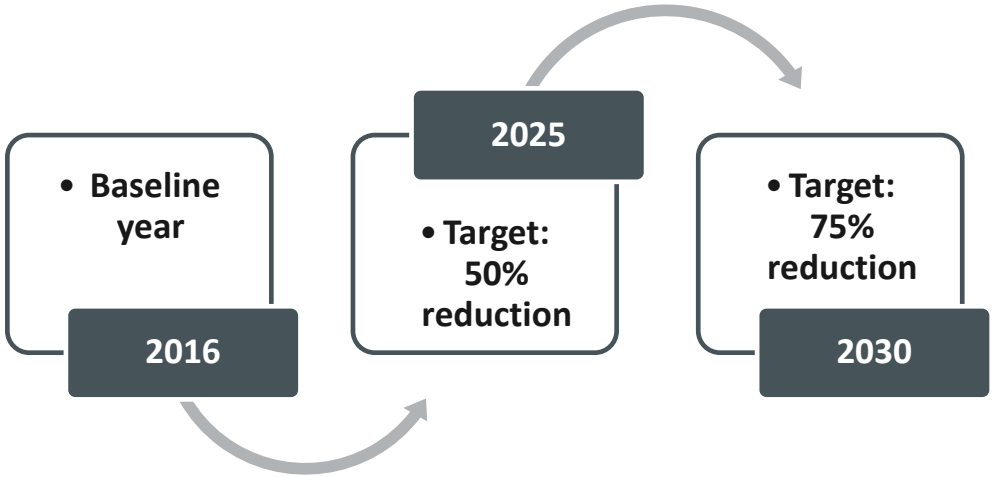
- CRES has been appointed as the national co-ordination centre in its area of activity (**National Energy Agency**).
- CRES was founded in September 1987 by Presidential Decree 375/87.
- It is a public entity, **supervised by the Ministry of Environment and Energy** and has financial and administrative independence.
- CRES has a scientific staff of more than 120 highly qualified and experienced multidisciplinary scientists and engineers.

ENERGY POLICY ANALYSIS Department

- Reporting under **RES Directive and EED**
- Contribution to the conduction of the **National Energy and Climate Plan (NECP) and its updates**
- Administrator of the **Greek Energy Efficiency Obligation Scheme (EEOs)** under Art. 7 of the EED
- Preparation of the **National Action Plan for the alleviation of energy poverty** and **the Greek Energy Poverty Observatory**

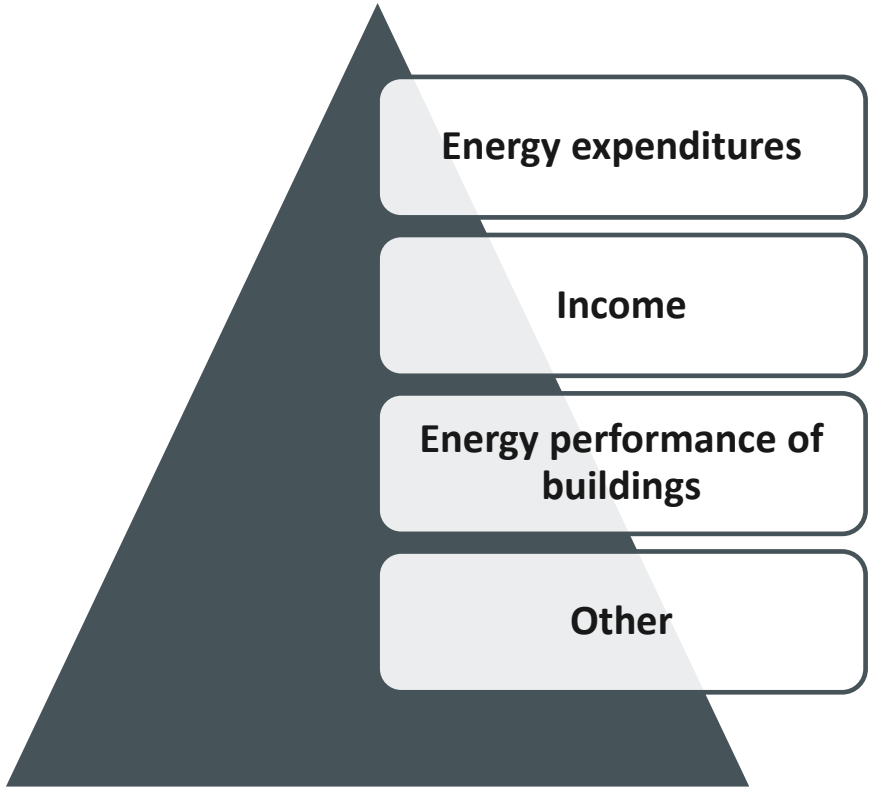
National context in regards to energy poverty in Greece

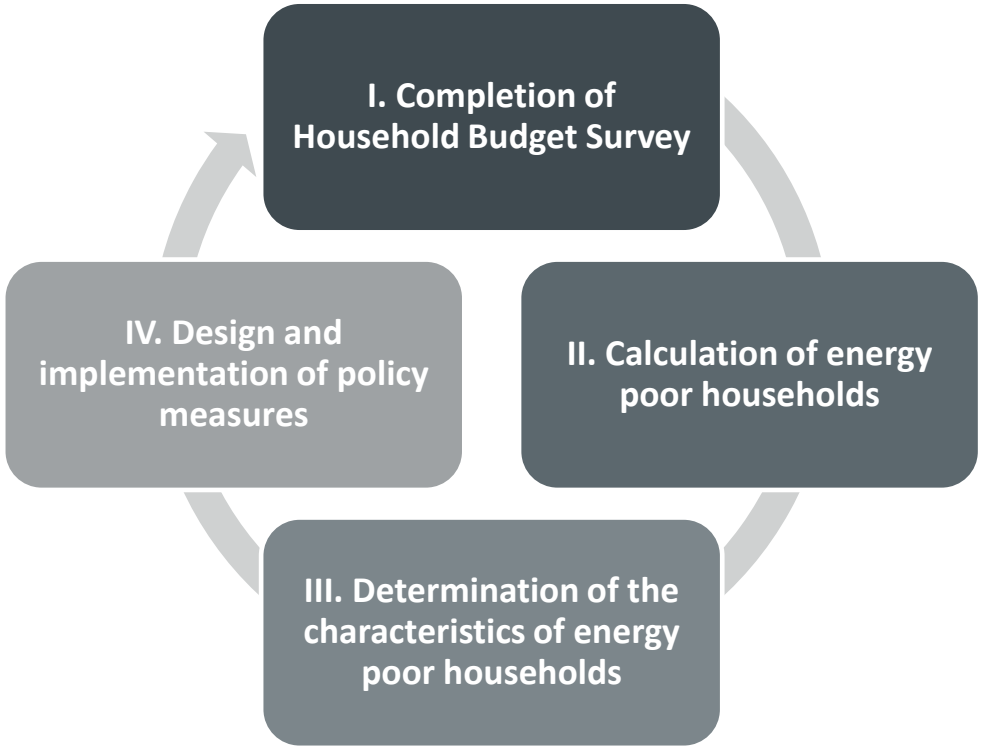
- Article 25 Law 4342/2015 (FEK A, 143/9.11.2015) - Preparation of the National Action Plan for the alleviation of energy poverty
- National Energy and Climate Plan - Specification of national target (ΦΕΚ Β, 4893/31.12.2019)



