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Measures to address the policies' impacts on low-income households in the target countries.

Study on the impacts of policies to decarbonize residential buildings on energy poverty in CEE/SEE and mitigation strategies

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1. SUMMARY

This Study was carried out to determine:

- The current conditions and challenges in low-income households from the perspective of vulnerability to energy poverty;
- The procedural dimension of energy justice as well as the ability of every Member States included in the study to respond to that challenge;
- The effects on low-income groups as well as the evolution and the quantification of energy consumption, costs and investments needed to implement the Minimum Energy Performance Standards (MEPS), the new Emissions Trading System (ETS2) which puts a carbon price on heating fuels, and the phasing-out of fossil heating by 2040, based on vulnerability indicators;
- The costs that the above-mentioned policy scenarios would impose on the studied Member States, both for the investments and/or for covering additional burdens for citizens;
- The EU funding available to cover those costs;
- And the policy instruments which, when introduced, would be most efficient in helping Member States address the adverse effects of the introduced policies on low-income groups.

The policies that are required to decarbonise the EU building stock will have unquestionable effects on low–income groups. On the one hand, the living conditions, with the introduction of MEPS or the phase-out of fossil fuel boilers, would change in terms of all comfortability-related energy poverty indicators, namely warmer houses in winter, cooler houses in summer, less dampness, mould, air pollution and lower energy bills. On the other hand, these measures introduce additional upfront cost burdens which represent high proportions of the income of low–income households, exacerbating their vulnerability from the perspective of welfare indicators, thereby leaving households with lower disposable income after the introduction of all three measures, unless preventive measures are put in place.

Therefore, it is important to calculate the total investment needs of the policies and consider them in relation to the total funding that might be available, primarily from the Social Climate Fund (SCF), but also from other available resources (such as the Modernisation Fund, Innovation Fund, revenues from auctioned ETS2 allowances, Just Transition Fund and other resources).

Figure 1 shows the funding required for investments in different scenarios, the revenues from the Social Climate Fund and the revenues from the auctioning of ETS2 allowances if they would be available. These funding streams can be directly linked to the low-income households, while the majority of the other available funding instruments do not have clearly earmarked amounts

or allocations for this target group at this point in time. Instead, they target broader energy efficiency or climate programs, where some amounts can be attributed to low-income groups. Based on current planning, Member States can cover the increased energy costs and the investments required by low-income groups from these funds, under the assumption that the costs of insulation and heat pumps will return to lower levels due to economies of scale, however if the opposite occurs, funding requirements will be higher. Since the purpose of these funds is to broadly support energy-poor households, meaning that a substantially higher number of households will be included, then the available funding is not sufficient for all of the cases. In the cases also where the funding from auctioned allowances is low and the costs of materials remain high, then the available funds will need to increase and other funding instruments must provide additional targeted support.

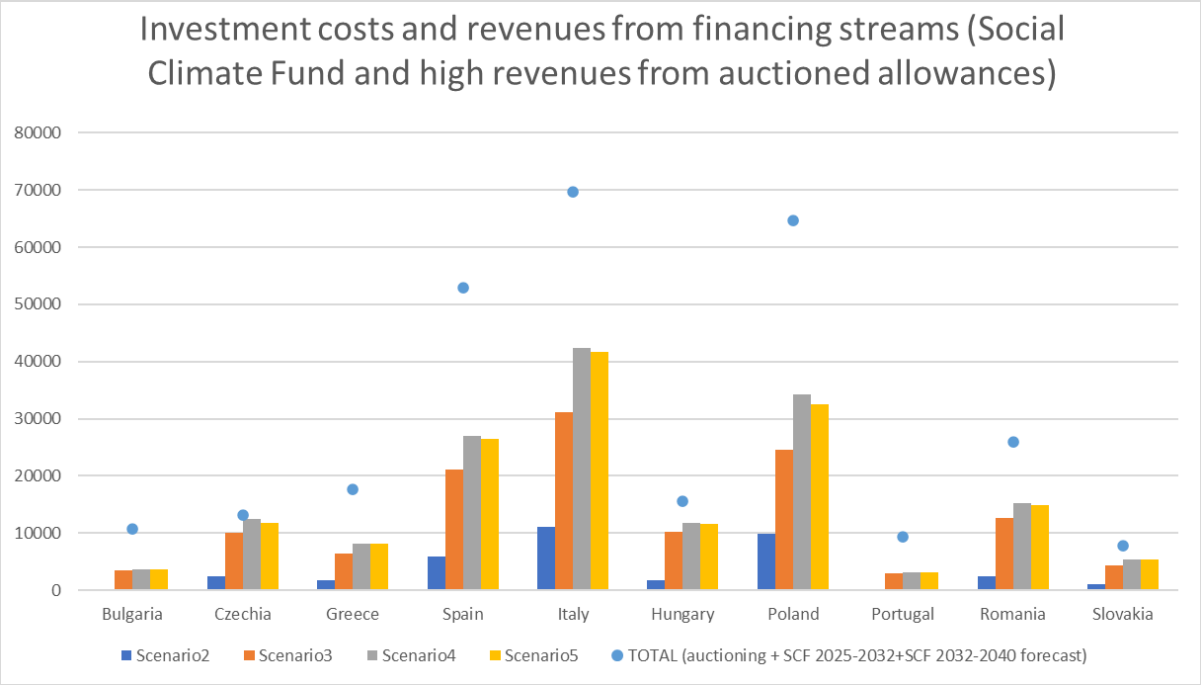

Figure 1a Scenario investment costs against possible SCF and high revenues from auctioning for all scenarios

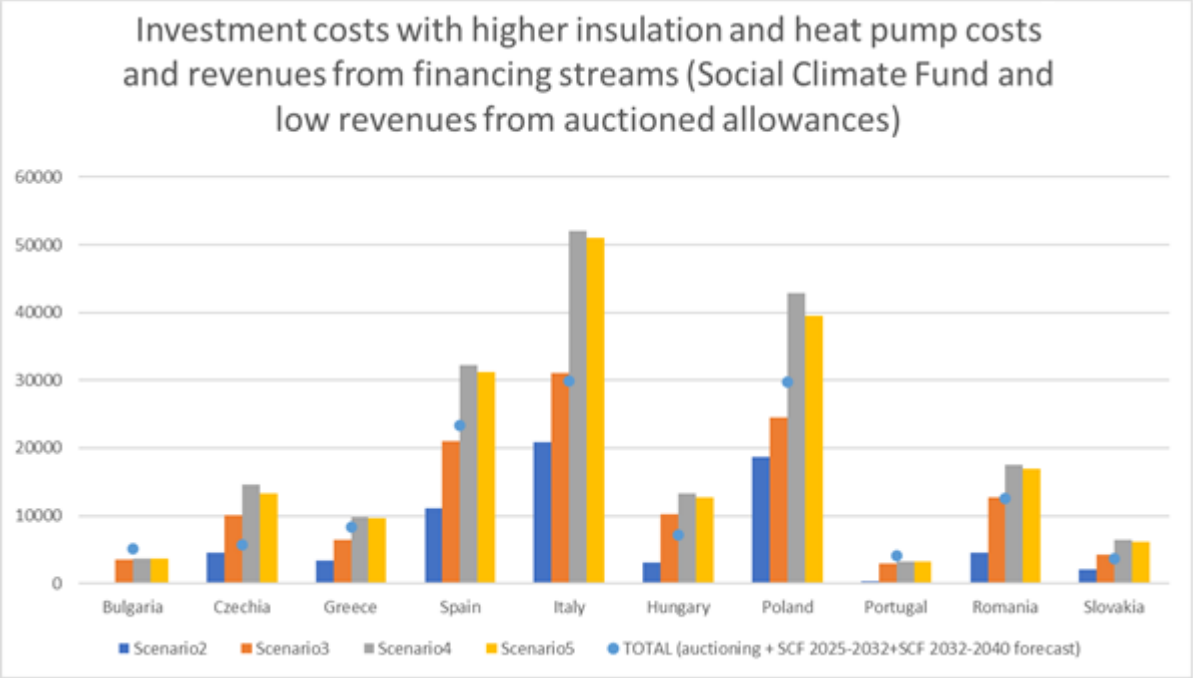

Figure 2b Scenario high investment costs against possible SCF and low revenues from auctioning for all scenarios

Countries need to further develop their Social Climate Plans if the Social Climate Fund is to come into force as this study shows that they are still not familiar with the burden that the cost of policy introduction would bring. To assist the national authorities, we have also analysed the measures that could be financed from the available national funding to directly address the vulnerability of low-income households, while also having positive social, environmental and economic effects on the Member States in general, with a positive influence on employment, air quality or health for example.

The most important recommendations from the study include the following:

- **Shift the available financing streams from fossil fuel boiler upgrades to clean heating systems**. In several countries, the phasing out of fossil fuel boilers from the market will not directly lead to the replacement of old fossil boilers within low-income households due to the associated high upfront costs as well as several incumbent policies that still encourage the installation of fossil fuel boilers. Therefore, it is important to end existing policies that subsidize fossil fuels (until 2025-2030) and instead use the available funding to subsidise clean heating systems.
- **Implement energy efficiency subsidy schemes with an earmarked maximum funding rate for low-income households.** The price signal of the ETS2 will not be adequate on its own to carry out energy efficiency upgrades or phase-out fossil fuel boilers from the low-income groups in the medium to long run due to the high upfront costs, due to low-income groups are excluded from financial services, and because their tenure status often aggravates the split incentive problem. Supporting measures and funding programmes targeting low-income households that subsidize 95-100% of the investments are required, which should

also cover technical guidance and assistance. Ideally, these investments should be brought forward to make use of the short-term available funding streams.

- **Plan the subsidy policies based on the Energy Efficiency First principle.** The energy efficiency first principle needs to be applied when introducing the above measures. An example of this would be through MEPS, so that their implementation would not result in higher costs to low-income groups or additional emissions, despite the change in fuel use. It is important to highlight the role that making information accessible to low-income groups regarding the benefits of the upgrades and the change to low-temperature heating can have, while highlighting that the introduction of Energy Building Benchmarks could be of additional value.
- **The combination of all three measures can provide a correct signal and generate structural effects on low-income groups.** Although the phase-out of fossil fuels seems to be the most cost-effective instrument from the simplified repayment period calculation and the comparison of investments and savings, it needs to be complemented by MEPS which are much more important in improving the situation of low-income households. Improving the energy performance of buildings and switching to heat pumps will lower the energy demand and consequently lower the energy costs required to satisfy the existing thermal needs. In addition, MEPS also positively influences thermal comfort, lowering the vulnerability of low-income households.
- **The Social Climate Fund must not be linked exclusively to the ETS2 implementation.** The Social Climate Fund and the revenue distribution among countries should be evaluated after the first period of its implementation (until 2032). The Social Climate Fund should be able to cover the increased costs for low-income groups irrespective of the policies implemented, and hence should not be linked to ETS2 only. If linked to ETS2 only (also in the case that ETS2 would not be implemented), Member States would lack a substantial amount of funding required to cover the adverse effects of the implementation of the other measures (MEPS and phasing out of fossil fuel boilers).
- **The EU must provide guidance on how to carry out the financial planning of the Social Climate Plans.** The combination of policies linked to the Fit-for-55 package should be carefully considered by the national authorities in each of the included countries, together with detailed financial planning and analysis (which could be included in the Social Climate Plans). From the multiple discussions with national stakeholders, it is evident that the expected impacts as well as the available funding, or lack thereof, are the areas in which national authorities require the most additional help and guidance. Furthermore, most MS are not aware of the potential scenarios related to the increase of energy poverty or the extra energy costs possible in the near future due to the high uncertainty of the future, and would require further support.
- **The funding streams must be revisited and requirements to include actions for energy-poor groups should be added**. In several countries, the Social Climate Fund and expected revenues from ETS2 allowances seem sufficient to cover the costs of introduction of the three measures (including the increased energy costs to low-income households and the investment costs required for heat pumps and refurbishments of buildings as a result of MEPS and phasing out of fossil fuel boilers) but only for low–income households. On top of that, the part of the available funding allocated to the residential sector will focus on energy poverty as a whole (which currently is evident also in the second income quintile groups, if not the third as well), which includes a much larger number of households in each country than the specific target group of this study, hence the available funding could not be enough. Regarding

the Recovery and Resilience Funding, RRF plans in the study's ten countries do not foresee concrete actions or budget allocations for low-income groups and regions or for energy poverty alleviation. Indirectly, they include a budget for the overall broader energy efficiency programs (with an average of a 40-50% financing rate), yet it is important to provide more targeted support to low-income groups from these programs with higher financing rates. Furthermore, it has to be taken into consideration that the Social Climate Fund is dedicated to alleviating transport poverty as well (hence these requirements would need to be taken into account and would reduce the overall budget for energy).

- **The timing of funding streams could be revisited.** In the cases where the revenues from ETS allowances could be low or when the costs of heat pumps and insulation may be higher in the short to medium run, the available funds from the SCF and auctioned allowances do not suffice. Given that the investment requirements are high in all scenarios in the period 2030-2040 in most countries, a redistribution of the shares of SCF and ETS2 revenues in the second period should be made, an increase of the targeted amounts for the next period through the new funding streams should occur, or a requirement should be made for earmarking amounts from the various funds with a longer time frame (such as the ERDF and others) towards supporting the investments of low-income groups. Alternatively, given the availability of more funding sources in the short run, the investments could be frontloaded to low-income groups through the allocation of all available funding as of 2025 to reduce the financing pressure in the next decade.
- **The EU regulations must have better insight into tintohe energy behaviour of low-income groups.** There is a lack of data to determine the price elasticities and changes in energy consumption among certain income groups. A price incentive, like the introduction of the ETS2, might result in lower energy consumption in low-income groups (as forecasted), but the source of the savings is likely linked to lower comfort. This signifies the importance of providing a careful combination of policies and measures to target adverse impacts.
- **The EU should enforce the calculation of multiple benefits of energy efficiency measures in the introduction, communication and evaluation of the three measures.** When implementing or evaluating policies, multiple indicators should be taken into consideration. It is important to identify that possible reductions in energy consumption and energy efficiency improvements intended to provide additional benefits to low-income groups would simultaneously generate multiple impacts contributing to society in general. These additional benefits must be included in the overall financial calculations of the measures, which can also lead to a better resolution for the split incentive problem.

As a takeaway message, this report concludes that:

The introduction of the new ETS on buildings must be accompanied with Minimum Energy Performance Standards (MEPS) and the phasing-out of new fossil fuel boilers (in addition to the eradication of incumbent policies that promote fossil fuel boilers) to reduce the energy costs in the medium and long run for low-income groups.

The introduction of the new ETS on buildings, together with other policies, will require a high financing rate (95-100%) for investments on energy efficiency upgrades and heat pumps by low-income households, which also cover technical guidance and assistance to these groups.

MEPS as a standalone instrument can generate structural effects in reducing energy costs of low-income groups, provided that they are implemented with a high (95-100%) financing rate for low-income households, which should also cover their technical guidance and assistance.

The available financing from the targeted funds will not suffice for the broader energy poor groups if the costs for insulation and heat pumps remains high following the energy crisis, and so this requires earmarking of amounts from broader EU funding streams.

The highest financing gaps are evident in the period 2030-2040, meaning that a redesign of the funding streams is required for more targeted support.

2. SCOPE OF REPORT

2.1. Introduction

This report is focused on the findings of *Workstream 3*, which details the measures needed to address the policies' impacts on low-income households in ten target countries. Through *Workstream 1*, the evaluation of the current statuses of the vulnerabilities of low-income households has been determined. In *Workstream 2*, the changes in energy expenditure and investment costs are shown the introduction of three policies:

- *The EU Minimum Energy Performance Standards (MEPS)*
- *EU Emissions Trading System extension to fuel suppliers in buildings and transport sector*
- *Phasing out of new fossil fuel boilers*

The objective of this report is to create a final list of policy responses and national measures to respond to the introduced policies in such a way that the adverse effects are reduced, and the benefits accrue to low-income households.

For the development of the final list of measures, the following steps are taken:

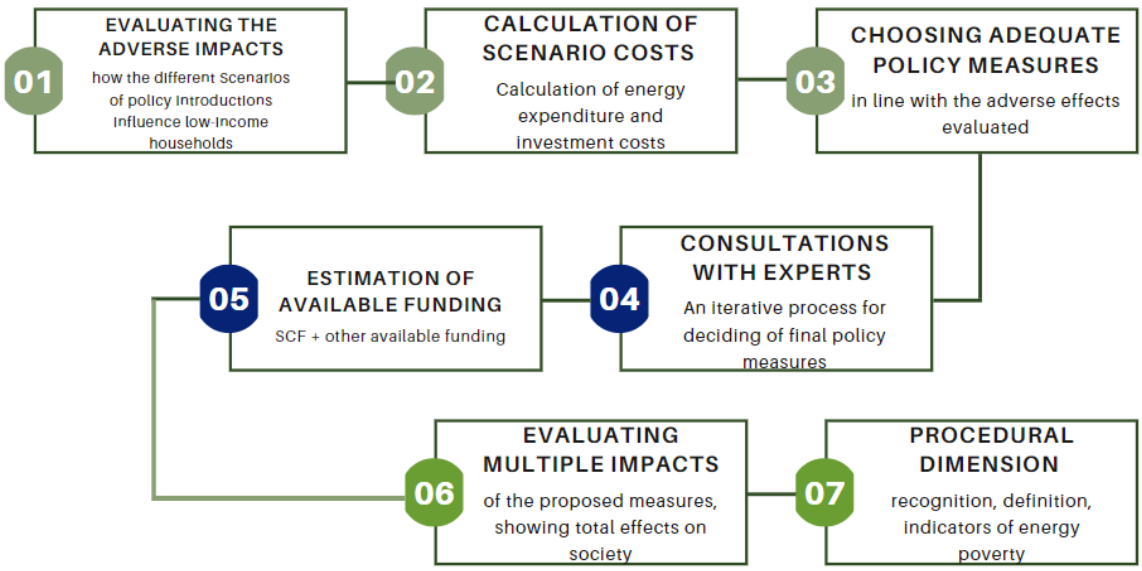

Figure 3 Process to create list of policy interventions

- The quantitative and the qualitative indicators are used to determine how the different Scenarios of policy introductions influence low-income households, which are calculated based on the results of *Workstream 2.* Additionally, recommendations for procedural dimension are described, which refer to i) the recognition of energy poverty as a clear problem in policy documents; ii) the presence of an official definition of energy poverty, and; iii) the development of clear indicators to measure the problem:

- The costs of the Scenarios on the level of the Member State, and/or the investments in the introduction of specific policies, are calculated;
- Of the available national measures proposed in the Integrated National Energy and Climate Plans (NECP) and others mapped in *Workstream 1* targeting energy poverty, the most relevant measures are chosen in line with the adverse effects evaluated, following consultations with national experts;
- The available funding estimation from the Social Climate Fund and ETS2 revenues as well as other sources of funding in the 10 MS are evaluated to potentially fund the measures/instruments to alleviate the adverse effects of policies;
- The most relevant measures are analysed in relation to the results of indicator analyses. The approach is based upon enquiring on negative (and positive) impacts and designing appropriate mitigation measures that should function by improving existing instruments;
- An iterative process of consultations with experts as well as national and EU stakeholders to determine the policy measures' list;
- The multiple benefits and the positive effects for vulnerable households that counteract the negative impacts of each of the policies are determined.

2.2 Indicators of energy poverty

A starting point for the report is to determine how to relate the modelling results and the well-known indicators of energy poverty, to be able to show the real effects of the policies from the perspective of vulnerability and loss of welfare; and how the later-introduced measures would be able to respond to the issues deriving from the proposed policies.

The EU Energy Poverty Observatory (currently Energy Poverty Advisory Hub) introduced a set of primary and secondary energy poverty indicators in 2020[1], all of which were used in WS1 for the evaluation of the status in the ten Member States.[2]

The introduced policies will have an influence on the change of status of low-income groups in relation to some of the indicators. For the causal changes, a qualitative assessment was undertaken, deriving from the modelled quantitative indicators. For the indicators that measure changes not influenced by the introduced policies directly, *ceteris paribus* is assumed, meaning that it is presumed that the results remain the same as in the *business-as-usual* setting.

Prior to the modelling being introduced, the process of evaluating challenges for low-income groups must be determined, and more specifically it is important to understand how the changes derived from the introduction of policies are evaluated based on the indicators.

Energy prices

The introduction of the new ETS, covering the buildings and transport sectors (ETS2), will change the price of final energy for households, in line with the price of the CO_2 and energy mix of households in each country. The change in the energy prices is modelled based on the datasets for current energy prices per fuel in each of the Member States as well as the introduction of policies, meaning the possible evolutions of the prices of the ETS2.

M/2 Absolute (equivalised) energy expenditure below half of the national median

Energy expenditure changes with different triggers related to the introduced policies, namely:

- Switching to technologies with different efficiencies due to the introduction of the phaseout of fossil fuel boilers;
- Reduced consumption linked to the introduction of Minimum Energy Performance Standards;
- The resulting consumption after the introduction of ETS2 influences energy prices, as final energy expenditure derives from the prices and the price elasticities of the included households;
- Above mentioned changes in energy prices.

[1] Thema, J., and Vondung, F. (2020) EPOV Indicator Dashboard: Methodology Guidebook. Wuppertal Institut für Klima, Umwelt, Energie GmbH.
[2] Note: EU, based on the suggestions in the EU Parliament might use only *the 2M indicator*, https://www.euractiv.com/section/energy-environment/news/parliament-drafts-energy-poverty-definition-as-part-of-eu-social-climate-fund-overhaul/

2M: Share of (equivalised) energy expenditure (compared to equivalised disposable income) twice above the national median

As a result of the modelling of the M/2 and introduction of the parameters of the income projections in the included country, we can evaluate the relation between the expenditure and income in the included groups.

Building stock feature-related indicators

The indicators related to building stocks include:

- Dwellings with different energy labels
- Dwellings in intermediately populated areas
- Dwellings in densely populated areas
- Equipped with heating
- Equipped with air conditioning
- Number of rooms per person by ownership status (renters, owners) and total

Of the included indicators, the first is influenced by the policies introduced, related to the energy labelling of dwellings. Others have been evaluated during the developments of WS1 and determine the status that will not be influenced with the introduction of policies.

Other indicators

Ability to keep homes adequately warm and other comfort–related indicators, arrears on utility bills as well as health risks are the indicators describing consequences of the above-mentioned changes.

The study did not quantify influence on the abilities to keep warm, possible arrears or possible excessive winter mortality and poverty risk rates, but qualitatively assessed them based on the results of the modelling.

3. DESCRIPTION OF SCENARIOS

The scenarios of the modelled policies are described in *Workstream 2* and are summarized in the table below.

Baseline scenario **Assumptions**: No implementation of additional policies. The foreseen increases of energy prices within the framework of the EU Reference Scenario 2020 were taken into account. Scenario 1 was considered for the projection of the electricity price.
Scenario 1 **Assumptions**: An ETS 2 price projection was considered the impacts of the ETS2 introduction (see Report No 2). The foreseen increases of the energy prices within the framework of the EU Reference Scenario 2020 were taken into account in addition to the increase due to carbon pricing. Scenario 1 for EU ETS 1 was also selected for the projection of the electricity price.
Scenario 2 **Assumptions**: Mandatory phase-out of heating oil and solid fossil fuels in 2030 and natural gas (including LNG) in 2040. It was considered that the actual phase-out will have occurred after five years (heating oil and solid fossil fuels in 2035 and natural gas and LNG in 2045), and that heat pumps will replace the existing heating systems. The installation cost of the heat pumps was assumed equal to €8,000. Additional sensitivity analysis is carried out (WS3) with higher heat pump prices (€15,000) and insulation costs (€7,500 on average).
Scenario 3 **Assumptions**: Establishment of MEPS for achieving energy class E in 2035. 50% of the affected households (75% of the total low-income households) will renovate their buildings until 2030 and remaining buildings until 2035. Assumptions for buildings' energy upgrade: Renovation cost: €10,000/dwelling and delivered final energy savings: 30%. In 2040, all the building will be upgraded to energy class D (Assumptions for buildings' energy upgrade: Renovation cost: €5,000/dwelling and delivered final energy savings: 10%). It should be noted that the renovation costs for the case of Hungary was assumed to be slightly higher (€13,500/dwelling and €6,500/dwelling in 2035 and 2040 respectively). Additional sensitivity analysis is carried out (WS3) with higher heat pump prices (€15,000) and insulation costs (€7,500 on average).
Scenario 4 **Assumptions**: Combination of Scenarios 2 and 3
Scenario 5 **Assumptions**: Combination of Scenarios 1, 2 and 3.

4. ASSESSMENT OF IMPACTS OF THE INTRODUCTION OF POLICIES

4.1 Methodology for assessment of impacts

Following the energy poverty indicators, the status of how low-income groups will change is evaluated based on the quantitative and qualitative indicators, after the three suggested polices come into force. To identify the influence of the changes through multi-dimensional evaluation of indicators, the redundancies of the indicators is first checked. When the redundancies between the indicators are high, it can be deduced that the changes have influenced the status of the households based on both indicators (for instance Sokolowski et.al. evaluate redundancies in their research on the Polish case)[3]. Generally, it can be concluded that the ability to keep homes adequately warm as well as other comfort–related indicators are highly linked to building quality and are also related to the share of expenditure in the income. Arrears with utility bills are a consequence mostly of prices, but also of income and building problems, as they result with the inability to keep households warm. The conclusions on the health-related indicators can be derived from the "inability to keep warm" and "arrears".

In Figure 4, the indicators relating to the model from the perspective of their quantification and a qualitative assessment of energy poverty after the implementation of the examined policies are shown.

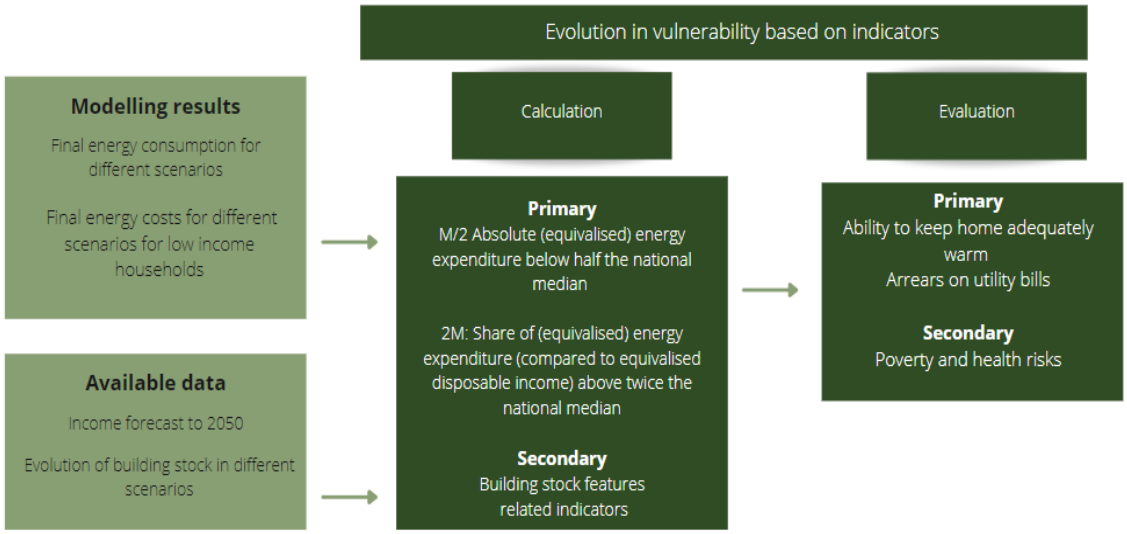

Figure 4 Indicators of energy poverty in relation to our results

Distributional elements of the introduced policies on low-income households can be shown by three types of data for every introduced scenario (energy costs, income, energy efficiency). From this data, the status of low-income households is evaluated in relation to the indicators. It is evident that the scenarios which introduce MEPS will positively influence building stock-related

[3] Jakub Sokołowski, Piotr Lewandowski, Aneta Kiełczewska & Stefan Bouzarovski (2020) A multidimensional index to measure energy poverty: the Polish case, Energy Sources, Part B: Economics, Planning, and Policy, 15:2, 92-112, DOI: 10.1080/15567249.2020.1742817

indicators with higher building energy classes, while ETS2 will increase energy costs without substantial structural changes due to the inability of low-income groups to access financing for the investments. Disposable income and energy costs are part of the quantitative evaluation chosen as a part of the methodology to determine influence on low-income households.

Aside from these distributional indicators, the procedural elements include the recognition of energy poverty as a clear problem in policy documents, the presence of an official definition of energy poverty, and the development of clear indicators to measure the problem.

Quantitative indicator

The quantified adverse (or positive) effect is based on the income dimensions, as the compensating variation is used as an index, which expresses the amount by which the mean total expenditure of low-income households would have had to increase/decrease in the target year (for instance 2030, 2040, 2050) to have maintained the baseline year ratio of absolute expenditure in relation to the overall mean energy expenditure in the target year. However, since the introduction of some policies does not add to the total energy expenditure but rather introduces new costs of the investments to households, **the amount of how much the income would have to increase for a specific household to keep the same welfare level is calculated.**

$$B = \square_{\square} y + p_{\square} x + \square_{\square}\square = Y + \square_{\square} x + \square_{\square}\square$$

[illegible] → [illegible]

[illegible] → [illegible]

[illegible]

[illegible] ([illegible])

[illegible] & [illegible]

$$Y = B - p_x X - p_i i$$

[illegible]

[illegible]

$$CV = Y_B - Y_{Sx}$$

Equation 1 Calculation of the compensating variation

4.2 Results of the assessment of adverse impacts without the available funding

The quantified impacts are described in detail in the Annexed specific country documents, with a summary shown in the tables below. The numbers present the value of how much the households' income would need to increase as a result of the policies' introduction to achieve the same level of welfare as in the baseline scenario, with or without the related EU funding (see also Chapter 3.3).

In the calculations below, the compensating variation (the welfare loss) in Table and Table 2 includes both increases (or decreases) in energy expenditure as well as the investments needed from the introduction of the specific scenarios. The tables show the adverse effects of introducing the measures without any financial support covering the burden of the investments. As described in the introduction of the policies, introducing a phase – out of fossil fuel boilers (via a switch to heat pumps) and the introduction of the Minimum Energy Performance Standards would result in positive impacts for the households, provided that the investments are fully covered by the available funding. The scenarios including only ETS2 show the lowest loss of income, but this worsens the conditions of low-income groups, as they respond to the increase in energy prices with a loss of thermal comfort due to their financial inability to invest (without support). Therefore, in Chapter 3.3, the results displayed consider the case where the investments are covered by the available funding. In the case of the absence or reduction of EU funding, the adverse impacts will deteriorate the conditions of low-income households.

Table 1 Welfare loss (income increase needed) - absolute value

Increase in income needed to cover both variation in energy price and the cost of scenario (average in the period 2025-2050/ EUR)										
	Bulgaria	Czechia	Greece	Hungary	Italy	Poland	Portugal	Romania	Slovakia	Spain
Scenario 1	32.88	6.96	31.36	-0.52	2.24	-50.99	33.46	28.25	24.27	-28.87
Scenario 2	384.77	81.47	6.03	107.47	26.23	145.83	50.64	58.27	67.43	121.80
Scenario 3	1,603.55	339.52	399.81	951.72	109.33	401.46	429.30	403.65	323.22	405.16
Scenario 4	1,977.29	418.65	457.60	1,079.75	134.81	578.39	509.90	462.98	377.99	547.46
Scenario 5	1,741.85	368.80	450.46	1,039.14	118.75	530.47	508.23	444.97	356.25	520.17

Table 2 Welfare loss (income increase needed)- value relative to average income

Increase in income needed to cover both variation in energy price and the cost of scenario (% of total average income)										
	Bulgaria	Czechia	Greece	Hungary	Italy	Poland	Portugal	Romania	Slovakia	Spain
Scenario 1	0.42	0.09	0.70	-0.01	0.03	-0.92	0.52	0.95	0.49	-0.37
Scenario 2	4.93	1.04	0.14	3.03	0.34	2.62	0.79	1.96	1.37	1.57

Scenario 3	20.55	4.35	8.97	26.80	1.40	7.22	6.67	13.56	6.56	5.21
Scenario 4	25.34	5.37	10.27	30.41	1.73	10.39	7.92	15.55	7.67	7.04
Scenario 5	22.33	4.73	10.11	29.26	1.52	9.53	7.89	14.95	7.23	6.69

The numbers rise to as high as 20% of income, meaning that a significant loss of disposable income for low-income households would occur. In the scenario where ETS2 is introduced as stand-alone, the average price elasticity is used. Therefore, if the costs are higher with this elasticity, the low income households can spend less on energy (due to thermal comfort loss) following the reduction of the energy consumption.

The procedural elements

As described above, procedural elements include the recognition of energy poverty as a clear problem in policy documents, the presence of an official definition of energy poverty, and the development of clear indicators to measure the problem. It represents the evaluation of the baseline situation on how countries can react to the adverse effects of the policies introduced, and to put in place new measures/policy instruments. We have mostly covered the procedural issues in WS1, analysing the policy options and the number of measures in the NECPs that directly target households that the countries consider energy poor. Most MS do have a definition for a vulnerable consumer, with some also defining energy poverty (IT, RO, ES, partially PT). However, most of the targeted countries, although not having an official definition, have measures that help certain groups of low-income households with specific policies. Of the included countries, all have at least one NECP measure targeting energy poor households, while Romania, Slovakia and Greece have three.

4.3 Assessment of policy impacts on household income if the funding of investments is available

As opposed to adverse effects evaluated in the previous chapter, this chapter's table shows the cost reductions and financial benefits for the households as well as welfare gain, in case of investments being covered using different available funding in the amount of 100% for low-income households.

The numbers present disposable income after the energy expenditure of each of the scenarios introduced, in 2050, after implementation of all policies, showing the energy expenditure reduction with the introduction of some of the scenarios (current prices used).

Table 2 Disposable income in case the investments are covered, 2050

Disposable income (2050/ EUR)										
	Bulgaria	Czechia	Greece	Hungary	Italy	Poland	Portugal	Romania	Slovakia	Spain
Scenario 0	4053.26	9842.20	4649.37	3847.16	10322.53	7428.63	8052.00	4065.48	5519.76	8874.67
Scenario 1	4053.26	9810.76	4595.78	3810.99	10312.41	7470.36	7994.97	4008.63	5459.08	8904.08
Scenario 2	4063.87	9911.81	4855.78	4017.66	10344.95	7490.54	8029.18	4144.53	5649.02	8897.13
Scenario 3	4106.75	9976.93	4784.33	3968.58	10365.92	7488.24	8074.81	4123.21	5675.40	8929.21
Scenario 4	4139.93	10043.17	4903.41	4087.41	10387.25	7505.67	8025.38	4202.26	5804.67	8913.70
Scenario 5	4140.30	10080.22	4907.38	4121.00	10399.18	7532.27	8032.99	4225.36	5831.05	8940.44

From Table 3, it can be observed that the disposable income in 2050 would be highest in the scenarios introducing both MEPS and phase-out, if the investment costs are covered. As in other chapters, we have described the important positive effects of MEPS on low–income households that go beyond the income benefits, however it is also relevant to capture the multiple positive effects of energy poverty reduction resulting from the introduction of MEPS financing.

5. COSTS FROM INTRODUCTION OF SCENARIOS

The costs that need to be financed consist of investment costs (technology and installation costs for boilers and energy refurbishments) and costs to consumers from the increased energy prices. They are described in the average total per household in the section above, while the total amount of costs is the dataset that is needed for the evaluation of whether the available funding could respond to the introduction of policies.

The investment costs include:

- *Scenario 2: Purchase and installation of Heat pumps*
- *Scenario 3: Energy Efficiency upgrades in the building envelope*
- *Scenario 4 and 5: Purchase and installation of Heat pumps and energy efficiency upgrades in the building envelope*

The introduction of the ETS2 as a standalone instrument would not carry out any investment on either heat pumps or energy efficiency upgrades in buildings, as the price signal is not enough (without support or an additional regulation) to low-income groups to finance any investment. Rather, the ETS2 as standalone would reduce the overall energy consumption without any structural effects for the low-income groups (signifying a loss of thermal comfort).

The introduction of the ETS2 (Scenario 5) in combination with the measures overall lowers the investment costs in comparison to the parallel introduction of MEPS and phasing out of fossil fuel boilers. This can be explained as the energy modelling starts with the ETS2, which lowers the energy consumption due to the higher energy price and costs, while for this lower demand, a smaller investment is needed to switch to other fuels (phasing out of fossil boilers) or to save energy with refurbishment (MEPS) to achieve the same results. The amounts differ when it comes to higher costs of heat pumps and insulation (based on a sensitivity analysis with heat pump costs at €15,000 and average insulation costs at €7,500), where the increase of the investment costs for MEPS can reach a 88% level, while for the combination of policies (4 and 5) there is an increase of 50-60% of the costs.

Table 3a Total investment costs for all scenarios from 2025 to 2050 with moderate costs of insulation and heat pumps

Total investment costs (m EUR)										
	Bulgaria	Czechia	Greece	Hungary	Italy	Poland	Portugal	Romania	Slovakia	Spain
Scenario 2	70	2,394	1,719	1,685	11,124	9,945	143	2,420	1,114	5,945
Scenario 3	3,536	10,020	6,411	10,160	31,119	24,531	2,958	12,666	4,263	21,039
Scenario 4	3,606	12,442	8,219	11,854	33,292	34,476	3,093	15,286	5,432	27,027
Scenario 5	3,596	11,787	8,144	11,536	41,735	32,534	3,087	14,919	5,296	26,426

Table 4b Total investment costs for all scenarios from 2025 to 2050 with high costs of insulation and heat pumps

Total investment costs (m EUR)										
	Bulgaria	Czechia	Greece	Hungary	Italy	Poland	Portugal	Romania	Slovakia	Spain
Scenario 2	131	4,489	3,358	3159	20,858	18,647	268	4,538	2,089	11,147
Scenario 3	5,304	15,030	9,617	15,240	46,679	36,797	4,437	18,999	6,395	31,559
Scenario 4	5,435	19,571	13,007	18,416	67,630	55,134	4,688	23,912	8,586	42,784
Scenario 5	5,418	18,343	12,866	17,820	66,585	51,800	4,679	23,223	8,330	41,657

6. POTENTIALLY AVAILABLE FUNDING FOR MITIGATING IMPACTS OF POLICIES

There are several funding streams available to the Member States which can be used to finance the increase of the energy costs and investment costs for low-income groups. The key findings of this study are that:

- The Social Climate Fund is linked to the introduction of the ETS2 and is a necessary tool that explicitly targets energy poverty, so it should be disentangled from the ETS2 introduction and run irrespective of the policies.
- The majority of the Recovery and Resilience Facility as well as Modernisation Fund plans do not have explicit allocations to low-income groups but rather include earmarked funds for general energy efficiency programs. The duration of the Recovery and Resilience funding might not seem adequate for the investment support to low-income groups, where the highest costs appear in the period 2030-2040.
- The Just Transition Plans under Pillar 1 reserve some amounts regionally for energy efficiency upgrades or for income support through employment effects, but these amounts must secure the funding for low-income groups for the period up to 2030-2040, where the introduced measures will incur the highest cost requirements.