- Adoption and publication of the National Action Plan for the Alleviation of Energy Poverty in September 2021 through Ministerial Decision.

National Action Plan for the Alleviation of Energy Poverty: Main dimensions and approach for energy poverty's definition



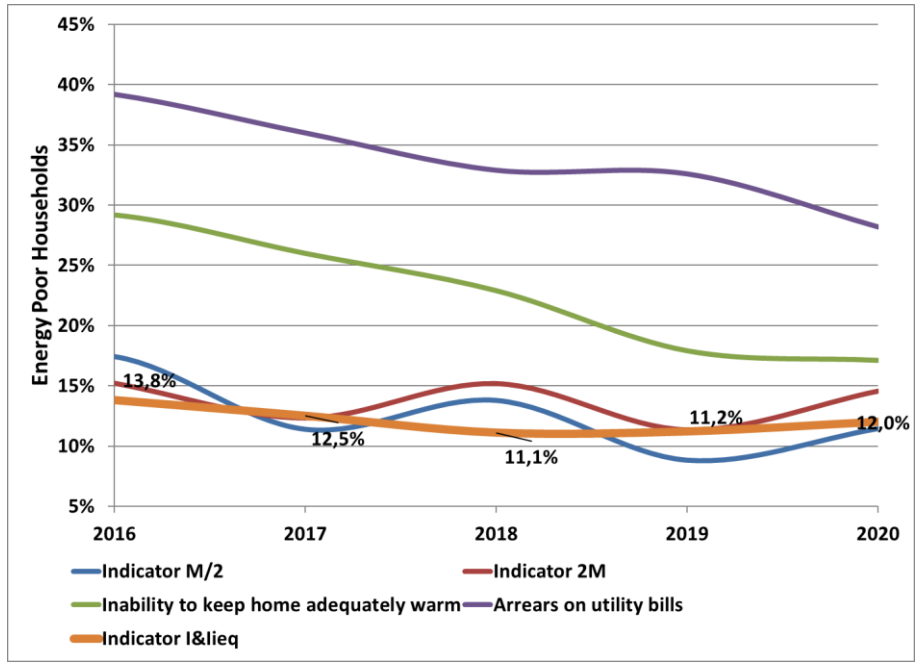


According to Directive (EE) 1791/2023 «'**energy poverty**' means a household's lack of access to essential energy services that underpin a **decent standard of living and health**, including **adequate warmth, cooling, lighting, and energy to power appliances**, in the relevant national context, existing social policy and other relevant policies.»

Energy Poverty Indicator in Greece

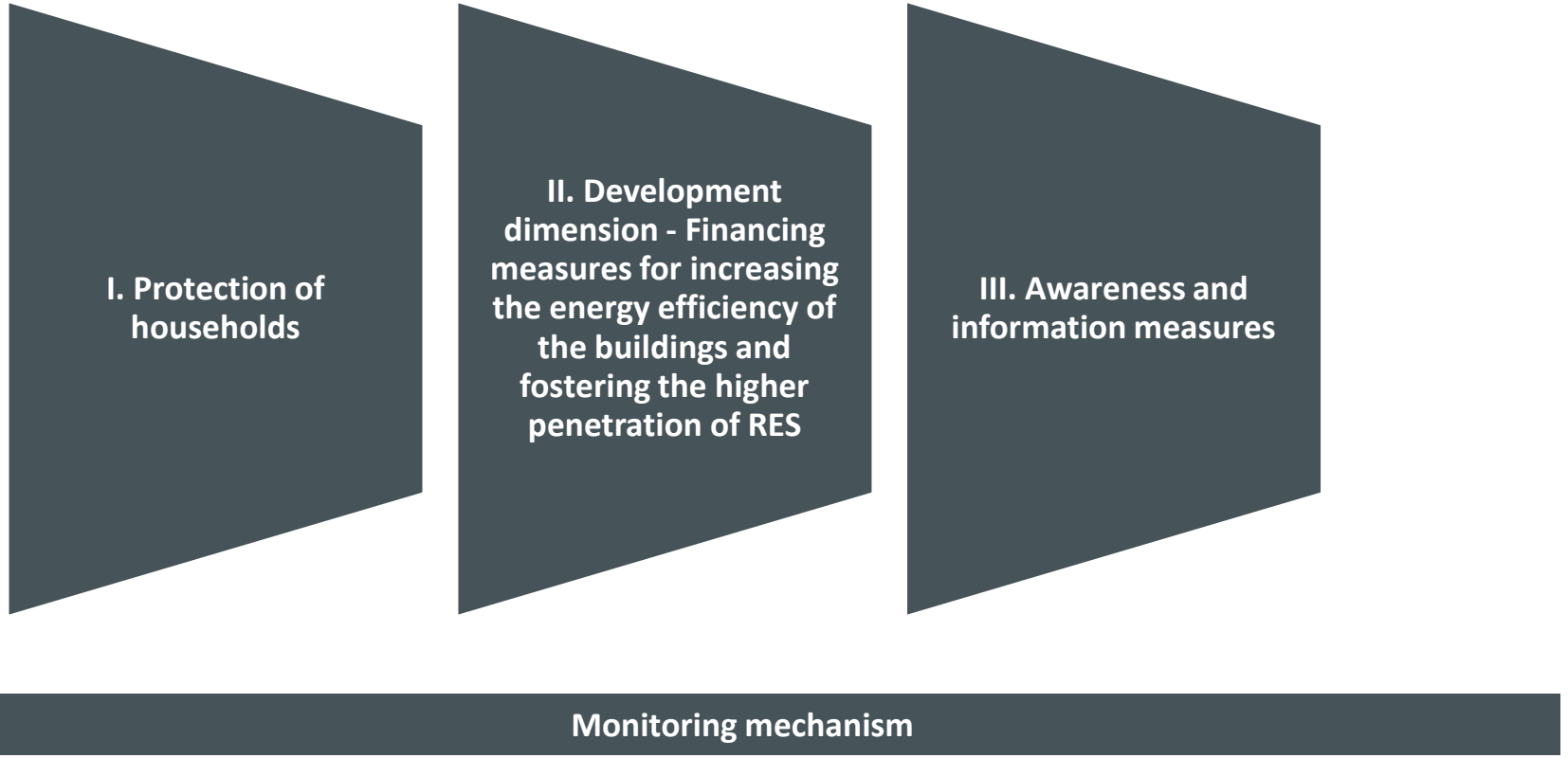
Energy poor households – Simultaneous satisfaction of the two conditions