6.1 Social Climate Fund

The most important source of funding is the Social Climate Fund. As it currently stands in the European Commission's proposal, it will provide funding to Member States to support policies and measures that seek to alleviate and mitigate social impacts of extending the emissions trading scheme to the buildings and transport sectors.

The objectives of the EU Social Climate Fund (€72 billion) are to a) finance temporary direct income support for vulnerable households and b) support measures and investments that reduce emissions in road transport and buildings sectors and as a result reduce costs for vulnerable households, micro-enterprises and transport users. The Commission will shortly propose a targeted amendment of the Regulation for the multiannual financial framework for the years 2021-2027 to accommodate an additional Union spending of €23.7 billion for the period of 2025-2027.

The methodology for the calculation of the maximum financial allocation per Member State is under the Fund pursuant to Article 13. This Annex sets out the methodology for calculating the maximum financial allocation available for each Member State in accordance with Articles 9 and 13. The methodology considers the following variables with regard to each Member State:

- *population at risk of poverty living in rural areas (2019);*
- *carbon dioxide emissions from fuel combustion by households (2016-2018 average);*
- *the percentage of households at risk of poverty with arrears on their utility bills (2019);*
- *total population (2019);*

- *the Member State's GNI per capita, measured in purchasing power standard (2019);*
- *the share of reference emissions under Article 4(2) of Regulation (EU) 2018/842 for the sectors covered by [Chapter IVa of Directive 2003/87/EC] (2016-2018 average).*

The maximum financial allocation per Member State under the Fund for the Member States included in this study cover both funding of SCF from ETS2 and other resources is detailed below.

Table 5 Financial allocation per EU Member State[4]

Maximum financial allocation per EU Member State				
Member State	Share as % of total	TOTAL 2025-2032 (in EUR, current prices)	Amount for 2025-2027 (in EUR, current prices)	Amount for 2028-2032 (in EUR, current prices)
Bulgaria	3.85	2,778,104,958	911,926,420	1,866,178,538
Czechia	2.40	1,735,707,679	569,754,460	1 ,65,953,219
Greece	5.52	3 986 664 037	1 308 641 796	2 678 022 241
Spain	10.53	7 599 982 898	2 494 731 228	5 105 251 670
Italy	10.81	7 806 923 117	2 562 660 358	5 244 262 759
Hungary	4.33	3 129 860 199	1 027 391 783	2 102 468 416
Poland	17.61	12 714 118 688	4 173 471 093	8 540 647 595
Portugal	1.88	1 359 497 281	446 261 573	913 235 708
Romania	9.26	6 682 901 998	2 193 694 977	4 489 207 021
Slovakia	2.36	1 701 161 680	558 414 568	1 142 747 112

6.2 Other sources of funding

There are different sources of funding which derive either from the ETS2 revenues or other available EU funding, that could help with the adverse effects of the introduced policies.

Modernisation Fund

The Modernisation Fund exists with the purpose of supporting 10 lower-income EU Member States in their transition to climate neutrality. Of eligible MS, those included in this study are:

Table 6 Allocation of Modernisation Fund in the included MS

Member States	Share as per Annex IIb part A of ETS Directive (sharing 2%)	Share as per Annex IIb part B of ETS Directive (sharing extra 2.5%)
Bulgaria	5.84%	5.0%
Czechia	15.59%	12.9%
Hungary	7.12%	5.9%
Poland	43.41%	34.8%
Portugal	0	8.8%
Romania	11.98%	9.9%
Slovakia	6.13%	4.9%
Greece	0	10.3 %

[4] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0568

Some countries have already allocated an amount of revenues that could help with the adverse effects of policies, while others have not included such measures. This is separately analysed in the country documents.

Recovery and Resilience Facility

This document does not focus on the Recovery and Resilience Facility (RRF) as the main resource for energy poverty alleviation, but some countries do use it for this purpose, therefore it is described in those specific countries.

Just transition fund

The Just Transition Fund is the first pillar of the JTM and supports the territories most affected by the transition towards climate neutrality. It is implemented under shared management and under the overall framework of Cohesion policy, which is the main EU policy to reduce regional disparities and address structural changes in the EU. The fund will be equipped with €17.5 billion (in 2018 prices; €19.2 billion in current prices), while the division among countries is described in Table 8. Whether or not and how much a country uses the JTF to fight energy poverty is a topic described in each of the countries' documents.

Table 7 Allocation of JTF for included MS[5]

EUR mill	Proposed JTF allocation (2018 prices)	Total estimated funding under Pillar 1* (2018 prices)	Estimated expected investments to be mobilized under Pillar 1, 2 and 3** (current prices)
BG	458	1,710	6,205
CZ	581	2,074	7,761
EL	294	1,049	3,923
ES	307	1,397	4,445
IT	364	1,301	4,868
HU	92	330	1,234
PL	2,000	7,692	27,344
PT	79	283	1,058
RO	757	2,704	10,116
SK	162	580	2,170

Not all countries are eligible for the JTM funding, as only coal regions are:

[5] https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/finance-and-green-deal/just-transition-mechanism/just-transition-funding-sources_en

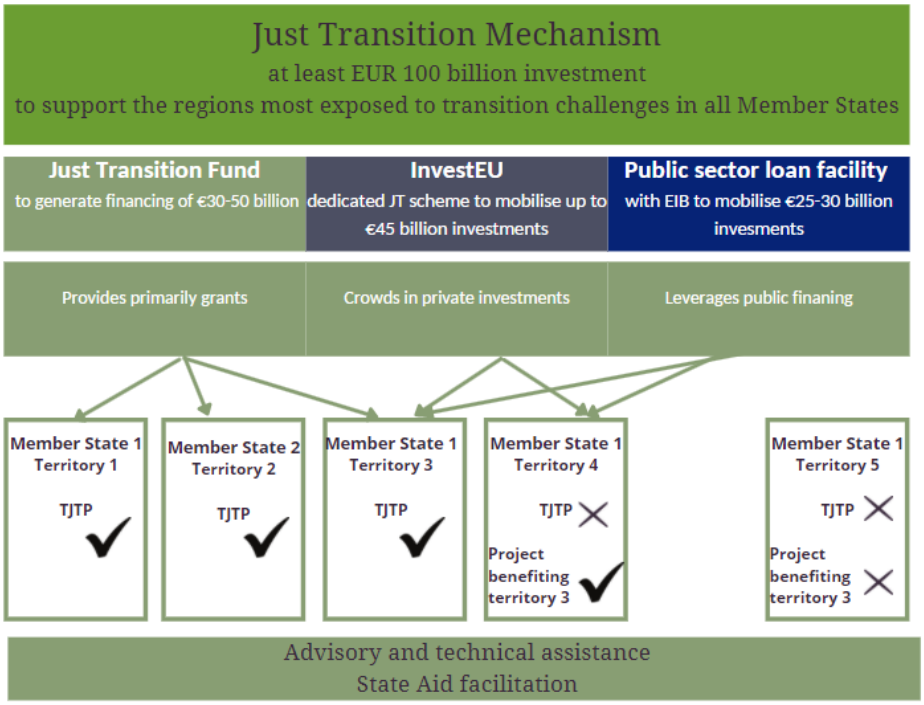

Figure 5 Just Transition Mechanism, source of data EC

6.3 National revenues from the ETS2

The national allocation of revenues from auctions includes revenues that are left after contributions to the Social Climate fund and are calculated based on the MSR1 (ETS2 first scenario) which give the countries information on the available funding. However, they are not directly dedicated to energy poverty alleviation or low-income groups, yet based on the evaluation in country documents, there might be a need to use them to complement the SCF. The common trait is that the majority of the funding for each country will be allocated before 2035 as the total emission cap lowers with time, which can increase the available funding (from the Social Climate Fund) as well as reduce the increased energy costs (from the new ETS scheme) and investment cost requirements in the first period (of MEPS and phasing out of fossil fuel boilers).

Table 8a National net revenues from ETS2 (high ETS prices)

Revenues from net allowances m EUR	Bulgaria	Czechia	Greece	Spain	Italy	Hungary	Poland	Portugal	Romania	Slovakia
2026	527.23	1,468.95	1,169.77	5,575.63	8,388.84	1,205.88	5,150.89	962.91	1,299.15	543.87
2027	363.19	1,011.90	805.81	3,840.84	5,778.75	830.69	3,548.25	663.31	894.93	374.65
2028	275.51	767.62	611.28	2,913.63	4,383.72	630.15	2,691.68	503.18	678.89	284.21
2029	233.73	651.22	518.58	2,471.80	3,718.96	534.59	2,283.51	426.88	575.94	241.11
2030	238.24	663.78	528.59	2,519.47	3,790.68	544.90	2,327.54	435.11	587.05	245.76
2031	257.79	718.24	571.95	2,726.18	4,101.69	589.61	2,518.51	470.81	635.21	265.92
2032	231.44	644.82	513.49	2,447.52	3,682.43	529.34	2,261.07	422.69	570.28	238.74
2033	205.09	571.41	455.03	2,168.86	3,263.16	469.07	2,003.64	374.56	505.35	211.56
2034	178.74	497.99	396.56	1,890.19	2,843.90	408.81	1,746.20	326.44	440.42	184.38
2035	152.39	424.57	338.10	1,611.53	2,424.64	348.54	1,488.77	278.31	375.49	157.19
2036	126.04	351.16	279.64	1,332.87	2,005.37	288.27	1,231.33	230.19	310.56	130.01
2037	99.69	277.74	221.17	1,054.20	1,586.11	228.00	973.90	182.06	245.63	102.83
2038	73.34	204.32	162.71	775.54	1,166.84	167.73	716.46	133.94	180.70	75.65
2039	46.98	130.91	104.24	496.88	747.58	107.46	459.02	85.81	115.77	48.47
2040	20.63	57.49	45.78	218.21	328.31	47.19	201.59	37.69	50.84	21.29
Total	**3,030.02**	**8,442.12**	**6,722.70**	**32,043.35**	**48,210.99**	**6,930.25**	**29,602.36**	**5,533.88**	**7,466.24**	**3,125.62**

Table 9b National net revenues from ETS2 (low ETS prices)

Revenues from net allowances m EUR	Bulgaria	Czechia	Greece	Spain	Italy	Hungary	Poland	Portugal	Romania	Slovakia
2026	201.22	560.63	446.44	2127.94	3201.60	460.22	1965.84	367.49	495.82	207.57
2027	138.61	386.19	307.54	1465.86	2205.46	317.03	1354.19	253.15	341.55	142.98
2028	111.04	309.37	246.36	1174.26	1766.74	253.97	1084.81	202.79	273.61	114.54
2029	100.98	281.35	224.05	1067.91	1606.73	230.96	986.56	184.43	248.83	104.17
2030	90.92	253.33	201.73	961.56	1446.71	207.96	888.31	166.06	224.05	93.79
2031	98.38	274.12	218.29	1040.45	1565.41	225.03	961.19	179.69	242.43	101.49
2032	88.33	246.10	195.97	934.10	1405.40	202.02	862.94	161.32	217.65	91.11
2033	78.27	218.08	173.66	827.74	1245.39	179.02	764.69	142.95	192.87	80.74
2034	68.21	190.06	151.35	721.39	1085.37	156.02	666.44	124.58	168.09	70.37
2035	58.16	162.04	129.04	615.04	925.36	133.02	568.19	106.22	143.31	59.99
2036	48.10	134.02	106.72	508.69	765.35	110.02	469.94	87.85	118.53	49.62
2037	38.04	106.00	84.41	402.34	605.34	87.02	371.69	69.48	93.75	39.25
2038	27.99	77.98	62.10	295.98	445.32	64.01	273.44	51.12	68.97	28.87
2039	17.93	49.96	39.78	189.63	285.31	41.01	175.19	32.75	44.19	18.50
2040	7.88	21.94	17.47	83.28	125.30	18.01	76.94	14.38	19.40	8.12
Total	**1174.07**	**3271.15**	**2604.91**	**12416.16**	**18680.80**	**2685.33**	**11470.33**	**2144.27**	**2893.02**	**1211.12**

6.4 Testing different allocation distributions and allocations to SCF

There are different options for the distribution of allowances which would result in various benefits for each MS. The chosen distribution is based on the average emissions from 2016-2018 and is the one used in the legislative framework. In this study, it was compared to the dataset available from Öko-Institut, presenting the case of distribution based on ESR ambition with an overall target of 40%.

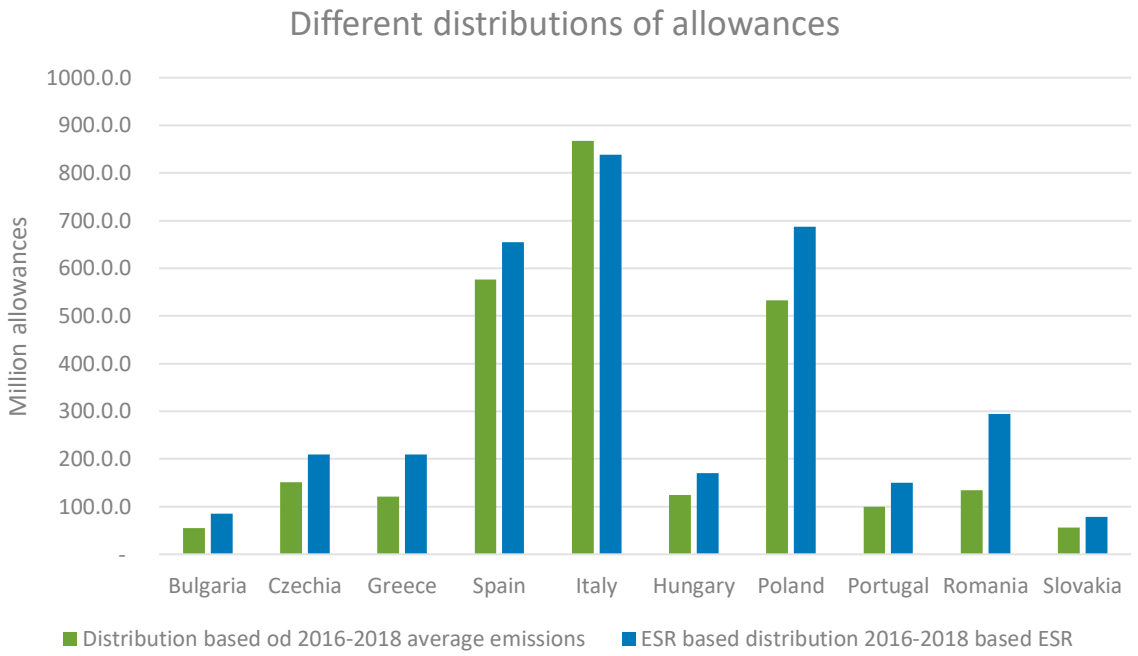

Figure 6 Different distribution of ETS2

The currently proposed ETS2 framework has also been developed to allocate 25% of countries' revenues to the Social Climate Fund and then to allocate it using the methodology for SCF already described. Due to dealing with low-income groups, different methodologies of allocation to SCF have also been tested for the targeted countries as shown in Figure 7 (with different splits). It is obvious that some countries would benefit from different allocation. For instance, with a possible 50/50 split, Bulgaria, Greece, Hungary, Poland and Romania would be slightly better off. In all cases, the amounts allocated are assumed to be used at a 100% financing rate for the low-income groups' investment needs (for changing fossil fuel boilers and energy efficiency upgrading) as we acknowledge that these groups cannot finance the upfront costs. This is a result of low income with a trade-off of heating versus other needs, lack of access to financing and banking facilities, and harder tenure status where the split incentive from both perspectives of landlords and tenants is high enough to not trigger any such investment.

Using the default (existing) scenario, the comparison has been done of all existing funding from ETS2 (SCF + revenues from auctions with high and low revenues) and the investments costs for the existing measures (with moderate and high costs of insulation and heat pumps). It is evident from this evaluation that in some countries, both funds are nearly enough to cover some of the

costs of the analysed scenarios, but only for low–income households. However, it has to be taken into consideration that SCF is dedicated to alleviating transport poverty as well, and, as explained in this study's country documents, includes financial aid/income support to low-income households. Nevertheless, if the revenues from the auctioned ETS2 allowances are low and the current increase of the costs of heat pumps and insulations remains in the medium run, then the envisaged amounts can cover marginally only the low-income groups (see Figures 7 a-c) and for the broader energy poor groups additional funding streams will be required.

Furthermore, funding from auctions of the ETS allowances is generally dedicated to implementing low carbon-related measures in general, in accordance with the priorities of the countries (in the form of general climate or energy efficiency programs), but there is no dedicated amount to the low-income households.

On top of that, the part of the available funding allocated to the residential sector will focus on energy poverty as a whole, which covers a much higher number of households in each country than the specific target group of this study, namely the low-income groups (explained in WS1 and 2 under the first income quintile). With the incumbent energy crisis, a larger share of the population is impacted (also from the second income quintile) and is unable to cover the higher energy costs. If the criterion of allocation of the SCF and other funds is energy poverty, with the various definitions used in several countries, the size of the target groups that fall under energy poverty would differ and would be much higher than the low-income groups, hence the available EU funding would not suffice. Furthermore, given the energy price crisis, the number of households under energy poverty is increasing (irrespective of the national definitions of energy poverty), raising more concerns about the level of available funding. In countries like Czechia, Slovakia and Hungary, the available funding is enough solely for low-income groups, thus higher amounts or different funding sources are required for the higher number of energy poor households.