- **Condition I:** The total final energy consumption of the household is lower than the 80% of the minimum final energy consumption, which is required theoretically.
- **Condition II:** The total normalized income of the household, based on the number of household's persons according to equivalence scale of OECD of the household is lower than the 60% of the mean income of all the households in Greece.



The percentage of households affected by energy poverty is expected to decrease to 7% in 2025 and to 3% in 2030 in accordance with NECP's target (approximately 420 thousand households)

National Action Plan for the Alleviation of Energy Poverty: Policy measures



National Action Plan for the Alleviation of Energy Poverty: Policy measures

I. Protection of households

- M1. Improvement of the Social Tariff
- M2. Provision of energy card to energy poor households
- M3. Regulatory measures for the protection of energy poor households

II. Development dimension - Financing measures for increasing the energy efficiency of the buildings and fostering the higher penetration of RES

- M4. Energy upgrade of the energy poor households' building including the installation of RES systems
- M5. Provision of incentives to energy poor households within the framework of the Just Transition Plan
- M6. Provision of incentives to energy poor households within the framework of the EEOs
- M7. Provision of incentives to energy poor households with in the framework of the Energy Communities

III. Awareness and information measures

- M8. Conduction of measures within the framework of the EEOs
- M9. Conduction of targeted measures centrally by the Ministry of Environment and Energy

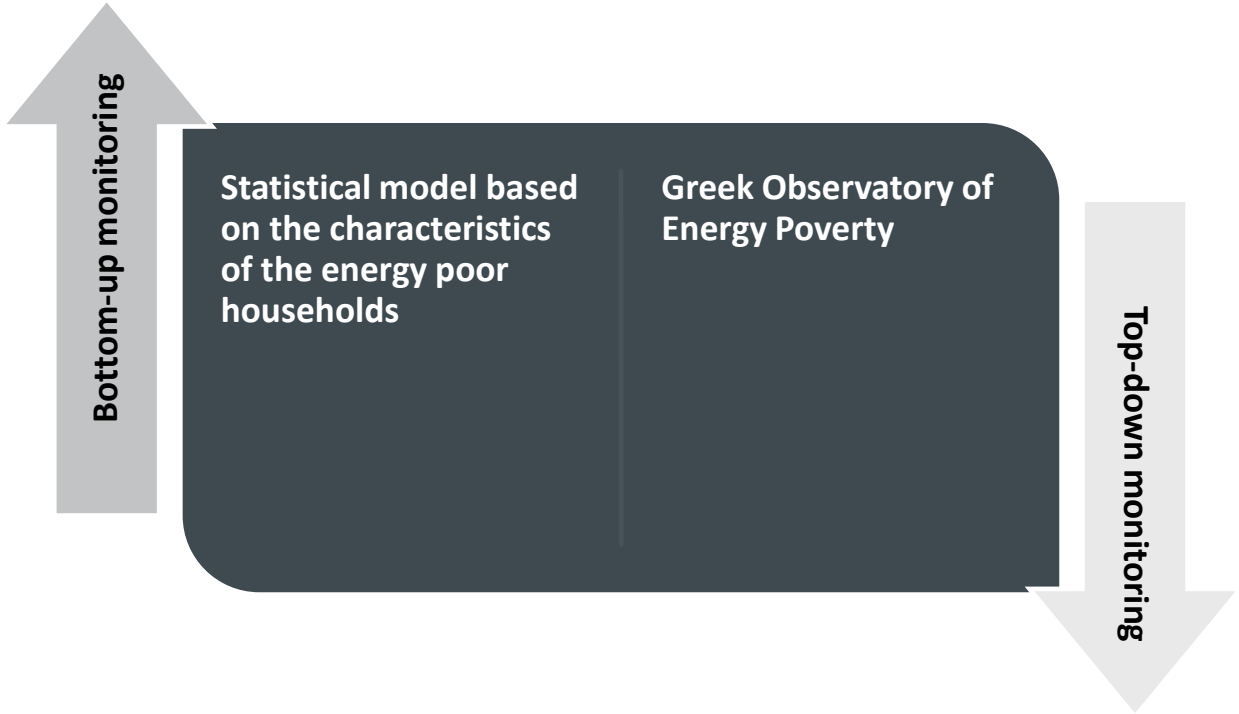
National Action Plan for the Alleviation of Energy Poverty: Policy measures

Policy measures	Number of energy poor households	Foreseen public aid
M1. Improvement of the Social Tariff	100,000	40 million € annually
M2. Provision of energy card to energy poor households	100,000	40 million € annually
M3. Regulatory measures for the protection of energy poor households	150,000	30 million €
M4. Energy upgrade of the energy poor households' building including the installation of RES systems	120,000	1.8 billion €
M5. Provision of incentives to energy poor households within the framework of the Just Transition Plan	10,000	210 million €
M6. Provision of incentives to energy poor households within the framework of the EEOs	100,000	70 million €
M7. Provision of incentives to energy poor households with in the framework of the Energy Communities	90,000	100 million €
M8. Conduction of measures within the framework of the EEOs	350,000	-
M9. Conduction of targeted measures centrally by the Ministry of Environment and Energy	100,000	10 million €

Specialization of policy measures for the period 2021-2023

Policy measure	Activity
M1: Improvement of the Social Tariff	**Activity 4**: Increased subsidy for eligible households in Social Tariff scheme so as to cover the extra cost of electricity due to energy cost crisis
M2: Provision of energy card to energy poor households	**Activity 1**: Subsidy for covering the extra cost of electricity due to energy cost crisis
	Activity 2: Subsidy for covering the extra cost of natural gas due to energy cost crisis
	Activity 3: Subsidy for covering the extra cost of pellets and biomass due to energy cost crisis
M3: Regulatory measures for the protection of energy poor households	**Activity 5**: Automatic transition of vulnerable household customers into the Universal Service regime
	Activity 6: Fast-track reconnection procedure for the case of energy poor households including the provision of the respective cost
M4: Energy upgrade of the energy poor households' building including the installation of RES systems	**Activity 7**: NRRF programme for the energy upgrade of residential buildings
M5: Provision of incentives to energy poor households within the framework of the Just Transition Plan	**Activity 4**: Subsidy for covering the extra cost of district heating due to energy cost crisis
M6: Provision of incentives to energy poor households within the framework of the EEOs	**Activity 7**: Promoting technical measures within EEOs
M7: Provision of incentives to energy poor households within the framework of the Energy Communities	**Activity 10**: NRRP for installing energy community-based PV systems and sharing electricity to energy poor households
M8: Conduction of information and awareness-raising measures within the framework of the EEOs	**Activity 11**: Promoting targeted information and awareness-raising measures within EEOs
M9: Conduction of information and awareness-raising measures implemented centrally by the Ministry of Environment and Energy	**Activity 12**: Further promotion of Price Comparison Tool including its improvement
	Activity 13: Feasibility study for proposing the structure of the National Observatory of Energy Poverty
No linkage with the existing policy measures	**Activity 14**: Feasibility study for developing support scheme for energy poor households in islands

National Action Plan for the Alleviation of Energy Poverty: Monitoring mechanism



Article 24: Integrated Reporting on Energy Poverty

Member State concerned shall include in its integrated national energy and climate progress report:

(a) information on progress towards the national indicative objective to reduce the number of households in energy poverty; and

(b) quantitative information on the number of households in energy poverty, and, where available, information on policies and measures addressing energy poverty.

- Central role is assigned to the **Working Group for monitoring the NECP** with the following duties:
  - Management, evaluation and improvement of monitoring mechanism.
  - Evaluation of the implemented policy measures in the period 2021-2030.
  - Formulation of proposals either for improving existing policy measures or designing and implementing new more efficient ones.
  - Preparation of the annual progress report.

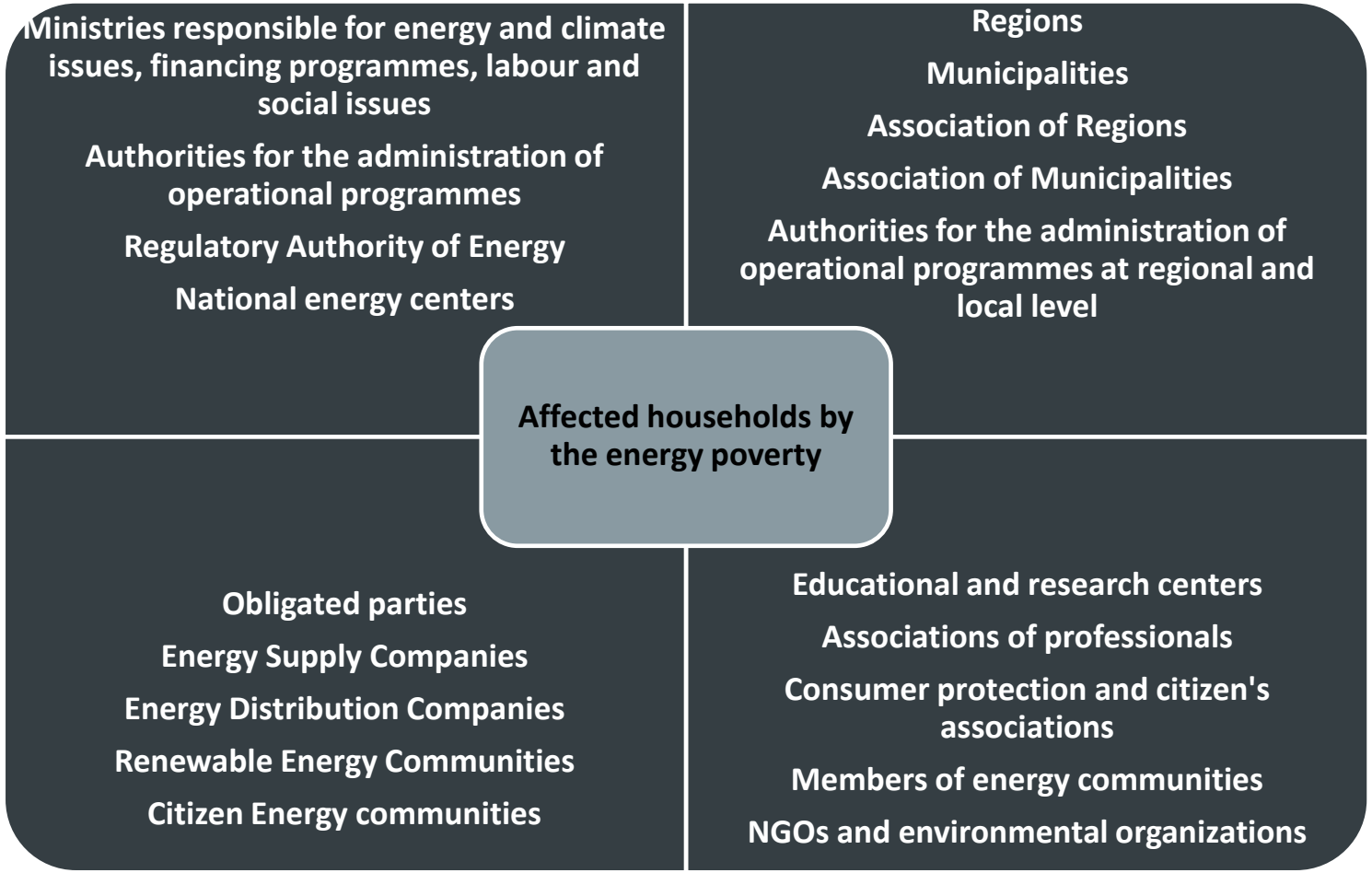
Statistical model for the indentification of the energy poor households