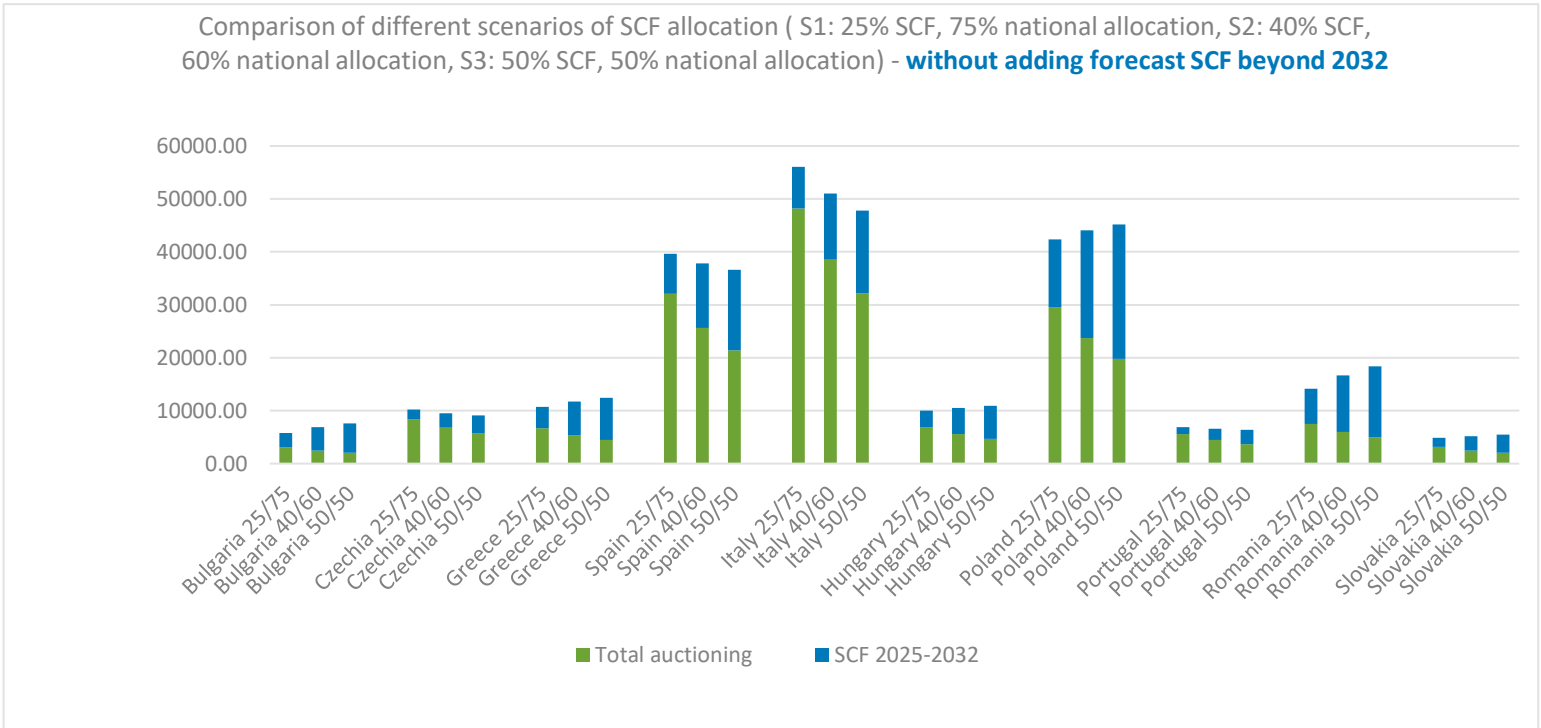

Figure 7 Different SCF allocation scenarios

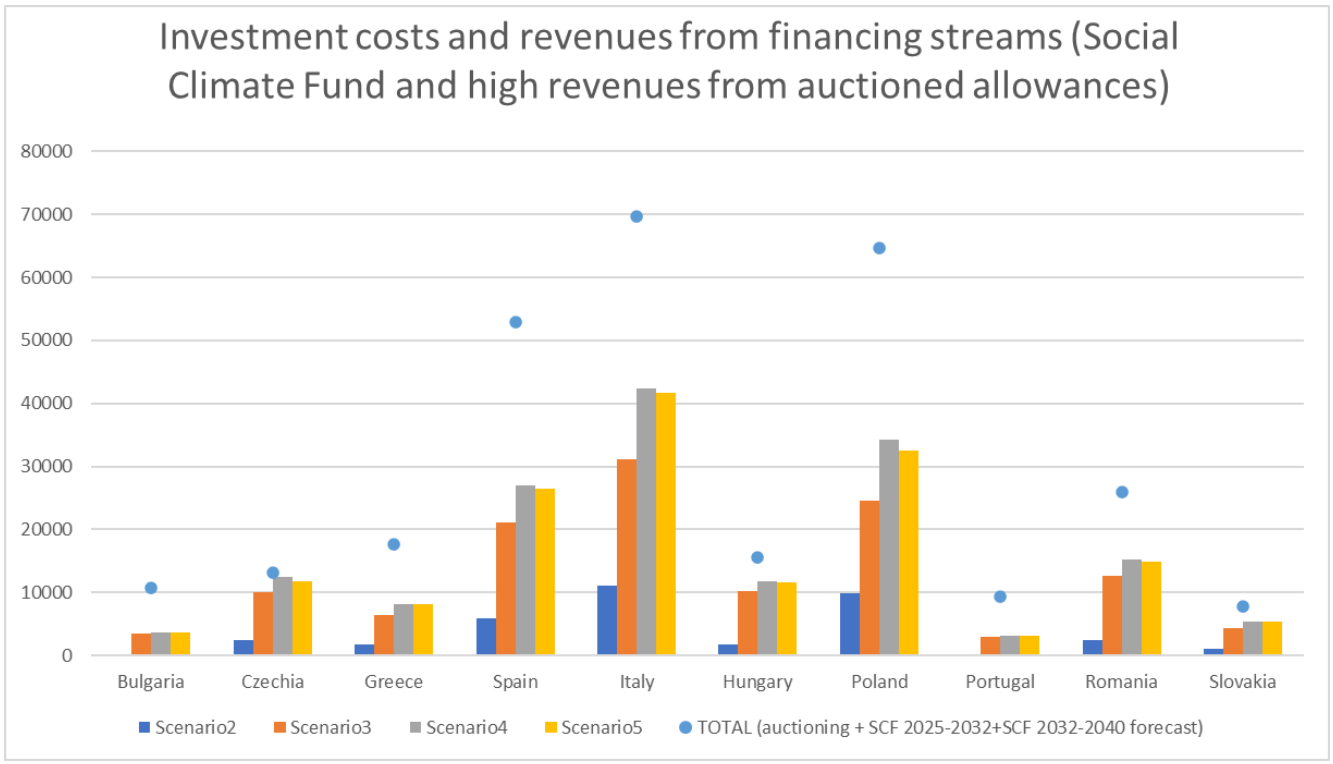

Figure 8a Investment costs against possible SCF and high revenues from auctioning for all scenarios

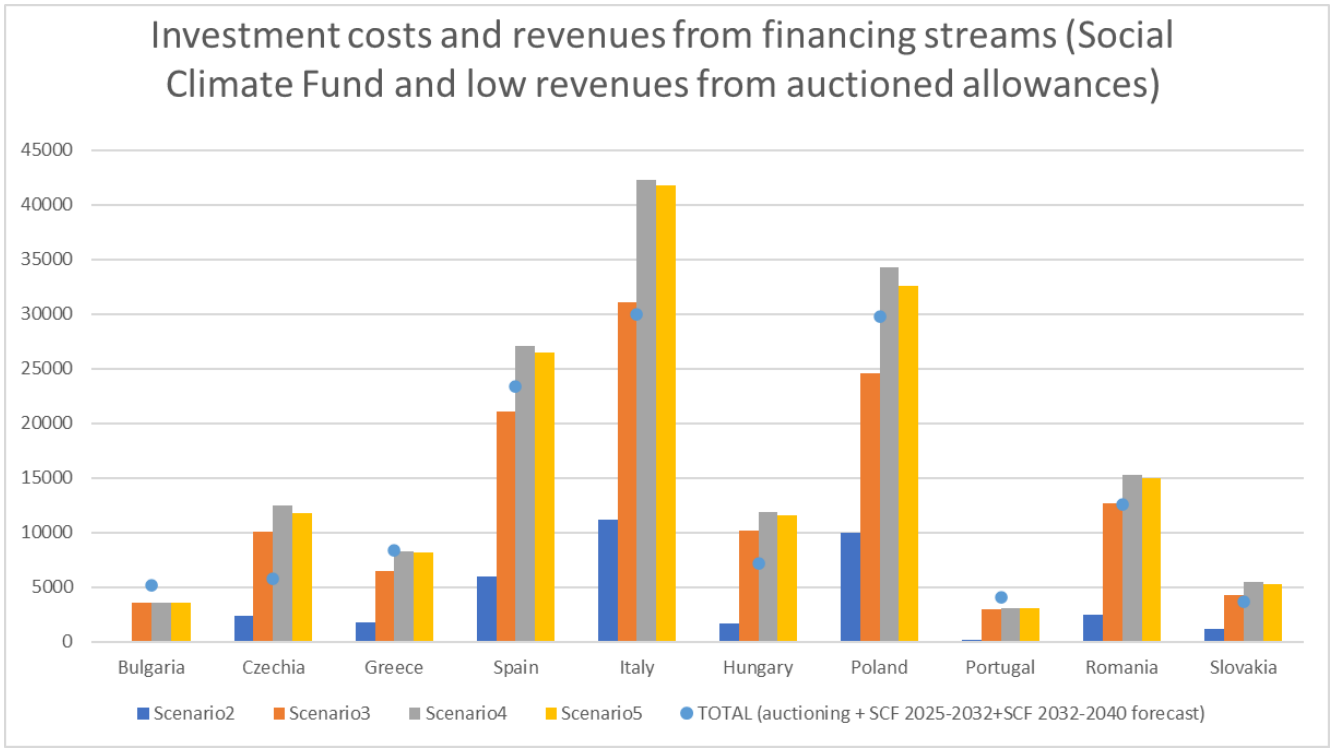

Figure 9b Investment costs against possible SCF and low revenues from auctioning for all scenarios

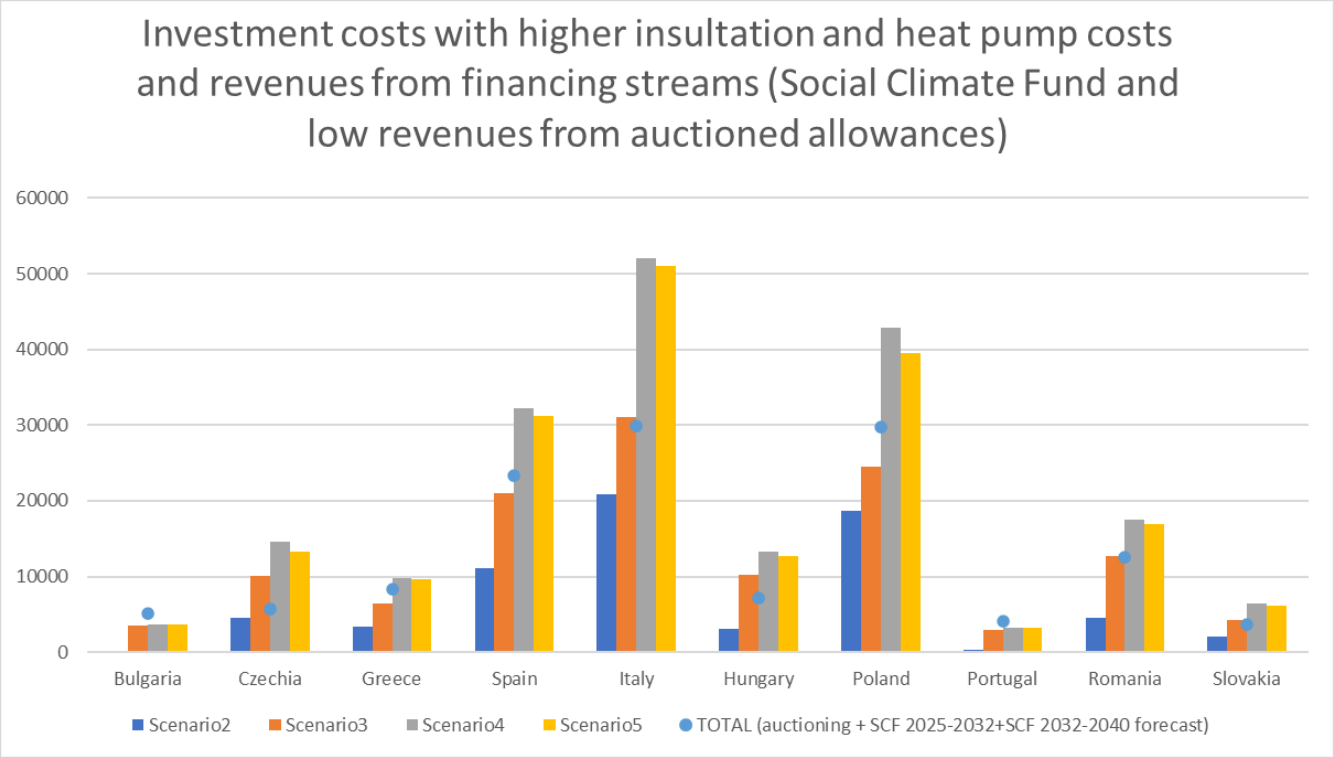

Figure 10c Investment costs against possible SCF and high revenues from auctioning for all scenarios with higher insulation and heat pump costs

6.5 Timing of financing streams

The next element that is important is the timing of the funding streams. As shown in Figure 8 (a-c) the majority of the amounts from both SCF and ETS2 revenues are destined for the initial period up to 2030-2032. The higher requirements for cost coverage are substantially higher in the period 2030-2040 in most countries, which signifies that either a redistribution of the shares of SCF and ETS2 revenues in the second period should be made, or an increase of the targeted amounts for the next period through the new funding streams could be made. Alternatively, a requirement for earmarking amounts from the various funds with a longer time frame (such as the ERDF and others) towards supporting the investments of low-income groups could be implemented. If it is assumed that the costs of the insulation and heat pumps remain high in the coming decade (before the economies of scale appear), combined with lower revenues from ETS2 allowances, then the funding streams would not suffice even for the initial period. This would require that investments are brought forward in time, and hence funds should be used as early as possible in each programming period, while funds with shorter time-span (such as the RRF) should earmark amounts for low-income groups to be launched by 2025.

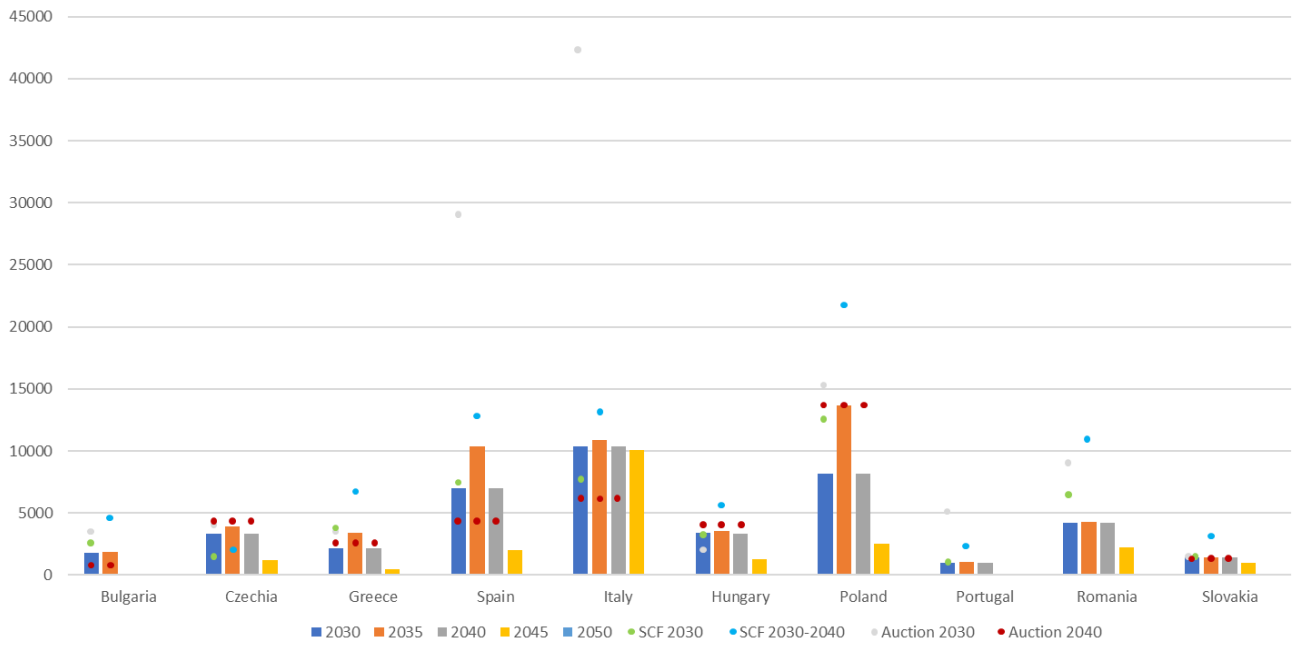

Figure 8a Investment costs against possible SCF and high revenues from auctioning for combination of policies

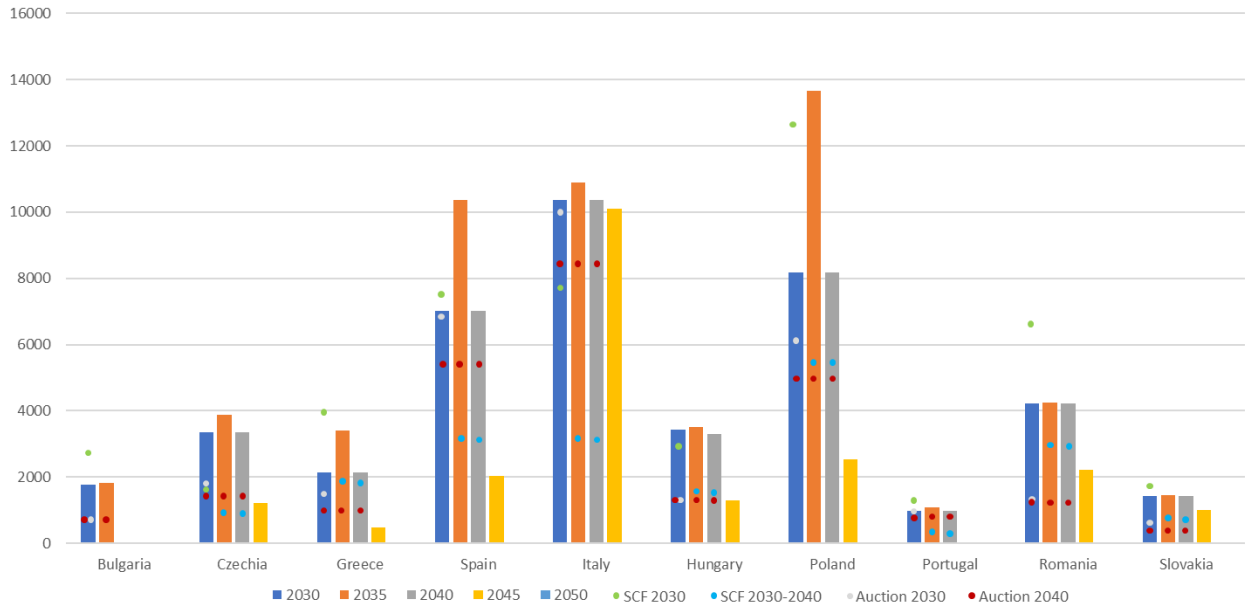

Figure 8b Investment costs against possible SCF and low revenues from auctioning for combination of policies

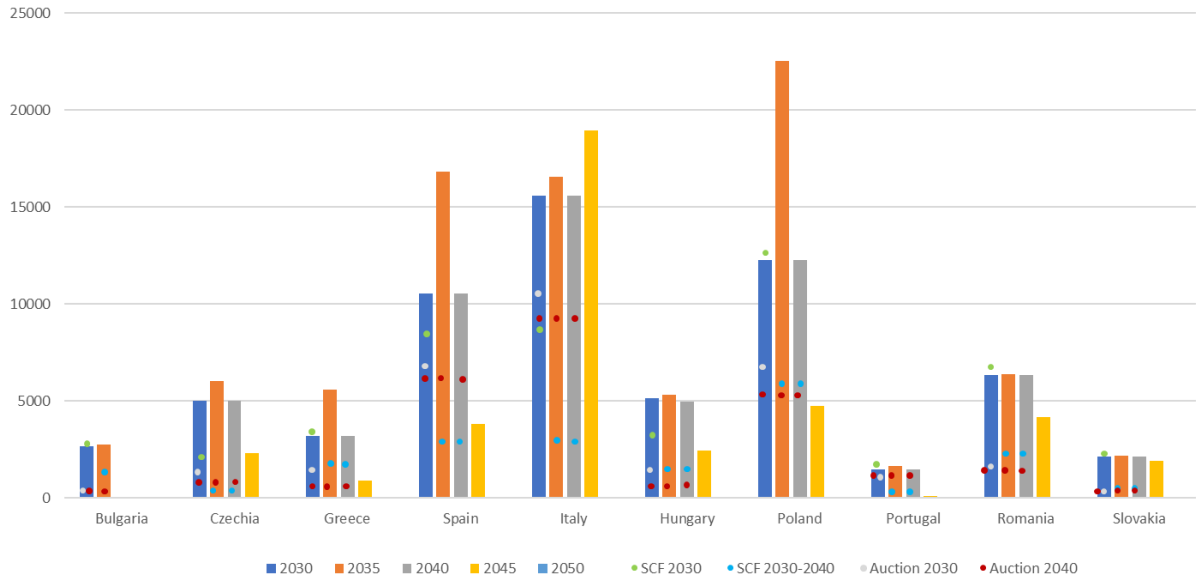

Figure 8c Investment costs against possible SCF and low revenues from auctioning and higher costs for insulation and heat pumps for combination of policies

6.5 Comparison between costs and revenues in the different periods under the combination of policies

The following figure shows a comparison between the required funding for investments in the combination of policies (Scenario 5) with the following assumptions:

- An ETS 2 price projection planned is in line with lower carbon pricing, indicating mixed CO2 reduction measures scenario (MSR REG1),
- It is foreseen that the Social Climate Fund will function as planned in the Regulation, until 2032. As the funding is divided in the streams until 2028 and after 2032, the assumption is that the 2028-2032 expenditure will be linear.

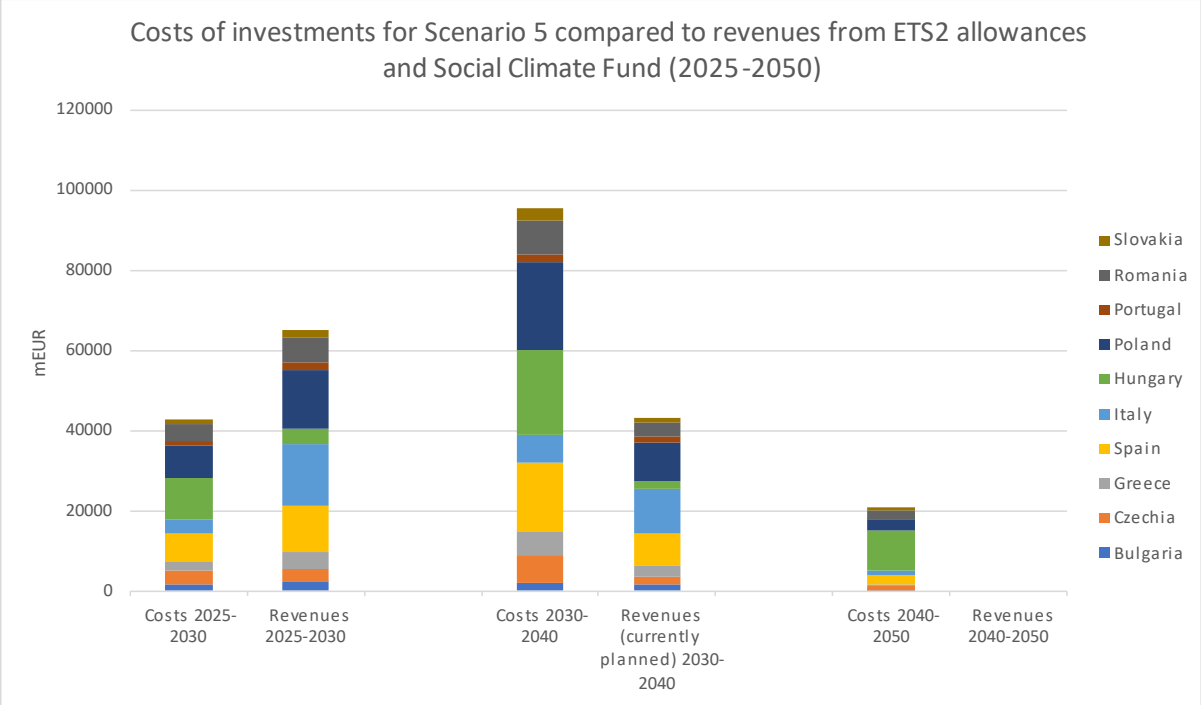

Figure 11 Investment costs against currently planned SCF and currently planned lower revenues from auctioning

7. METHODOLOGY FOR EVALUATION OF EXTERNAL EFFECTS

The prioritisation of multiple benefits, their quantification, monetisation and internalisation are the most important changes in the new European energy policy framework.

Since effects of the policies targeting low-income households are being analysed, it is of even more important to avoid additional burdens and maximise benefits for households which would affect their living environment, health, jobs or social life. Therefore, aside from the impacts on the disposable income and other straightforward energy poverty indicators, additional external effects are also evaluated.

For the evaluation of impacts, due to the fact that the measures are not yet developed in detail, a qualitative assessment is used. This qualitative assessment includes the combination of IEECP research on the indicators of impacts and the use of the H2020 COMBI project tool [6]. Using the COMBI project tool, it is possible to prioritise and evaluate whether measures have the effect which is in line with the EU average, highly above it, or insignificant. If the effects are negative and significant, the mitigation measures should be proposed, or alternative policy instruments should be chosen.

The included impacts are:

7.1 Environmental impacts of the introduced measure

Climate change: The evaluation of the impact on climate change is conducted with solely the mitigation aspect in mind, as the measures are evaluated from the perspective of GHG reduction. For this, the simple methodologies of evaluating the possible saving in emissions deriving from the measures are used. If the measure includes energy savings or energy efficiency, the positive effect on climate change mitigation is straightforwardly indicated. If the measure includes a fuel switch, both the efficiency of energy consumption and the emission factor of the fuels are included in the evaluation. Although climate change does not affect the households directly, low-income categories are most prone to consequences of climate change[7], therefore it is wise to avoid additional long–term adverse impacts of the introduced mechanisms.

Air quality: Energy poverty influences air quality due to the low efficiency of heating equipment, poor quality of used fuels, excessive energy use to sufficiently heat homes and the burning of various polluting materials which are available to help adequately heat the households.[8] The problems of air quality include both external air quality from the chimneys of low-income neighbourhoods as well as internal air pollution from the technically inadequate heating system. Therefore, all of the measures that include improvements in energy efficiency and encourage switching to more efficient heating systems with less PM particles or other air pollutants positively affect air quality. In the case of heat pumps, there are no direct emissions released into

[6] https://combi-project.eu/charts/
[7] https://www.worldbank.org/en/news/feature/2015/02/06/climate-change-complicates-efforts-end-poverty
[8] https://www.euki.de/wp-content/uploads/2019/04/5._A.I.2.-Methodological-framework-for-mapping-energy-poverty-and-assessing-its-climate-impacts.pdf

the air, however, the whole system has to be taken into consideration to ensure that the production of electricity for heat pumps also comes from clean renewable resources.

7.2 Social impacts of the introduced measure

Health & wellbeing: Across Europe, the energy poor population is more likely to report poor health and emotional well-being than the non-energy poor population, with a higher incidence of bad and very bad health, poor emotional well-being, and likely depression.[9] The reasons for this are multiple, from cold homes, damp, mould and draft through doors and windows to the mental effects of constant worries about arrears, price increases, etc. Therefore, if the measure includes energy refurbishment, it changes moisture and dampness in a home, and therefore has positive health impacts, along with measures that will make households adequately warm or warmer. If a measure reduces energy bills, it helps avoid arrears, meaning that is assists mental health. Additional health risks are linked to the above-mentioned air quality, inducing respiratory health issues.

Improved social inclusion: Energy poverty does not only include lack of thermal comfort and energy services, but also influences self-perception[10] and disposable income. These both influence feelings of social exclusion and isolation, the former due to self-isolation and the latter because of the inability to pay for the participation in events. Therefore, the measures that improve the status of the household also positively affects the social life of the household members.

7.3 Economic impacts of the introduced measure

Education, jobs and productivity: If the measure influences job creation, it has positive impacts on the society beyond low–income households, although these households are indirectly targeted. Of the technical sides of the measure, it is not rare that the energy poor have non-adequate energy services in a way that influences their productivity, as better lighting, heating and cooling positively influences productivity and education.

Increased economic activity: Every measure that includes market actors to provide materials or services increases economic activity and positively influences the economy.

[9] Thomson H, Snell C, Bouzarovski S. Health, Well-Being and Energy Poverty in Europe: A Comparative Study of 32 European Countries. *Int J Environ Res Public Health*. 2017;14(6):584. Published 2017 May 31. doi:10.3390/ijerph14060584

[10] Stefan Bouzarovski, Sergio Tirado Herrero, Saska Petrova & Diana Ürge-Vorsatz (2016) Unpacking the spaces and politics of energy poverty: path-dependencies, deprivation and fuel switching in post-communist Hungary, Local Environment, 21:9, 1151-1170, DOI: 10.1080/13549839.2015.1075480

8. FINAL LIST OF CHOSEN POLICY RESPONSES

The final list of the chosen policy responses is described in the table, with details in the country reports.

Table 10 Final list of chosen policy measures

Member States	Policy measures		
Bulgaria	Long-term National Strategy to Support the Renovation of the Building Stock until 2050	Program for energy efficiency in the building stock	Program for financing single measures for energy from renewable sources
Czechia	New Green Savings Program	Boiler Subsidies Program	EFEKT Program
Greece	Exoikonomo Programme		Energy Efficiency Obligation scheme
Hungary	Support for residential solar PV systems and electrification of heating systems in combination with PV panels		
Poland	Clean Air Programme and the Anti Smog Tariff	Thermomodernisation and Renovation Fund	
Portugal	Social electricity and natural gas social tariffs	Efficiency Voucher	Reduction of VAT taxes on energy prices
Romania	Heating aid during winter (Ajutoare pentru încălzirea locuinţei) and subsequent support for vulnerable consumers		Legislation on vulnerable consumers
Slovakia	Green for Households II (Zelená domácnostiam II)	Live Frugally (Bývajte úsporne)	Aid in material need - Housing allowance (Pomoc v hmotnej núdzi)

9. POLICY RECOMMENDATIONS

9.1 Recommendation for additional research

Generally, the final energy consumption of low-income households, including behaviour upon incentives, should be studied more extensively.

- **Funding should be directed towards research on evaluation of price elasticities of low income households to be able to derive precise conclusions on the vulnerability after price increases due to the introduction of ETS2 (and other policies)**. More generally, the non-linearity of their effects should be explored. There is literature on "*heterogeneity in households' reactions to energy price fluctuations*", along with literature showing demand response in average households, but the numbers are not clear per income groups. This is especially relevant as in WS1 the HHI index has been evaluated. As described, the shares of the largest gas and electricity suppliers have been falling across the case study countries, but they remain particularly high in Slovakia, Hungary and Poland (for gas), as well as Czechia, Slovakia and Greece (for electricity). Since the response to the rise in prices would consist of energy efficiency measures, the switch of fuels or switch of suppliers in the case of low-income households in rather closed markets, demand reduction would mainly be a result of consumption reduction. The results therefore show that when taking into consideration average elasticities, if savings in energy expenditure would not originate from the fuel switch and energy efficiency, they must come from lower energy consumption, thus negatively influencing the vulnerability status of the household.

- In this report, the results show the increased costs of fossil fuel boiler bans depending on the energy mix for heating in each country, along with the results in energy consumption and CO_2 reduction (*ref*. WS2). However, the assumptions based on average data determine how long it would take for decisions on the fossil fuel boilers' market ban to be followed by boiler phase-out from the households. Research shows that low-income households might be responding slower to market ban measures, as they use higher discount rates in comparison to the average households due to their use of the discounting gap. This means that **low-income households might prefer (or are in a no-choice situation) short term solutions to investments**. If the replacement rate of fossil fuel boilers for different income groups is not researched and taken into consideration, the data will not be precise on the response to policies.

9.2 Policy development

- **The EU must strengthen the requirement to Member States to implement their policies departing from the Energy Efficiency First principle, hence starting from the MEPS and the switch to efficient heating systems such as heat pumps.** The modelling of the policies was implemented successively. Firstly, the impact of the ETS2 price was calculated, meaning that the energy consumption should be lower in that phase due to price elasticity but this does not constitute a structural effect, rather a reduction of

thermal comfort. The price signals from the ETS2 would not be enough for carrying out investments in the absence of a full-financed compensation mechanism, due to the inability of low-income households to finance investments on their own. The introduction of MEPS was considered in a second phase to estimate the reduction of the final energy consumption. Finally, the phasing out of fossil fuel boilers was examined for the combined assessment of the examined policies. The phasing out consists of primarily banning the sales of new fossil fuel equipment and gradually substituting them (in the presence of funds) to electrification (heat pumps). As the costs of alternatives such as green hydrogen or residuals (e.g., hydrotreated vegetable oils etc) is not certain, these could act as supplementary to heat pumps and speed up the phasing out in rural regions or in regions with upscaled heating grids for hydrogen (at this stage none of the ten countries can demonstrate this). It should be highlighted that the energy efficiency first principle was applied both in the introduction of MEPS and the phasing out of fossil fuel boilers. A meaningful reduction of energy consumption was assumed in the case of MEPS while the installation of heat pumps was considered for replacing existing fossil fuel boilers due to the fact that it is the most energy efficient option. The combination of the examined policy measures can increase the delivered impacts compared to their individual implementation; however the most effective combination of policies differs between countries and should be evaluated prior to implementation.

- **The combination of all three measures can provide a correct signal and generate structural effects to low-income groups.** Although phase-out of fossil fuels seems to be the most cost-effective instrument from the simplified repayment period calculation and the comparison of investments and savings, MEPS is much more important for low-income households. It lowers the energy demand and consequently lowers energy costs required to satisfy the existing thermal needs, but it (compared to other policies) also positively influences thermal comfort, lowering the vulnerability of the low-income households. For the case of the phase-out, low-income households may decide not to install heat pumps but instead to either substitute their existing fossil fuel boilers with other less efficient and potentially more carbon-intensive systems (i.e. biomass stoves) or to magnify energy poverty, lowering the final energy consumption, in which case the national programs supporting phase outs are most significant. The introduction of MEPS should also include an evaluation of the distribution of dwellings now in building class G-F by income/ownership status and the vulnerabilities of owners/renters, as well as the building typology, the urban or rural status, and other non-monetary barriers, to be able to determine co-financing rates in the appropriate national supporting policies.

- **The EU should enforce the calculation of multiple benefits of energy efficiency measures in the introduction, communication and evaluation of the three measures.** When implementing or evaluating policies, multiple indicators should be taken into consideration. It is important to identify possible reductions in energy consumption and energy efficiency improvements as the additional benefits to low-income groups would generate multiple impacts contributing the society in general. These additional benefits must be included in the overall financial calculations of the measures, and this can also lead to a better tackling of the split incentive problem. Furthermore, some MS do not cover single family houses or multiapartment buildings in their programs for multiple reasons (from complexity of administration to the fact that

multiapartment buildings have better simplified repayment results), therefore, it is important to include non-monetary benefits in the policy proposal and evaluation.

- **The policies must trigger the reduction of the thermal comfort loss, hence the ETS2 must be accompanied with energy efficiency upgrades through MEPS.** From the calculations of the baseline, it is obvious that low-income households use around 28% less energy than average households, as shown in Figure . Therefore, it is also clear that they do not achieve normal thermal comfort, but it is visible from the MEPS calculation that the achieved savings would be around 33% (ref. country documents in the Report No2). With the implementation of MEPS, low-income households could achieve normal (average) thermal comfort and have the same expenses as they currently do.

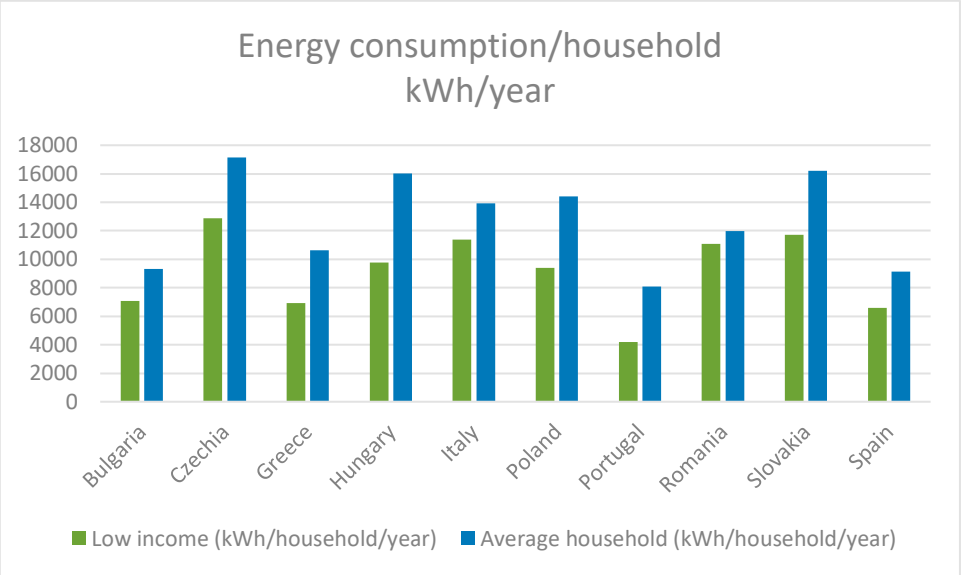

Figure 9 Comparison of the current consumption between average and low income

- **The role of taxation and excise duties on electricity for the low-income households is important and support is required to avoid reduction of thermal comfort, in the absence of structural measures.** For modeling and forecasts, the ETS1 price from the official EU level scenarios was used until 2050, considering the long-term balancing of the system volatility. The current level of carbon prices in ETS1 is above €80/tCO_2 in 2021 due to the increase experienced in recent years from below €20/tCO_2 just until three years ago (2018). The price of electricity in comparison to other fuels derives from electrification and the phase out of fossil fuel boilers. It is thus important to consider the excise duties linked to electricity from the side of production and consumption. Testing different prices of electricity shows that with the reduction of electricity prices in 2035 by 10% compared to 2030, the final energy consumption increases, while the costs will be reduced (as shown in the example from Italy for 2 different scenarios below). This demonstrates the situation where the citizens would respond to changes in electricity prices with higher consumption, which would increase their comfort level and not the expenditure. It is also important to emphasize that the electricity price incentive might motivate citizens to switch from other fuels, contributing faster pace of boilers' switch.