- **Development of a logit model from the sample of the energy poor households**

$$Y_{2021} = 2{,}9889 - 0{,}0034 * electricity - 0{,}3726 * year - 0{,}7443 * central - 0{,}0006 * income + 2{,}1393 * size + 0{,}3446 * tenants + 0{,}3347 * age + 0{,}3115 * apartments - 0{,}6692 * kids$$

Variable	Explanation	Coding
electricity	Annual electricity cost	Continuous (€)
year	Building's age of construction	1: Before 1946 2: 1946-1960 3: 1961-1980 4: 1981-1995 5: 1996-2005 6: 2006-2011 7: After 2012
central	Operation of a central heating system	1: Yes 0: No
income	Annual net household's income	Continuous (€)
size	Number of household's members	Continuous
tenants	Living in rented building	1: Yes 0: No
age	Number of members with age higher than 65 years	Continuous
apartments	Living in apartment	1: Yes 0: No
kinds	Number of members with age less than 18 years	Continuous

Overview of the involved categories of stakeholders



updated NECP: Policies and measures to combat energy poverty

I. Protection of households

- M1. Social Tariff and mitigation of energy crisis' impacts
- M2. Regulatory measures for the protection of energy poor households

II. Development dimension - Financing measures for increasing the energy efficiency of the buildings and fostering the higher penetration of RES

- M3. Energy upgrade of the energy poor households' building including the installation of RES systems
- M4. Provision of incentives to energy poor households within the framework of the EEOs
- M5. Provision of incentives to energy poor households with in the framework of the Energy Communities
- M6. Innovative financing instrument

III. Awareness, information and coordination measures

- M7. Conduction of measures within the framework of the EEOs
- M8. Conduction of targeted measures centrally by the Ministry of Environment and Energy
- M9. Establishment of one-stop shops

ENERGY UPGRADE OF RESIDENTIAL BUILDINGS

"Save Energy at Home" program (periods: 2014 – 2017, 2017 – 2020, 2021 – 2023, alternative measure)

- Subsidy and low interest loan (or no interest loan)
- Energy saving interventions in residential buildings (insulation, windows, heating/cooling systems, SHW, local RES)
- Aiming at reducing energy needs & consumption of conventional fuels
- Based **on Energy Performance Certificates**

(energy class **before** vs energy class **after** interventions)

Individual Income (€)	Family Income (€)	Grant rate	
		Home ownership (%)	Free housing allowance /House rental (%)
<= 5.000	<=10.000	75	65
>5.000 – 10.000	>10.000 – 20.000	70	60
>10.000 – 20.000	>20.000 – 30.000	55	45
>20.000 – 30.000	>30.000 – 40.000	45	40
>30.000	>40.000	40	40

The measure has evolved through the years
- FiFo assessment in the first period, higher subsidies for low income households
- comparative assessment in the last period, taking into consideration factors such as:
  - €/kWh (cost per energy saved)
  - income of household
  - social criteria

❑ **from 2024 and on, it will be designed exclusively for energy vulnerable households**

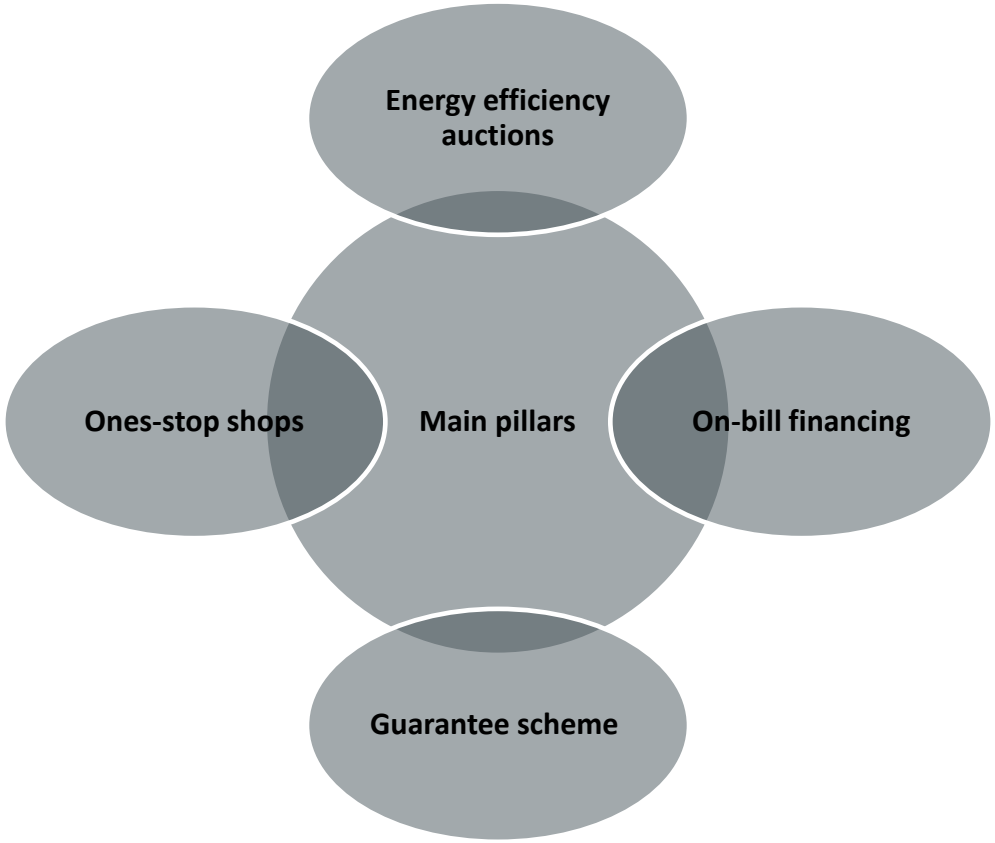
ENERGY COMMUNITIES TO TACKLE ENERGY POVERTY

APOLLON program (Law 5106/2024, Art. 103)

- Aims at reducing the energy cost of municipalities and **vulnerable households**.
- Energy needs covered by installation of RES systems with **virtual net billing**
- Each Regional Authority (13 Regions in Greece) will establish a **Citizens Energy Community** (CEC), where the beneficiaries will participate as members.
- Competitive procedures for the installation of RES systems.