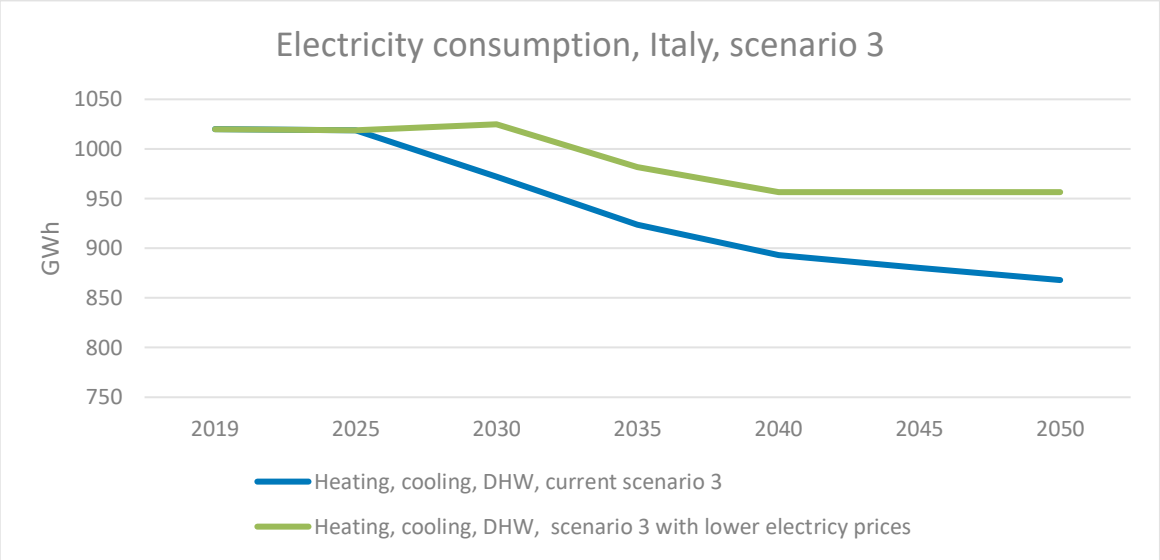

Figure 10 Electricity consumption differences based on different prices

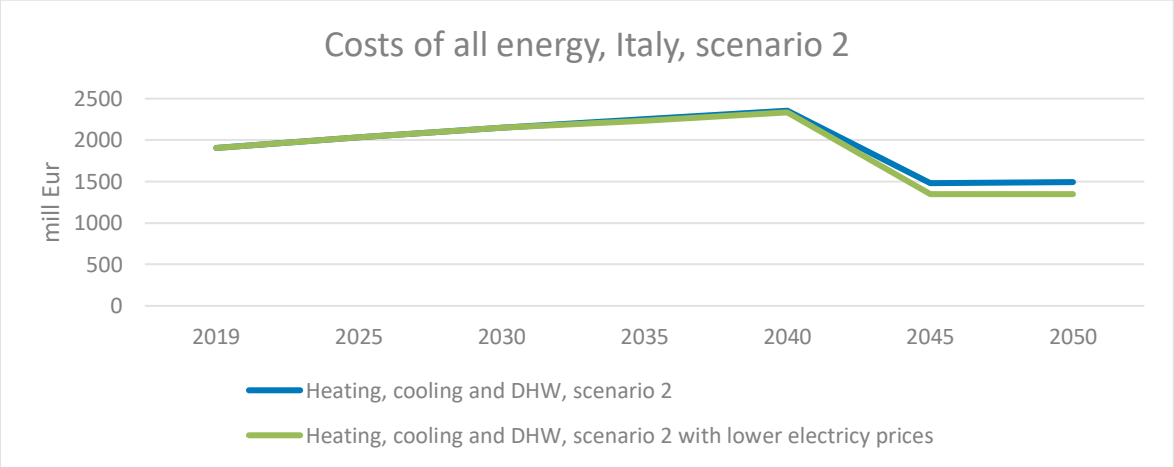

Figure 11 Total energy costs in cases of different electricity prices

- **It is important to develop the evaluation criteria for the determination of success of policies in low-income groups beyond simplified energy savings based on known MRV methods.** These could be aligned with the EPOV indicators of vulnerability.

  This is mostly relevant for MEPS and the renovation of the worst-performing buildings as it has already been studied that these buildings are mostly occupied by low-income households. The link with energy poverty is clear and the numbers have been used as such. However, it is important to distinguish possible reductions in energy consumption and energy efficiency improvements:

  - Several studies have illustrated the prebound effect in these buildings, i.e. that occupants do not heat their dwellings to the usual comfort standard, mostly

because they cannot afford it. Therefore, fewer rooms are heated, for shorter periods, and possibly to lower temperatures.

  - This does not mean that renovations will not deliver energy efficiency improvements but it does mean that these energy efficiency improvements will not necessarily lead to reductions in energy consumption. Likewise, it may not necessarily lead to reduction in energy bills (especially if energy prices increase due to ETS or other factors), but occupants will surely benefit from a better comfort.

- **It is important to analyse the distributive effects of the overall energy transition package and not only the extended ETS**. It is indeed essential to prevent the effects of policies that will increase energy prices, but there can be other distributive effects by which the revenues should be distributed (for example, low-income households would benefit more from direct incentives, while higher income would from tax reduction etc.).

- **The funding streams must be revisited and requirements in including actions for energy poor groups should be added**. Calculations show that different distributions of Social Climate Fund have different effects on included countries, therefore SCF allowances and revenues distribution should be evaluated after the first period of implementation. In light of the ongoing energy crisis and the expansion of energy poverty across Europe, an important element to consider is that the Social Climate Fund should be able to cover the increased costs for the low-income groups irrespective of the policies implemented, and hence should not be linked to ETS2 only. Moreover, the highest energy and investment costs in all countries are in the period 2035-2045. Therefore, the SCF duration can partly capture the increased costs (both energy and investment costs) of the low-income groups until 2032, and new follow-up mechanisms would be required (in the case that the amounts allocated from the ETS2 auctions does not suffice).

9.3 Policy implementation

- The total costs of the introduction of policies are evaluated on national levels and by that, **the distribution of additional funding (besides the Social Climate Fund) should be included to avoid adverse effects on low-income households**. Otherwise, interventions would influence low-income groups with welfare loss (higher expenditure as compared to income). Numbers for compensating variation are very high in some countries.

- **National Social Climate Plans in their evaluation should be cross-checked with how they answer the challenges deriving from the introduction of these policies**. They should also demonstrate the types of investments that they will cover (on substitution of boilers or energy efficiency upgrades) and the extent to which they can address both low-income groups and broader groups under energy poverty resulting from the new policies. From the procedural point of view, they will also need to recognize energy poverty and develop appropriate indicators (for the countries that have not submitted their National Energy Poverty Action Plans) with relevant stakeholders.

- **The Recovery and Resilience Funding, in addition to the other funding streams, should earmark a specific amount in their overall energy efficiency and climate measures for low-income households.** Most RRF plans in the ten countries do not foresee concrete actions or budget allocations for low-income groups and regions or energy poverty alleviation. Indirectly, they include a budget for the overall broader energy efficiency programs (with assumptions of 40-50% financing rate), but it is important to provide more targeted support to low-income groups from these programs with higher financing rates. Alternatively, a dedicated section in RRF plans could provide means for guarantees to banks for the unhindered financing for low-income households. Finally, the duration of the RRF funding might not be adequate to cover the increased costs of the measures (which are mostly required for the period 2030-2040).

10. ANNEX – COUNTRY REPORTS

10.1 Bulgaria

Implementation of the policies would require funding for the mitigation of adverse effects on low-income households. Depending on the type of measure introduced, different funding is available for the alleviation of adverse effects. When considering the scenarios including ETS2 development, MS shall rely mostly on the funding from the SCF, however, as other funding streams do not directly target vulnerable or low-income households, the decoupling between SCF and ETS2 is one of the first EU level recommendations. With the current SCF proposal and the regulation on other funding resources, the possible sources of funding are evaluated below.

Social Climate Fund

The objectives of the EU Social Fund (€72 billion) are to a) finance temporary direct income support for vulnerable households and b) support measures and investments that reduce emissions in the road transport and buildings sectors and therefore reduce costs for vulnerable households, micro-enterprises and transport users. Spending should be frontloaded to precede and accompany a smooth introduction of the new ETS, but this does not cover scenarios without the ETS2 introduction. The amount of €48.5 billion for 2028-2032 is subject to the availability of the funds under the annual ceilings of the applicable multiannual financial framework.

The Fund will be operational as of 2025 and Bulgaria must finance at least 50% of the total costs of the Social Climate Plans. The amount attributed to Bulgaria is €2.78 billion for the period 2025-2032, based on the share of 3.85% for the country (according to the Regulation of the Social Climate Fund). If the available funding does not match the costs of the introduction of ETS2 and related measures, additional funding is required. It can come from the resources linked to ETS2 or others. As visible from the description of the Fund, it could cover multiple type of measures, including building renovations, electrification and financial aid. The final application will depend on the national Social Climate Plan, but the possible financing of the combination of measures supports the idea of scenarios where all policies are combined and co-financed.

Recovery and Resilience Funding

Bulgaria will receive an amount of €6.6 billion from the RRF. The indicative cost estimates needed to achieve the objectives of the low carbon development amount to a total of BGN 8 420.7 million (€4,309.23 million), of which BGN 4,368 million (€2,235.29 million) are on behalf of the Recovery and Sustainability Mechanism while the rest is national co-financing. One of the objectives of this component is the development of a definition and criteria for "energy poverty" for households in the Energy Law for the purposes of market liberalization and financing of energy efficiency projects in vulnerable households. What could be financed is described in the plan description, but aside from administrative reform in defining the energy poverty, MEPS-related measures and energy efficiency in buildings in general are major components of RRF.

Revenues from auctioned allowances

Bulgaria will receive €3 billion from the revenues of auctioned allowances in 2026-2040 (which are net from the national contributions, the Innovation Fund and the SCF). These revenues will stream predominantly (€2.6 billion) in 2026-2035, which can assist in covering financing gaps for low-income groups in the form of social policies. However, the revenues could be spent based on the priorities of the country and are not dedicated only to low-income households, but to the low-carbon measures in general. One of the priorities could be covering of phase-out expenses or MEPS implementation, only in cases where the ETS2 is combined with one of those measures.

Modernisation fund:

The funding from the Modernisation fund for Bulgaria, as one of the eligible countries, consists of the revenues from the auctioning of 2% of the total allowances under the EU ETS. It is estimated as a total amount of €398 million. The key elements that must be checked prior to allocating the modernisation fund for the low-income groups are to i) provide evidence that the investment proposal is in line with the State aid rules; ii) confirm that the investment complies with any other applicable requirements of Union and national law and; iii) confirm that there is no double funding of the same costs with another Union or national instrument.

MS mainly do not finance low-income related energy issues from MF, but it is not ineligible as energy efficiency in buildings is one of the targets. However, from the ongoing approved projects, there are no projects from Bulgaria.

Just transition fund

Using the method for calculating the fair, balanced and effective distribution of the Just Transition Funds resources, Bulgaria is allocated €458 million from the JTF (plus the total estimated funding under Pillar 1 of the Just Transition Mechanism of €1.710 million, including estimated investments for pillars 1,2,3 of €6.205 million).

Costs from introduction of scenarios

The costs that need to be financed by the various funding streams and the specific policy instruments to do that (See below) consist of investment costs (technology and installation costs for boilers and energy refurbishments) and also costs to consumers from the increased energy prices. The investment costs should normally be financed through various policies and subsidy schemes from the state budget, and they should reach a very high or maximum financing rate (over 95% up to 100%) as the category of the population to which we refer are low-income groups (first quintile of the income categories). These groups cannot use own their financing means for such investments and they are the ones locked-in to using fossil fuel technologies, living in low-insulated buildings and cannot carry out changes due to the higher split incentive problem (as their landlords might object to undertaking investment costs) and other known barriers (see WS1 report). The investment costs required from the five scenarios are presented below.

Table 11a Investment costs for different scenarios

Scenario 2	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**Total**
	Heat pumps	0	0	69	0	1	0	70

Scenario 3	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Building envelope	0	1,768	1,768	0	0	0	3,536
Scenario 4	**Investments (m EUR**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Heat pumps	0	0	69	0	1	0	
	Building envelope	0	1,768	1,768	0	0	0	
	Total	0	1,768	1,837	0	1	0	3,606
Scenario 5	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Heat pumps	0	0	60	0	1	0	
	Building envelope	0	1,768	1,768	0	0	0	
	Total	0	1,768	1,828	0	1	0	3,596

The highest costs are presented, and reflect expectations since they require technological change when the banning of fossil fuel boilers is combined with the Minimum Energy Performance Standards (Scenario 4) and also when the latter are combined with the ETS 2 on heating fuels (Scenario 5). The respective policies (see below) should also aim for the largest financing gap in the 2030-2040 period, where the majority of the funds must be delivered. For instance, the SCF will last until 2032 and thus the other funds will need to cover the gap for these investment costs.

Nevertheless, it is important to consider that in case i) the costs of heat pumps remain high up to 2030, thus hindering the full effects of the economies of scale, and ii) the costs of the insulation materials remain high, then the investment costs in all scenarios would be substantially higher and the existing funds would not be able to cover the required financing gaps (see Table below).

Table 12b Investment costs for different scenarios with higher costs

Investments (million €)	2025	2030	2035	2040	2045	2050	Total	Increase
Scenario 2	0	0	129	0	2	0	131	88%
Scenario 3	0	2652	2652	0	0	0	5304	50%
Scenario 4	0	2652	2781	0	2	0	5435	51%
Scenario 5	0	2652	2765	0	2	0	5418	51%

In terms of costs from energy price increases, if Bulgaria will implement a social support policy framework (such as on-bill financing or cost coverage to low-income groups from higher energy costs), then the total energy costs passed on to consumers on a yearly basis and cumulatively (upon which a support scheme could be based) are presented below.

Table 13 Energy costs

Total energy costs (m EUR)	**2019**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**Total**
Baseline scenario	43	45	45	45	46	46	47	317
Scenario 1	43	45	45	45	46	47	47	318
Scenario 2	43	45	45	43	44	44	45	309
Scenario 3	43	45	40	36	36	37	37	273
Scenario 4	43	45	40	30	30	30	31	249
Scenario 5	43	45	40	30	30	30	31	249

In all scenarios, except the fossil fuel boilers phase out, the low-income groups will reduce their energy costs cumulatively in the long run. For the ETS2 (Scenario 1) and phasing out of fossil fuel boilers (Scenario 2), there will be a requirement to support the low-income households due to the increase in energy costs for such years (calculated as the difference of the energy costs in the scenario with the baseline costs) as shown in Table 14.

Table 14 Energy costs difference from baseline

Energy costs difference from baseline (m EUR)	**2030**	**2035**	**2040**	**2045**	**2050**
Scenario 1	0.00	0.00	0.00	5.30	0.00
Scenario 2	0.00	62.57	-10.61	-9.54	-10.61

More specifically, in the period 2030-2040 an extra support of €63 million will be required to cover the increased bills of households (in the phasing out of fossil fuel boilers) and €5.3 million for the period 2040-2050 (in the case of ETS2).

Adverse impacts of policy introduction on low-income groups

Based on the methodology described in the introductory part of this report, we calculate the compensating variation of the household or the rise in income that the household would need to cover the expenses introduced. The expenditure side of the calculation includes both energy expenditure and the expenditure for investments for the specific scenario introduced in comparison to the baseline scenario. The income remains the same as in the baseline scenario, forecasted from the available income data.

Table 15 Adverse impacts of policy introduction per household

Rise in income needed to cover both variation in energy price and the cost of scenario								**AVG (EUR)**	**Share in income (%)**
Year	**2019**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**		
Scenario 1			0.00	0.00	0.00	5.30	0.00	1.06	0.03
Scenario 2			0.00	62.57	-10.61	-9.54	-10.61	6.36	0.21
Scenario 3			1,847.19	1,826.14	-52.55	-50.34	-53.49	703.39	22.94
Scenario 4			1,847.19	1,869.26	-83.53	-82.25	-86.67	692.80	22.60
Scenario 5			1,847.59	1,858.47	-83.99	-82.67	-87.04	690.47	22.52

To be able to cover the expenses of an energy expenditure change and share of costs for covering the implementation of policies, without the measures/instruments introduced, low-income households in Bulgaria need a rise in income of around 0.1% for the first two scenarios and 22% in scenarios 3,4 and 5. This means that the average yearly household income would have to rise by €1 in Scenario 1, €7 in Scenario 2, but around €700 for Scenarios 3,4,5 of the €3,065 average projected income for low-income groups to 2050. Taking into consideration that the disposable income is the most important primary indicator of energy poverty, this result would move additional number of citizens into vulnerable groups. Therefore, it is of highest importance to use the available funding to create measures to avoid adverse effects on households, as the low-

income households react to lower disposable income with negative impacts on arears, comfortability and causally with worsening of their social life and health.

Policy instruments

The three most important policy instruments that can play a role for alleviating the costs of low-income groups during the implementation of the three policies are the following:

Measure	**Long-term National Strategy to Support the Renovation of the Building Stock until 2050**
Description	Long-term National Strategy to Support the Renovation of the Building Stock until 2050 Relevant policy measures: - To establish a National Decarbonisation Fund as the main financial scheme in support of the Bulgarian long-term renewal strategy. - To create a unified system for collecting information for the purposes of the implemented social policies concerning energy vulnerable groups of the population and providing suitable financial instruments whilst maintaining a 100% grant component within targeted social policies.
Proposal of changes	The development and adoption of a national definition of energy poverty is critical to creating workable tools and policies to address the negative impacts of the policies to decarbonise residential buildings on vulnerable households and achieve a just green transition.
Evolution of measure	The measure is introduced in the new framework.
Additional funding	The financial instruments of the programme are under preparation.
Start year and duration	2021-2050

Measure	**Program for energy efficiency in the building stock. Project 9a "Support for sustainable energy renovation of the housing stock".**
Description	The focus will be on multi-family residential buildings nationwide. Planned policy measures: - To establish one-stop shops to provide support to the beneficiary homeowners' associations. - To provide 100% subsidy for the cost of the renovation works for homeowners' associations that apply for the programme until 30/09/2022 and 80% subsidy for the cost of the renovation works for homeowners' associations applying for the programme from 01/10/2022 to 01/03/2023. At a later stage, to implement a financing model that will include as a component additional targeted financial aid provided to socially vulnerable homeowners.

Proposal of changes	There is a need to provide also funding for the energy renovation of single-family residential buildings, which house a great share of the population in Bulgaria. Moreover, a significant part of energy-poor households lives in this type of housing, which requires special policy attention.
Evolution of measure	The possibility since the beginning of the programme to scale up the financial aid according to the profile of beneficiary households and keeping the 100% grant only for energy-poor households has been discussed among various stakeholders and proposed to the national authorities.
Additional funding	Planned as part of the National Recovery and Resilience Plan. Not yet approved by the EC.
Start year and duration	2021-2027

Measure	**Program for financing single measures for energy from renewable sources in single-family buildings and multi-family buildings that are not connected to heat and gas networks**
Description	Planned relevant policy measure: - To provide funding for the construction of solar systems for domestic hot water and for the construction of photovoltaic systems up to 4 kW with battery storage (with additional energy needs met through the grid). Households eligible for direct heating allowances on their energy bills are expected to receive a 100% grant.
Proposal of changes	The important and well-designed programme for small scale renewables with 100% of subsidy for energy-poor households within the National Recovery and Resilience Plan must be accompanied by energy efficiency measures at residential building level. The LIFE-IP Clean Air programme for the implementation of a scheme for the transition to alternative forms of household heating must also be accompanied by energy efficiency measures at residential building level.
Evolution of measure	The measure is introduced in the new framework.
Additional funding	Planned as part of the National Recovery and Resilience Plan. Not yet approved by the EC.
Start year and duration	2021-2027

The analysis of impacts of the proposed measures

Environmental impacts of energy efficiency measures

Climate change: All three measures deal with energy efficiency or renewable energy, and have high impact on climate change mitigation in Bulgaria. When looking at the COMBI tool dataset,

direct CO_2 emissions are not as high from residential buildings as they are from transport, but the implementation of such measures still largely influences Bulgaria's total emissions.

Air quality: Similar to CO_2 emissions, the influence of the transport sector is higher for PM particles, however the residential sector's refurbishment offsets potential PM. This is also relevant for the fuels used in heating as the fuel switch ensures reduced PM particle emission.

Social impacts of energy efficiency measures

Health & wellbeing: All of the proposed interventions aim to improve the overall health and wellbeing of residents through interventions in the form of improved thermal insulation and retrofitting of buildings, thus occupants should see an increase in their comfort of living. The reduction of the cost of living for the two first measures (reflected in reduced energy bills) also benefits their wellbeing. In this case, replacing old boilers with efficient ones can have positive impacts on health and wellbeing by providing better living conditions (ability to keep home at adequate temperature). Energy efficiency measures can also have positive impacts in terms of mental health as households can generate energy savings and avoid arrears on energy bills.

Improved social inclusion: The energy-bill cost reductions introduced through the proposed measures lead to higher disposable income and buying power of its residents.[11] Energy savings provide fewer energy bills and enhance social inclusion by allowing households to spend on other goods and services as "feelings of social exclusion and isolation (…) extend beyond the traditional impacts of energy poverty (health risks, restricted available income, indebtedness, risk of disconnection from suppliers, etc.) and hint at the systemic implications of the everyday experience of domestic energy deprivation."[11]

Economic impacts of energy efficiency measures

Education, jobs, and productivity are all promoted and touched upon in one way or another through the wide range of interventions proposed including the retrofitting of buildings (specifically residential with new windows for better lighting), thermal insulation and living comfort for improved education and productivity, as well as the stimulation of RES creating jobs.