1. Establishment of Citizens Energy Community (CEC)
2. Express of interest for participation as member in the CEC
3. Study and dimensioning of the RES systems in order to cover the energy needs of their members
4. Competitive procedure and selection of projects
5. Contract signing between CEC and owners of RES systems – Implementation

updated NECP: Innovative financing instrument

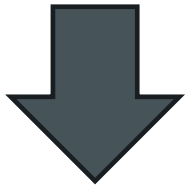


Greek Observatory of Energy Poverty

The observatory of energy poverty was **developed by the Center for Renewable Sources and Savings (CRES) in 2014** in order to inform both of the citizens and the decision-makers about the phenomenon of energy poverty in Greece.

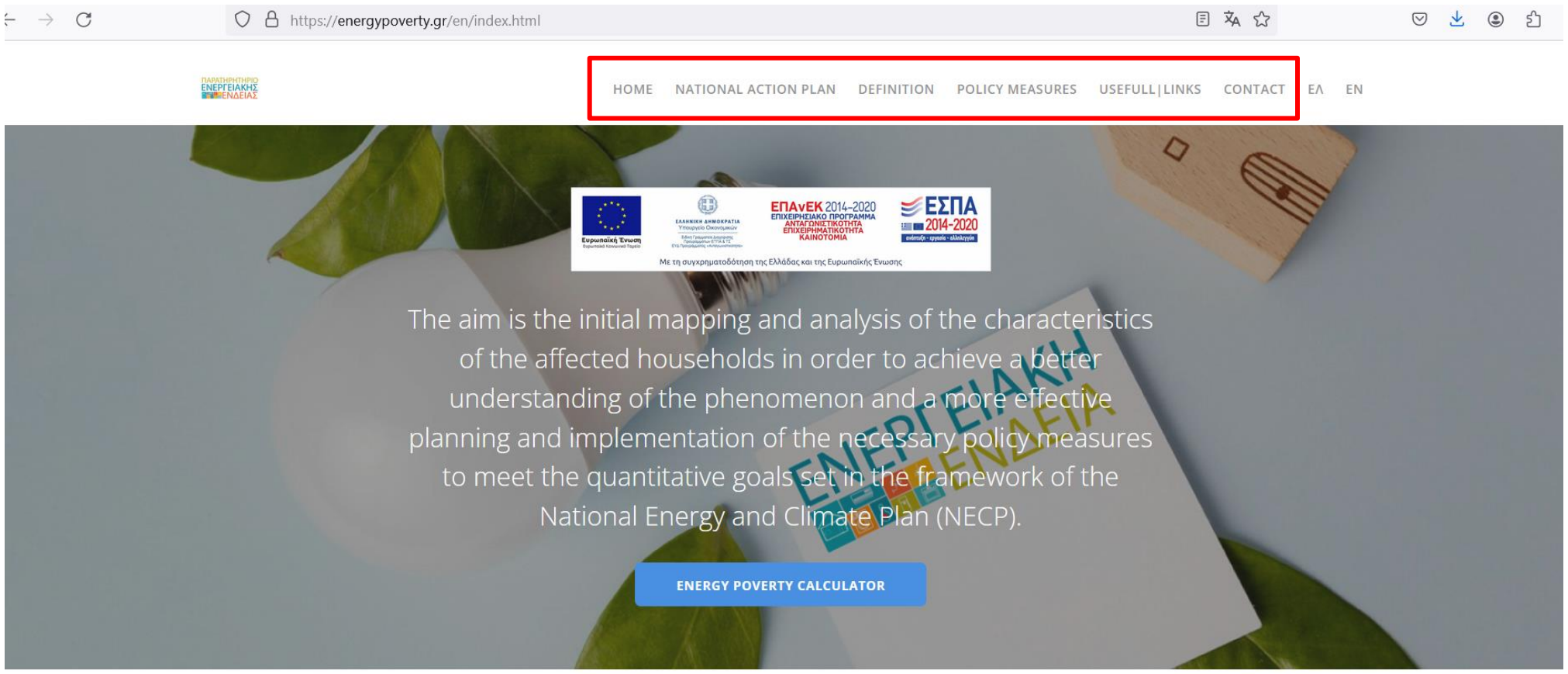
Objectives of the observatory:

- ✓ **Assessment of the energy poverty levels** in Greece through the estimation of representative indicators and monitoring of its fluctuation over the years.
- ✓ **Identification of the parameters**, which affect and intensify the phenomenon of energy poverty.
- ✓ **Design and implementation of efficient policy measures** for the alleviation of the energy poverty.

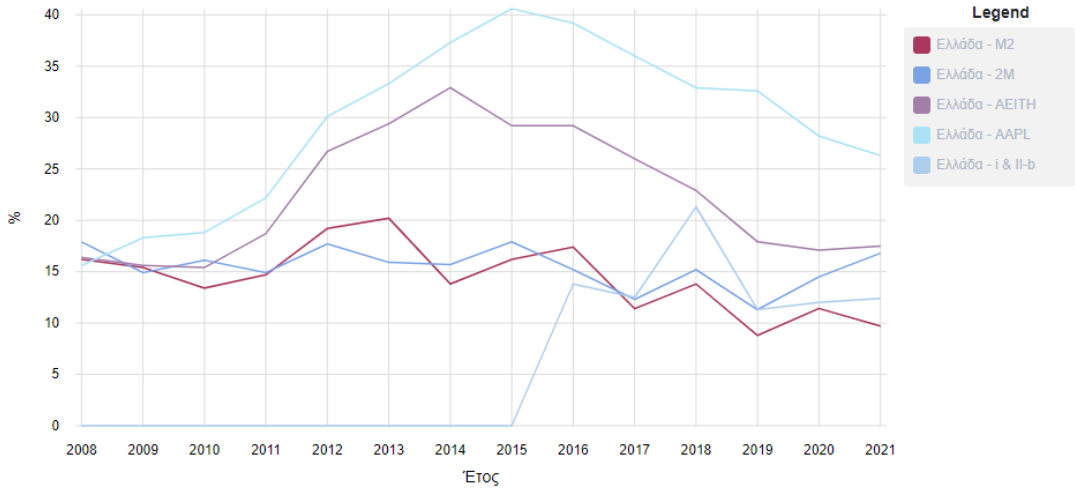


Decision by the **Ministry of Environment and Energy** to update and operate the Greek observatory within the **framework of the Action Plan for the alleviation of energy poverty,** which was **adopted as Ministerial Decision in September 2021**.

Greek Observatory of Energy Poverty
http://energypoverty.gr/



Greek Observatory of Energy Poverty
Charts and Indicators



Indicators of the EU Energy Poverty Observatory

- **Index M/2** Low absolute energy expenditure
- **Index 2M** High share of energy expenditure in income
- **Index of inability to keep homes adequately warm**
- **Index of arrears on utility bills**

National indicators

- **Index I-II$_{eq}$**
- **Index I-II**

Greek Observatory of Energy Poverty
Statistical model

Probability for identifying households affected by energy poverty

Please enter the annual electricity cost (€) for your residence

Please select the year of construction for your home

Do you have a central heating system in your home? Yes ○ No ○

Based on your tax return, state your annual net family income (€)

State the total number of members in your household

Do you rent the residence you live in? Yes ○ No ○

State the number of people over the age of 65 in your household

Choose in which Climate Zone your residence is located

State the number of unemployed persons in your household

Accommodation in an apartment building: Yes ○ No ○

Please state the number of people under the age of 18:

Calculate

Please enter the annual electricity cost (€) for your residence: 500

Please select the year of construction for your home: 1961 - 1980

Do you have a central heating system in your home? Yes ● No ○

Based on your tax return, state your annual net family income (€): 8000

State the total number of members in your household: 2

Do you rent the residence you live in? Yes ● No ○

State the number of people over the age of 65 in your household: 2

Choose in which Climate Zone your residence is located: Zone Γ

State the number of unemployed persons in your household: 1

Accommodation in an apartment building: Yes ● No ○

Please state the number of people under the age of 18: 0

Calculate

possibility: **56%**

save to pdf

Greek Observatory of Energy Poverty
Additional info

Source of financing: Targeted programme financed by an Operational Programme* for the provision of technical support by CRES to the Ministry of Environment and Energy for various services including the energy poverty issues.

Charge of the budget definition and the validation of it: Ministry of Environment and Energy in cooperation with the authority for the administration of the Operational Programme.

Main priorities /annual work programmes set up: Continuous update and acting as an active information point for all the energy poverty related issues.

***Operational Programme Competitiveness, Entrepreneurship and Innovation 2014-2020 (EPAnEK)**, which is one of the seven Sectoral and thirteen Regional Operational Programs of the Partnership and Cooperation Agreement (NSRF) for the period 2014-2020.

Standardized saving methodology for energy efficiency actions alleviating energy poverty

$$TFES = (FEC_{baseline} - FEC_{action}) \cdot (1 - f_{BEH})$$

$$TFES = A \cdot \left(\frac{SHD_{baseline} \cdot (1 - f_{prebound\ EPOV}) + HWD}{eff} - \frac{SHD_{action} + HWD}{eff} \right) \cdot (1 - f_{BEH})$$

TFES	Total Final Energy Savings [kWh/a]
$FEC_{baseline}$	Final energy consumption for end-use, before building refurbishment [kWh/a]
FEC_{action}	Final energy consumption for end-use, after building refurbishment [kWh/a]
A	Useful floor area of the refurbished building [m^2]
$SHD_{baseline}$	Specific space heating demand of the reference building [$kWh/m^2/a$]
SHD_{action}	Specific space heating demand of the efficient building [$kWh/m^2/a$]
HWD	Specific domestic hot water demand [$kWh/m^2/a$]
eff	Conversion efficiency of the heating system [dmnl]
$f_{prebound\ EPOV}$	Factor for adjusting baseline consumption of average household to energy poor household [dmnl]
f_{BEH}	Factor to adjust for rebound effects of the action [dmnl]

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Standardized saving methodology for energy efficiency actions alleviating energy poverty

Table 54: Overview of prebound effects

Prebound: energy underconsumption due to self-rationing - space heating				
Reference	Country	Type of article	Sample size	Value (%)
Sunikka-Blank and Galvin (2012)	Germany	Review	3,700 homes	30
Tighelaar and Menkveld (2011)	Netherlands	Study	4,700 households	30
Kelly, 2011	UK	SCI-paper	2,531 dwellings	Not specified
Hens et al., 2010	Belgium	SCI-paper	964 dwellings	Not specified
Holz et al., 2011	Germany	Book chapter	~ 90% of German buildings	35
Cayre & Laurent, 2011	France	Study	2,000 households (survey)	40
Teli et al., 2016	UK	SCI-paper	107-flat tower block	40
Papada & Kaliampakos, 2020	Greece	SCI-paper	800 households (survey)	Not specified
Vilches et al., 2017b	Spain	SCI-paper	4 buildings	No savings