Increased economic activity: Through the retrofitting and renovation activities of residential buildings, many market actors ranging from (building) contractors, energy service providers installing new PV and larger scale distributed RES (wind/solar parks amongst others), policy makers, and regulators are all necessary and assigned work bringing significant economic activity to the region where works are performed. In 2017, the European Commission provided four different scenarios that assess increased targets for the EU's 2030 energy efficiency target. For the GDP impact, each scenario resulted in a positive change, from a 0.1%-2% increase in GDP in the least ambitious and most ambitious scenarios of increased energy efficiency respectively.[12]

Education, jobs, and productivity: Data has shown that energy efficiency provides more job opportunities in Europe.[13] Cost-effective energy efficiency improvements can also have positive impacts by boosting economic activity that can turn into higher employment rates. A 2016 study

[11] https://www.tandfonline.com/doi/full/10.1080/13549839.2015.1075480
[12]http://www.buildup.eu/en/practices/publications/ec-report-macro-level-and-sectoral-impacts-energy-efficiency-policies-0
[13] https://ec.europa.eu/energy/sites/ener/files/documents/CE_EE_Jobs_main%2018Nov2015.pdf

assessed the impact of the EU's Ecodesign Directive projects on the efficiency measures developed, which would lead to 0.8 million additional jobs by 2020. Energy service companies and energy utilities are the two main players and therefore employers within the sector, which employ more than 1 million people globally[14], but this figure will grow with the adoption of energy efficiency policies.

Impact analysis

Environmental	Positive
Social	Positive
Economic	Positive

Links and co-benefits between the measures

These three measures complement each other as they are all centred around energy efficiency or include both energy efficiency and refurbishment, providing specific and adaptive measures for households and/or vulnerable households. It is important that they interact so that firstly, the framework of energy vulnerability is determined and that secondly, the EE1st principle is implemented so that refurbishment is carried out in buildings that apply for fuel changes.

Recommendations for procedural dimension

The distributional dimension of vulnerability includes, inter alia, energy affordability and energy efficiency assessed in *Workstream 2*, while procedural elements include the recognition of energy poverty as a clear problem in policy documents, the presence of an official definition of energy poverty, and the development of clear indicators to measure the problem. Although Bulgarian legislation does not define vulnerability, it is obvious from the description of the first planned policy that they wish to create a unified system for collecting information for the purposes of implementation of social policies concerning energy vulnerable groups and providing suitable financial instruments to deal with the issue. As such, collecting and developing data are crucial parts of the legislation. In addition, experts agree that the development and adoption of a national definition of energy poverty is critical to creating workable tools and policies to address the negative impacts of the policies and to decarbonise residential buildings inhabited by vulnerable families while achieving a just green transition.

Conclusions

Chosen policies adequately respond to the challenges of the introduction of new policy measures, they are mostly relevant in covering the MEPS effects and trying to help citizens in introduction of MEPS and phase out of fossil fuel boilers with alternatives. Experts agree that the direct financial aid to compensate the high energy prices is inefficient. It is more economically and socially efficient to target direct subsidies for energy-poor households towards improving the energy status of their homes, thereby achieving more sustainable and long-term results in terms of reducing energy costs and improving living conditions. Experts also agree that a need to change the national policy and put more incentives to enable and empower the households so that they can take the initiative in general. The more decentralised the process, the more effective it is expected to be.

[14] https://ec.europa.eu/energy/sites/ener/files/documents/eia_ii_-_status_report_2016_rev20170314.pdf

10.2 Czechia

Of the available funding for the mitigation of the impacts of policies, Czechia relies mostly on funding from the Social Climate Fund and remaining amounts of auctioned allowances, however, as other funding streams do not directly target vulnerable or low-income households, the decoupling between SCF and ETS2 is one of the first EU-level recommendations.

Social Climate Fund

The objectives of the EU Social Fund (€72 billion) is to a) finance temporary direct income support for vulnerable households and b) support measures and investments that reduce emissions in road transport and buildings sectors and as a result reduce costs for vulnerable households, micro-enterprises and transport users. The spending should be frontloaded to precede and accompany a smooth introduction of the new ETS, but would not cover policy scenarios without the ETS2. An amount of €48.5 billion for the period 2028-2032 is subject to the availability of the funds under the annual ceilings of the applicable multiannual financial framework. The Fund will be operational as of 2025 and Czechia must finance at least 50% of the total costs of the Social Climate Plans. The amount attributed to Czechia is €1.7 billion for the period 2025-2032, based on the share of 2.4% for the country (according to the Regulation of the Social Climate Fund). The amount between 2025-2027 is of €569,754,460, and the period of 2028-2032 amounts to €1,165,953,219. If the available funding does not match the costs of the introduction of measures, additional funding is required, which can come from the resources linked to ETS2 or others.

Table 16 Allocation of SCF to Czechia[15]

Member State	Share as % of total	TOTAL 2025-2032 (in EUR, current prices)	Amount for 2025-2027 (in EUR, current prices)	Amount for 2028-2032 (in EUR, current prices)
Czechia	2.40	1,735,707,679	569,754,460	1,165,953,219

As visible from the description of the Fund, it could cover multiple types of measures, including building renovations, electrification and financial aid. The final application will depend on the national Social Climate Plan, but the possible financing of the combination of measures supports scenarios where all policies are combined and co-financed.

Recovery and Resilience Fund

Czechia will receive €7 billion from the RRF. Czechia's plan devotes 42% of its total allocation to measures that support climate objectives. The plan includes investments in renewable energy, the modernisation of district heating distribution networks, the replacement of coal-fired boilers

[15] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0568

and improving the energy efficiency of residential and public buildings, including childcare and social care facilities (total size at €1.4 billion).

Revenues from ETS auctioned allowances

Czechia will cumulatively receive €8.2 billion (in 2026-2040) from the auctioned allowances (that are net from the contributions to the Innovation Fund and the Social Climate Fund). The first €2.7 billion will be received as revenues in the period until 2030 which can be spent for general purposes (hence contributing to the social policies for the energy price increase).

Table 17 Revenues from auctions

Revenues from auctions of national allocations

Year	Czechia	Central_MSR1	Revenues	Revenues without SCF
2026	25.7	74.2	1,903.2	1,468,95
2027	17.7	85.1	1,502.0	1011,90
2028	13.4	111.9	1,495.9	767,62
2029	11.3	106	1,200.5	651,22
2030	11.5	140.2	1,618.7	663,78
2031	12.5	152.2	1,902.8	718,24
2032	11.2	180.1	2,020.4	644,82
2033	9.9	199.9	1,985.0	571,41
2034	8.6	224.7	1,941.7	497,99
2035	7.4	254.3	1,870.9	424,57
2036	6.1	278.2	1,688.6	351,16
2037	4.8	305.9	1,462.7	277,74
2038	3.5	337.3	1,178.7	204,32
2039	2.2	372.4	822.3	130,91
2040	0.9	344.3	317.1	57,49
			22,910.5	8,442.12

However, the revenues could be spent based on the priorities of the country and are not dedicated only to low-income households, but to the low-carbon measures in general. Some of the priorities could cover the phase-out of boilers or MEPS implementation in the cases where ETS2 is combined with one of those measures.

Modernisation fund

The total number of allowances for the period of 2021-2030 for Czechia is €193,152,692 contributing to the modernization fund (as a 2% of the ETS CAP). The funding part consists of the revenues from the auctioning of 2% of the total allowances under the EU ETS and the additional allowances transferred (Art 10) at €111,462,281 worth of allowances. This is estimated as a total amount of €5 billion (150 billion KR at current prices). As of 2025, additional allowances may be added to the fund, depending on how much is needed for the free allocation to industry. The key elements that must be checked prior to allocating the modernisation fund for the low-income

groups are to i) provide evidence that the investment proposal is in line with the State aid rules, ii) confirm that the investment complies with any other applicable requirements of Union and national law, and iii) confirm that there is no double funding of the same costs with another Union or national instrument. The funds under the Modernization Fund can be drawn over the next 10 years (the first standard RFPs from the HEAT programme in the Modernisation Fund were announced in April 2021).

The related programs under the Modernization Fund that can be used are the 1) Heat Sector and 8) Community energy projects. The **HEAT SECTOR** program supports the use of RES and low-carbon sources of energy primarily intended for heating, such as a change in the fuel base and modernisation of heat sources and distribution systems, the total share of which is 26%, amounting to €1.3billion.[16] More specifically, the program finances the reconstruction or replacement of the heat source in TESS (thermal energy supply systems) with a) a change of the fuel used or type of energy to RES, use of waste energy with high-performance CHP, or an electrical boiler, b) with a combination with high efficiency CHP, and c) including heat exchangers and measurement and control system. The applicants are the owners of TESS and 30% of this fund will be allocated with priority to the coal transition regions. SME applicants can be granted a bonus of 10% for medium and 20% for small business. At this stage there are no provisions for additional bonuses to energy poor groups or low-income households.[17] For the **COMMUNITY ENERGY program (KOMUENERG)**, the programme focuses on support for open energy societies established for the purpose of satisfying their own energy needs (the main purpose is not to generate profit). The total share is 1.5% amounting to €75 million (with no further information on this program and whether it addresses energy poor groups).

Solidarity provision from ETS1

Through the Solidarity provision, an estimated number of additional allowances the Czech Republic receives can be calculated at €88,360,000 using a 31% increase of allowances to be auctioned which is taken from Annex II(a) of the directive and is gotten from either the verified emissions under the EU ETS for 2005, or the average of the period 2005-2007. This figure can be used to calculate the estimated value of these allowances over phase 4 using a limited price range for the current spot price (at €20/EUA) and the highest expected price level (at €35/EUA) resulting in ~€1.8 billion and €2.6 billion respectively.[18]

Just transition fund

Using the method for calculating the fair, balanced and effective distribution of the Just Transition Funds resources, the Czech Republic is allocated €580.8 million or a share of 7.7% of the total available funding (€7.5 billion). This results in a total estimated expected investment to be mobilized under pillar 1, 2, and 3 for the Czech Republic at ~€7.8 billion, of which the total estimated funding under pillar 1 is €2.1 billion.[19] The priority investment areas and framework conditions set for the delivery of the Just Transition Fund are outlined by the commission and

[16] https://www.sfzp.cz/en/about-the-modernisation-fund/
[17] https://www.sfzp.cz/files/documents/storage/2021/05/20/1621500815_ModF_HEAT_EN.pdf
[18] https://www.ceep.be/www/wp-content/uploads/2018/10/Funding-Mechanisms-in-the-fourth-phase-of-the-EU-ETS.pdf
[19] JTF Allocation: https://ec.europa.eu/commission/presscorner/api/files/attachment/860491/JTM%20and%20JTF%20Allocation%20Table.pdf

work towards an effective delivery of the fund investments in Czechia. These areas and conditions were derived from the broader analysis of territories that face serious socio-economic challenges detailed in the 2019 Country Report for Czechia. The top investment priorities identified in Czechia are i) the coal mining regions of Moravskoslezský and Severozápad (including Karlovarský and Ústecký) with around 18,000 people working directly in coal mining activities as well as ii) another 21,000 people that are dependent on the coal mining and coal-fired energy sector in local communities and further supporting another 19,000 indirect jobs across the country. It is acknowledged that further impact in these areas could potentially be deepened as these regions are already amongst the poorest in the country. The interventions of the JTF are concentrated on these regions and are warranted based on the expectation that they will experience substantial job losses as a result from the transition process towards a climate-neutral economy. Seeing as the substantial loss of employment is not entirely offset solely through the creation and development of SMEs, it is, in exceptional cases, allowed to support larger enterprises through productive investments if they show clear relevance to the territorial just transition plan. More practical examples and key actions that are to be considered under the JTF are (non-exhaustive list taken from the CZ Country Report) include investments in the deployment of technology and infrastructures for affordable clean energy, in greenhouse gas emission reduction, energy efficiency and renewable energy; investments in the creation of new firms, productive investments in SMEs, including start-ups, upskilling and reskilling of workers and investments in regeneration and decontamination of sites.[20]

A complete overview of the distribution of the JTF resources is given below:[19]

- Industrial GHG emissions of regions with a high carbon intensity: **45,627** (1,000 tCO_2 equivalent)
- Employment in industry in regions with carbon-intensive industry: **355,000** (thousand); (**5.0%)**
- Employment in mining of coal and lignite: **24**,**000**; (**9.6%)**
- Share in total in Industrial GHG emissions: **5.1%**
- Initial share after capping: **6.3%**
- Share after GNI per head adjustment: **8.0%**
- Final share after adjustment for minimum aid intensity: **7.7%**
- Allocation: €**580.8** million
- Aid intensity: €**54.7** per person

In summary, the JTM is eligible only for the transition regions, which in Czechia refers to two regions. However, as the JTM is there for both energy efficiency projects and socio-economic impacts of the transition, it can finance both transition in low–income households but also assist with the adverse effects of it.

Other sources of funding

[20] https://ec.europa.eu/info/sites/default/files/annex_d_crs_2020_en.pdf

According to the CZ NECP (p.92), "In its first draft, the Commission allocated €226 billion for the European Regional Development Fund (ERDF), approximately €47 billion for the Cohesion Fund (CF) and about €100 billion for the European Social Fund (ESF)."[21]

Table 40: *Multiannual Financial Framework for the period 2021–2027*[75]

	07–13 (EUR billion)		14–20 (EUR billion)		2021+ (EUR billion)	
	EU	CR	EU	CR	EU	CR
ERDF	201	13.66	212	11.94	226	10.524
CF	70	8.82	75.4 (including transfer to CEF)	6.14	47 (including transfer to CEF)	6.44
ESF	76	3.77	84	3.43	100	2.737
Total	347	26.12 (7.52 %)	371	21.51 (5.8 %)	373	ca 20.02[76]

Source: Ministry for Regional Development (National Coordination Authority)

Costs from introduction of scenarios

The costs that need to be financed by the various funding streams and the specific policy instruments to do that (see below) consist of investment costs (technology and installation costs for boilers and energy refurbishments) and costs to consumers from the increased energy prices.

The investment costs should normally be financed through various policies and subsidy schemes from the state budget, and should reach a very high or maximum financing rate (over 95% up to 100%) for low-income groups (first quintile or decile of the income categories). These groups cannot use their own financing means for such investments as they are often locked-in to using fossil fuel technologies, live in low insulated buildings and cannot carry out changes due to the split incentive problem (as their landlords might object in undertaking investments), and other known barriers (see WS1 report). The investment costs required from the five scenarios are presented below.

Table 18a Investment costs for different scenarios

Scenario 2	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**Total investment costs (m EUR)**
	Heat pumps	0	0	1079	0	1315	0	**2,394**
Scenario 3	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Building envelope	0	3,340	3,340	3,340	0	0	**10,020**
Scenario 4	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Heat pumps	0	0	1,079	0	1,343	0	**12,442**

[21]CZ NECP https://energy.ec.europa.eu/system/files/2019-03/ec_courtesy_translation_cz_necp_0_0.pdf

	Building envelope	0	3,340	3,340	3,340	0	0	
	Total	0	3,340	4,419	3,340	1,343	0	
Scenario 5	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Heat pumps	0	0	546	0	1,221	0	**11,787**
	Building envelope	0	3,340	3,340	3,340	0	0	
	Total	0	3,340	3,886	3,340	1,221	0	

The highest costs are presented since they require technological change when the banning of fossil fuel boilers is combined with the Minimum Energy Performance Standards (Scenario 4) and when the latter are combined with the ETS 2 on heating fuels (Scenario 5). The respective policies (see below) should also aim for the largest financing gap in the 2030-2040 period, where the majority of funds must be delivered. For instance, the Social Climate Fund will have a duration up to 2032 (with €1.7 billion) and thus the other funds will need to cover the gap for these investment costs (approximately €1.7 billion more from the revenues from ETS auctioned allowances and €3 billion in the first two years of the Just Transition fund). Nevertheless, it is important to consider that in case the costs of heat pumps remain high up to 2030, thus hindering the full effects of the economies of scale, and the costs of the insulation materials remain high, then the investment costs in all scenarios would be substantially higher and the existing funds would not be able to cover the required financing gaps (see Table below).

Table 16b Investment costs for different scenarios with higher costs

Investments (million €)	2025	2030	2035	2040	2045	2050	Total	Increase
Scenario 2	0	0	2023	0	2466	0	4489	88%
Scenario 3	0	5010	5010	5010	0	0	15030	50%
Scenario 4	0	5010	7033	5010	2518	0	19571	57%
Scenario 5	0	5010	6034	5010	2289	0	18343	56%

In terms of costs from energy price increases, if Bulgaria will implement a social support policy framework (such as on-bill financing or cost coverage to low-income groups from higher energy costs), then the total energy costs passed on to consumers on a yearly basis and cumulatively (upon which a support scheme could be based) are presented below.

Table 19 Energy costs

Total energy costs (m €)	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**Cumulative costs (m EUR)**
Baseline	571	585	600	615	623	631	**3,625**
Scenario 1	571	574	596	617	639	659	**3,656**
Scenario 2	571	585	604	618	562	569	**3,509**
Scenario 3	571	539	511	497	504	511	**3,133**
Scenario 4	571	539	503	490	446	452	**3,001**
Scenario 5	571	541	487	478	414	419	**2,910**

In all scenarios, except the fossil fuel boilers phase out, the low-income groups will reduce their energy costs cumulatively in the long run. For the ETS2 (Scenario 1) and phasing out of fossil fuel boilers (Scenario 2), there will be a requirement to support the low-income households due to the increase in energy costs for such years (calculated as the difference of the energy costs in the scenario with the baseline costs) as shown in the table below.

Table 20 Energy costs difference from baseline

Energy costs difference from baseline (m EUR)	2030	2035	2040	2045	2050
Scenario 1	-11	-4	2	16	28
Scenario 2	0	4	3	-61	-62

More specifically, in the period 2030-2040 an extra support of €7 million will be required to cover the increased bills of households (in scenario 2: the phasing out of fossil fuel boilers) and €46 million for the period 2040-2050 (in the case of ETS2).

Adverse impacts of policy introduction on low-income groups

Based on the methodology described in the introductory part of this report, we calculate the compensating variation of the household or the rise in income that the household would need to cover the expenses introduced. The expenditure side of the calculation includes both energy expenditure and the expenditure for investments for the specific scenario introduced in comparison to the baseline scenario. The income remains the same as in the baseline scenario, forecasted from the available income data.

Table 21 Adverse impacts of policy introduction per household

Rise in income needed to cover both variation in energy price and the cost of scenario (EUR)								AVG (EUR)	Share in income (%)
Year	**2019**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**		
Scenario 1			**-12.35**	**-4.49**	**2.25**	**17.96**	**31.44**	**6.96**	**0.09**
Scenario 2			**0.00**	**246.78**	**3.37**	**226.80**	**-69.61**	**81.47**	**1.04**
Scenario 3			**698.35**	**650.07**	**617.51**	**-133.61**	**-134.73**	**339.52**	**4.35**
Scenario 4			**698.35**	**883.38**	**609.65**	**102.84**	**-200.97**	**418.65**	**5.37**
Scenario 5			**700.60**	**745.73**	**596.18**	**39.52**	**-238.02**	**368.80**	**4.73**

To be able to cover the expenses of an energy expenditure change and share of costs for covering the implementation of policies, without the measures/instruments introduced, low-income households in Czechia would need a rise in income of around 1% for first two scenarios and 4-6% in scenarios 3,4 and 5. This would mean that the average yearly household income would have to rise by €7 in Scenario 1, €80 in Scenario 2, but around €400 for Scenarios 3,4,5 of the €7,800 average projected income for low-income groups to 2050. Taking into consideration that the disposable income is the most important primary indicator of energy poverty, this result would mean that an additional number of citizens would be classified as vulnerable groups. Therefore, it is of highest importance to use the available funding to create measures which avoid adverse effects on households, as low-income households react to lower disposable income with

negative impacts on arears, comfortability and causally with worsening of their social life and health, as described in the methodology.