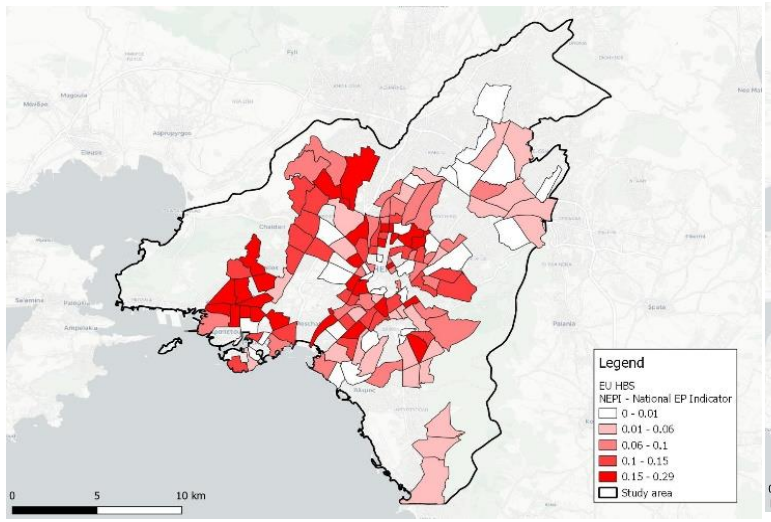
Table 55: Overview of rebound effects

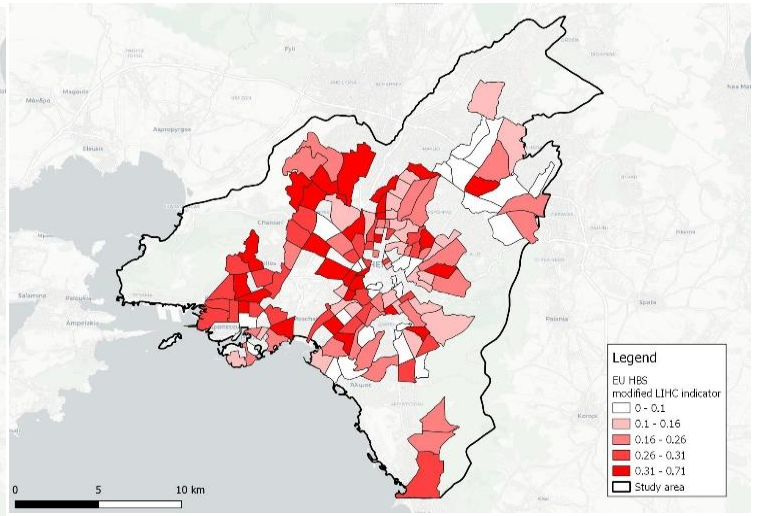
Rebound: overconsumption following building refurbishment - space heating				
Reference	Country	Type of article	Sample size	Value (%)
(Sorrell et al., 2009)	UK	Review study	/	20
(Hens et al., 2010)	Belgium	SCI-paper	964 dwellings	Not specified
(Haas & Biermayr, 2000)	Austria	SCI-paper	500 Austrian households	25
(Galvin, 2015b)	Germany	SCI-paper	14 datasets of German households	36
(Aydin et al., 2017)	Netherlands	SCI-paper	563,000 households in the Netherlands	Owners: 26.7 Tenants: 41.3
(Hediger et al., 2018)	Switzerland	SCI-paper	3,555 (survey)	33
(Nadel, 2016a)	US	SCI-paper	/	25
(Thomas & Azevedo, 2013)	US	SCI-paper	/	20
(Nässén & Holmberg, 2009)	Sweden	SCI-paper	Not specified - Swedish Household Budget Survey	10
(Brøgger et al., 2018)	Denmark	SCI-paper	134,000 buildings	29,4
(Madlener & Hauertmann, 2011)	Germany	Study	11,000 households in Germany	Owners: 12 Tenants: 49
(Dubin et al., 1986)	US	SCI-paper	504 customers	10
(Nesbakken, 2001)	Norway	SCI-paper	551 households	21

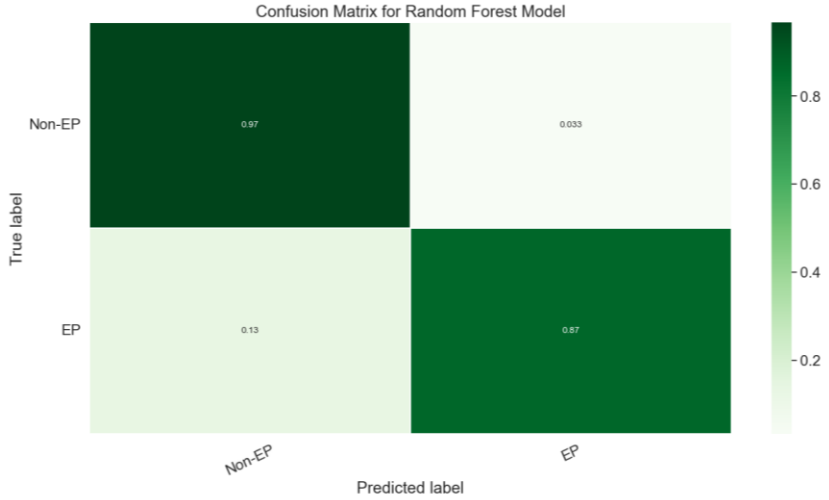
https://streamsave.eu/wp-content/uploads/2022/09/D2-2_PracticalGuidance_final_June23.pdf

Insights from REVERTER project in regards the identification of energy poor households

- Conduction of survey and calculation of additional indicators (LIHC & LILE)
- Multivariate regression analysis
- Spatial analysis
- Machine learning algorithms







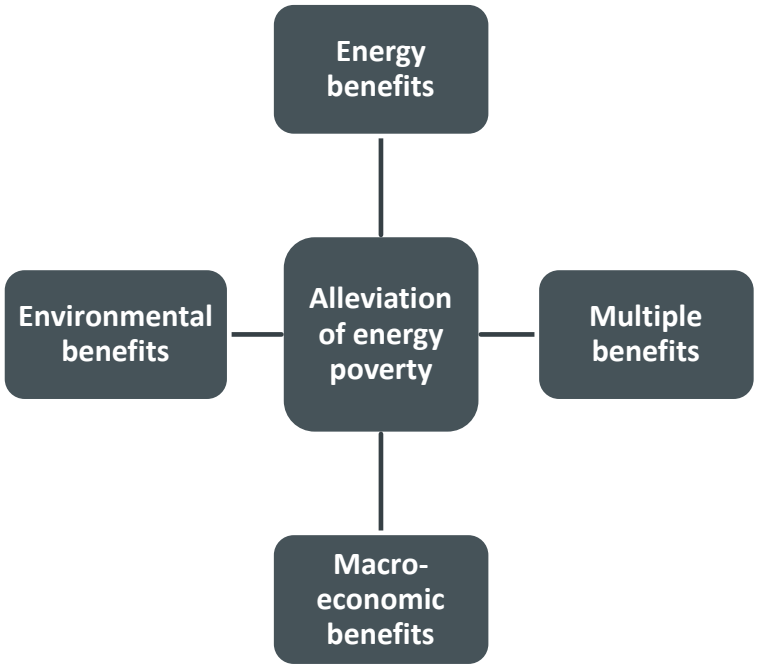
Insights from REVERTER project in regards the preparation of buildings renovation roadmaps

REVERTER

I. Specification of the main objectives

II. Preparatory actions for the development of the roadmap

III. Development of the REVERTER Roadmaps



- Legislative and policy framework
- Identification of key stakeholders
- Analysis of the current levels and characteristics of energy poverty
- Analysis of the building stock
- Prioritisation in the context of the “worst first” principle
- Identification and confrontation of the barriers – Conduction of PESTEL analysis
- Establishment of OSSs

I. Assessment and selection of the most effective energy efficient and RES interventions

II. Identification of the main pathway for the developed scenario

III. Determination of the renovated buildings

IV. Calculation of the triggered impacts

Thank you for your attention!!!

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