Policy instruments

The three most important policy instruments that can play a role for alleviating the costs of low income groups during the implementation of the three Fit-for-55 package policies are the following:

Measure	**New Green Savings Program**
Description	It supports the reduction of the energy intensity of residential buildings (complex or partial thermal insulation), construction of houses with very low energy intensity, environmentally friendly and efficient use of energy sources and renewable sources of energy (RES). The indicative actions subsidized are: Renovation of family houses and apartment buildings (thermal insulation of facade, roof and ceiling, replacement of windows and doors), Construction of family houses and apartment buildings in so-called passive standard (passive houses), Solar thermal and photovoltaic systems, Green roofs, Use of heat from wastewater, Controlled ventilation systems with heat recovery (recuperation), Replacement of heat sources for heat pumps, biomass boilers. The beneficiaries are owners or builders of family houses and apartment buildings, both individuals and legal entities, organizational units of the state and state subsidized organizations in the case of buildings of central institutions. Depending on the real energy savings, the beneficiary can save up to 50% of the total eligible expenses (reaching up to 60% with extra bonusses). The average subsidy is estimated at 207k KR (€8,475) so the average investment cost is estimated around €17,000.
Proposal of changes	Simplified application process to stimulate uptake and reduce regulatory expenses, checks and balances. Checks on the correctness of applications are currently undertaken in 100 % of cases and happen either before, at the start, during or after the intervention is done. A method to simplify this process is via the creation of a pre-approved technical specification list of interventions and setting up a public repository of pre-approved interventions (with product code/serial) that er eligible for funding upon show of proof (cutting out the need for the expert audit). Under the current program applicants must submit, in addition to the formal annexes, a cover sheet of technical parameters (a summary of fundamental technical information and figures – similar to a registration sheet) accompanied by an expert opinion on i) Project documentation (accompanying and technical report, drawings) provided only a person authorised by the Czech Chamber of Chartered Engineers and Technicians or the Czech Chamber of Architects may draw up such documentation, ii) an Energy assessment (only an energy specialist with authorisation to conduct energy audits, and iii) the building energy performance certificate,

	which may also be performed by a specialist authorised to draw up building energy performance certificates (energy assessment was replaced in the program conditions by energy evaluation). In terms of timing of investments, the highest subsidies in all scenario (including phasing out of fossil fuel boilers and MEPS) must be allocated towards the end of the decade (from 2025-2030) with an average of €3.4 billion and a higher financing rate for low-income groups. This could support around 217,000 investments (based on the average investment size from the program).
Evolution of measure	Repository/list of technical interventions can be adjusted and continuously updated to reflect ongoing developments, efficiency standards, and include new developments.
Additional funding	Due to its wide approach ERDF and ESF
Start year and duration	2023 – 2028 (5 years)

Measure	**Boiler Subsidies Program**
Description	A pilot program was launched by the National Environment Program and provided financial assistance to households and municipalities in the Karlovy Vary, Moravian-Silesian and Ústí and Labem Regions. It provided pre-financing to replace solid fuel boilers in households in the form of a soft loan as well as the intervention of advisory services. This program specifically targeted vulnerable households with lower incomes eligible to receive a subsidy of up to 95% for the replacement of an old boiler.
Proposal of changes	The program can be expanded to include more regions across the CZ and potentially focus on Moravskoslezský and Severozápad (including Karlovarský and Ústecký) specifically as they were identified to be particularly vulnerable due to their reliance on the coal industry, which is under pressure considering the energy transition. Other proposal would be to expand the level of subsidy up to a full 100% of the replacement costs for the lowest income households reliant on boilers that do not meet the specified emission/efficiency classes. For the Fit-for-55 package policies, the Boiler Subsidies Program would need to cover roughly €2.4 billion for boiler substitution, which would require a financing of €2.28 billion for the period up to 2040.
Evolution of measure	The size of the funding provided and the scope of regions, but also income levels, can be adjusted upwards to include and make the subsidy attractive

	for larger groups keeping an ongoing focus lower income households depending on the level of uptake of the policy
Additional funding	Additional (in-direct) sources could be unlocked through the Just Transition Fund for the Moravskoslezský and Severozápad areas initially.
Start year and duration	2023 – 2030 or until a specified goal for # of boilers replaced is reached. Either total or annually with annual review of budget, goals, targets, income groups considered and their specific compensation.

Measure	**EFEKT Program**
Description	The State Program for the Support of Energy Savings, or the " EFEKT Program ", was announced by the Ministry of Industry and Trade with the intention of participating in the fulfillment of the State Energy Concept. It was implemented to achieve the current target set by the European Directive no. 2012/27 / EU on energy efficiency. The EFFECT Program was a complementary program to operational and national energy programs to increase energy savings. The budget of the program for the period 2017-2021 is a maximum of 750 million CZK.
Proposal of changes	/
Evolution of measure	There will be no increase of the final energy consumption which has been considered on annual basis in the period 2021-2030 due to the reduction, which is forecasted in the EU Reference Scenario 2020 for the case of Czech. It should be noted that no increase was considered for the period 2031-2050 due to the implementation of the various policies. Therefore, the measure should be successful and not change.
Additional funding	No funding suggested, but possible funding could be provided from RRF since the EFEKT Program offers energy efficiency and energy savings programs.
Start year and duration	2021

The analysis of impacts of the proposed measures

The New Green Savings Program, Boiler Subsidies Program and EFEKT Program all put forth energy efficiency measures, and to provide impacts of these measures, data and information on the influence of energy efficient actions have been gathered. Based on the COMBI database, for similar introduced measures in Czechia there is a ~2% influence on total EU direct GHG emissions for 1.060 Mt CO_2 reduced.

Environmental impacts of energy efficiency measures

Climate change: The New Green Savings program offers a range of energy efficient interventions which, inherently, reduces GHG emissions, similarly to how replacing solid fuel boilers with new ones protects eco systems and prevents further degradation through reduced emissions.

Air quality: Included in the New Green Savings program is the retrofitting and replacement of inefficient boilers as well as the promotion and uptake of RES as a replacement for dependency on fossil energy sources used for heating. Replacing old and polluting boilers provides better air quality as it reduces polluting emissions, and therefore improves overall quality of life for the environment and citizens. Overall, energy efficiency measures provide better air quality by reducing air pollution emissions, and related environmental benefits occur by avoiding emissions from inefficient stoves, fossil fuels or waste burning for heating.

Social impacts of energy efficiency measures

Health & wellbeing: All of the proposed interventions are aimed to improve the overall health and wellbeing of its residents through interventions in the form of improved thermal insulation and retrofitting of buildings, therefore occupants should see an increase in comfort of living. The reduction on the cost of living (reflected in reduced energy bills) also benefits their wellbeing. In this case, replacing old boilers with efficient ones can have positive impacts on health and wellbeing by providing better living conditions (ability to keep home to adequate temperature). Energy efficiency measures can also have positive impacts in terms of mental health as households can generate important energy savings and avoid arrears on energy bills.

Improved social inclusion: The energy-bill cost reductions introduced through the proposed measures lead to higher disposable income and buying power of its residents.[11] Energy savings provide fewer energy bills and enhance social inclusion by allowing households to spend on other goods and services as "feelings of social exclusion and isolation (…) extend beyond the traditional impacts of energy poverty (health risks, restricted available income, indebtedness, risk of disconnection from suppliers, etc.) and hint at the systemic implications of the everyday experience of domestic energy deprivation."[11]

Economic impacts of energy efficiency measures

Education, jobs, and productivity are all promoted and touched upon in one way or another through the wide range of interventions proposed including the retrofitting of buildings (specifically residential with new windows for better lighting), thermal insulation and living comfort for improved education and productivity, as well as the stimulation of RES creating jobs.

Increased economic activity: Through the retrofitting and renovation activities of residential buildings, many market actors ranging from (building) contractors, energy service providers installing new PV and larger scale distributed RES (wind/solar parks amongst others), policy makers, and regulators are all necessary and assigned work bringing significant economic activity to the region where works are performed. In 2017, the European Commission provided four different scenarios that assess increased targets for the EU's 2030 energy efficiency target. For the GDP impact, each scenario resulted in a positive change, from a 0.1%-2% increase in GDP in the least ambitious and most ambitious scenarios of increased energy efficiency respectively.[12]

Education, jobs, and productivity: Data has shown that energy efficiency provides more job opportunities in Europe.[13] Cost-effective energy efficiency improvements can also have positive

impacts by boosting economic activity that can turn into higher employment rates. A 2016 study assessed the impact of the EU's Ecodesign Directive projects on the efficiency measures developed, which would lead to 0.8 million additional jobs by 2020. Energy service companies and energy utilities are the two main players and therefore employers within the sector, which employ more than 1 million people globally.[14]

Impact analysis

Environmental	Positive
Social	Positive
Economic	Positive

Links and co-benefits between the measures

These three measures complement each other as they are all centred around energy efficiency, providing specific and adaptive measures for households and/or vulnerable households. What differentiates the measures is the scale, as the New Green Program provides overall energy efficient refurbishments, whereas the Boiler subsidies focus on one aspect of one's household, just as the REFLEKT Program aims to reach energy savings goals target set by the European Directive no. 2012/27/ EU on energy efficiency.

Recommendations for procedural dimension

The distributional dimension of vulnerability includes, inter alia, energy affordability and energy efficiency assessed in *Workstream 2*, while procedural elements include the recognition of energy poverty as a clear problem in policy documents, the presence of an official definition of energy poverty, and the development of clear indicators to measure the problem. Czech legislation has not developed its own definition or adopted a one from other countries, nor does it use specific indicators to evaluate whom the measures should target.[22] From the perspective of procedural elements recognised in *Workstream 1*, to support the policies suggested above, Czechia can provide a clearer definition of vulnerable groups based on income and other chosen indicators.

Conclusions

To conclude, there has been a low number of measures targeting directly low income and vulnerable groups in Czechia, due to a lack of consistent data. This is highlighted in the lack of policies that tackle energy poverty and energy efficiency measures. For instance, there is room for finding new ways to communicate from government bodies to low-income groups and finding new ways to reach them and provide more adaptive and informational approaches. There should also, based on current measures, exist future measures that have a precise approach on how to address energy poor households in terms of information, raising awareness on the availability of funds, as most vulnerable households have no knowledge of them. This also means finding solutions for social housing with building renovations through subsidies and ensuring owners maintain and prioritise low-income households for these renovations and address the rising issues between tenants and landlords and what they entail for vulnerable households who struggle to access renovation processes.

[22] DOI:10.1016/j.enpol.2017.12.045

10.3 Greece

Social Climate Fund

The objectives of the EU Social Fund (€72 billion) are to a) finance temporary direct income support for vulnerable households and b) support measures and investments that reduce emissions in road transport and buildings sectors and as a result reduce costs for vulnerable households, micro-enterprises and transport users. The spending should be frontloaded to precede and accompany a smooth introduction of the new ETS, but does not cover scenarios without the ETS2 introduction. The amount of €48.5 billion for the period 2028-2032 is subject to the availability of the funds under the annual ceilings of the applicable multiannual financial framework. The Fund will be operational as of 2025 and Greece must finance at least 50% of the total costs of the Social Climate Plans. The amount attributed to Greece is approximately €4 billion for the period 2025-2032, based on the share of 5.52% for the country (according to the Regulation of the Social Climate Fund). If the available funding does not match the costs of the introduction of ETS2 and related measures, additional funding is required, which can come from the resources linked to ETS2 or others. As visible from the description of the Fund, it could cover multiple type of measures, including building renovations, electrification and financial aid. The final application will depend on the national Social Climate Plan, but the possible financing of the combination of measures supports the idea of scenarios where all policies are combined and co-financed.

Table 22 Allocation of Social Climate Fund to Greece[23]

Member State	Share as % of total	TOTAL 2025-2032 (in €, current prices)	Amount for 2025-2027 (in €, current prices)	Amount for 2028-2032 (in €, current prices)
Greece	5.52	3,986,664,037	1,308,641,796	2,678,022,241

Recovery and Resilience Fund (RRF)

Greece will receive an amount of €30 billion from the RRF, while the foreseen grants are equal to €18 billion. Greece's plan devotes 37.5% of its total allocation to measures that support climate objectives. The plan includes investments in renewable energy (Component 1.1 – Power up), the energy renovation of buildings including the development of strategic "green" urban regeneration projects (Component 1.2. – Renovate), the promotion of electromobility (Component 1.3. – Recharge and refuel) and projects aligned with the principles of a circular economy, natural environment protection and climate change (Component 1.4. – Sustainable use of resources, climate resilience and environmental protection).

A targeted programme is foreseen for the energy renovation of the residential buildings as a quantitative energy saving target was defined equal to of 213 ktoe of new savings per year. Eligible renovations include a) energy savings: replacement of household frames (windows/doors etc.), installation/upgrading of thermal insulation, heating/cooling system

[23] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0568

upgrade, hot water system using Renewable Energy Sources RES or heat pumps and b) new smart technologies and systems of energy production (thermal and/or electricity). The investment will be implemented in 3 phases, while a sub-program will be addressed to the support of energy poor households; the total budget is €3,095 million and €1,554 million (€1,253 million excluding VAT) will be covered by RRF fund through grants. The first phase is already in progress, while the whole project will be completed in 2025.

Revenues from ETS auctioned allowances

Greece will cumulatively receive €6.72 billion (in the period of 2026-2040) from the auctioned allowances (that are net from the contributions to the Modernization Fund, the Innovation Fund and the Social Climate Fund). The first €3.6 billion will be received as revenues in the period until 2030 and they can be spent for general purposes (hence contributing to the social policies for the energy price increase). However, the revenues could be spent based on the priorities of the country and are not dedicated only to low-income households, but to low-carbon measures in general. Some of the priorities could be covering of phase-out expenses or MEPS implementation in the case where the ETS2 is combined with one of those measures.

Table 23 Revenues from auctions

Revenues from auctions of national allocations (million EUR)

Year	Central_MSR1	Revenues
2026	21.0	1,169.77
2027	14.5	805.81
2028	11.0	611.28
2029	9.3	518.58
2030	9.5	528.59
2031	10.3	571.95
2032	9.2	513.49
2033	8.2	455.03
2034	7.1	396.56
2035	6.1	338.10
2036	5.0	279.64
2037	4.0	221.17
2038	2.9	162.71
2039	1.9	104.24
2040	0.8	45.78
		6,722.7

Modernisation Fund

Greece will not receive any support by the Modernisation Fund.

Solidarity provision from ETS1

Through the Solidarity provision, an estimated number of additional allowances Greece receives can be calculated at €40.83 million using a 17% increase of allowances to be auctioned which is taken from Annex II(a) of the directive and is gotten from either the verified emissions under the EU ETS for 2005, or the average of the period 2005 to 2007. This figure can be used to calculate the estimated value of these allowances over phase 4 using a limited price range for the current

spot price (at 20 €/EUA) and the highest expected price level (at €35/EUA) resulting in ~€815 million and €1.4 billion respectively[24].

Just transition fund

Using the method for calculating the fair, balanced and effective distribution of the Just Transition Funds resources, Greece is allocated €294 million or a share of 3.9% of the total available funding (€7.5 billion). Resulting in a total estimated expected investments to be mobilized under pillar 1, 2, and 3 for Greece at ~€3.9 billion of which the total estimated funding under pillar 1 is €1.05 billion.

The priority investment areas and framework conditions set for the delivery of the Just Transition Fund are outlined withing the Master Plan identifying five different pillars, namely i. Green Energy Production, ii. Industrial and Commercial Sectors, iii. Smart Agricultural Sectors, iv. Sustainable Tourism and v. Technology and Education.

The JTM is eligible only for the two transition regions in Greece. However, as JTM is there for both energy efficiency projects and socio-economic impacts of transition, it can finance both transition in low – income households but also assist with the adverse effects of it.

Other sources of funding

According to the proposal of the European Commission on the Multiannual Financial Framework as mentioned in the NECP, €19.138 million in constant 2018 prices, or €21.582 million in current prices, are allocated to Greece for the period 2021-2027. These funds are provided by the European Social Fund, the European Regional Development Fund (ERDP), the Cohesion Fund and the European Territorial Cooperation. In particular, according to the above proposal, available funds for the ERDF correspond to €10.222 million in constant 2018 prices and for the Cohesion Fund to €3.578 million. The proposal for a regulation concerning the ERDF and the Cohesion Fund stipulates that, for countries with a gross national income lower than 75% of the EU average, at least 30% of ERDF resources must be used for Policy Objective 2, pertaining to energy, the climate and the environment. A significant proportion of the Cohesion Fund resources (around 50%) is expected to be allocated to Policy Objective 2. Therefore, it is expected that at least a minimum of €3,066.6 million (at constant 2018 prices) from the ERDF and approximately €1.789 million from the Cohesion Fund (at constant 2018 prices) will be available for this Policy Objective.

Costs from introduction of scenarios

The costs that need to be financed by the various funding streams and the specific policy instruments to do that (see below) consist of investment costs (technology and installation costs for boilers and energy refurbishments) and costs to consumers from the increased energy prices.

The investment costs should, normally, be financed through various policies and subsidy schemes from the state budget, and they should reach a very high or maximum financing rate (over 95% up to 100%) as the category of population we refer to are low-income groups (first quintile or decile of the income categories). These groups cannot use own financing means for such investments and they are the ones locked-in fossil fuel technologies, low insulated buildings and cannot carry out changes due to the higher split incentive problem (as their landlords might

[24] https://www.ceep.be/www/wp-content/uploads/2018/10/Funding-Mechanisms-in-the-fourth-phase-of-the-EU-ETS.pdf

object in undertaking investment costs) and other known barriers (see WS1 report). The investment costs required from the five scenarios are presented below.

Table 24a Investment costs for different scenarios

Scenario 2	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**Total investment costs (m EUR)**
	Heat pumps	0	0	1,303	0	488	0	**1.719**
Scenario 3	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Building envelope	0	2,137	2,137	2,137	0	0	**6.411**
Scenario 4	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Heat pumps	0	0	1,303	0	505	0	**8.219**
	Building envelope	0	2,137	2,137	2,137	0	0	
	Total	0	2,137	3,440	2,137	505	0	
Scenario 5	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Heat pumps	0	0	1,270	0	463	0	**8.144**
	Building envelope	0	2,137	2,137	2,137	0	0	
	Total	0	2,137	3,407	2,137	463	0	

The highest costs are presented as they require technological change when the banning of fossil fuel boilers is combined with the Minimum Energy Performance Standards (Scenario 4) and when the latter are combined with the ETS 2 on heating fuels (Scenario 5). The respective policies (see below) should also aim at the largest financing gap in the 2030-2040 period, where the majority of funds must be delivered. For instance, the Social Climate Fund will have a duration up to 2032 (with €4 billion) and thus the other funds will need to cover the gap for these investment costs. Nevertheless, it is important to consider that in case the costs of heat pumps remain high up to 2030, thus hindering the full effects of the economies of scale, and the costs of the insulation materials remain high, then the investment costs in all scenarios would be substantially higher and the existing funds would not be able to cover the required financing gaps (see Table below).

Table 22b Investment costs for different scenarios with higher costs

Investments (million €)	2025	2030	2035	2040	2045	2050	Total	Increase
Scenario 2	0	0	2443	0	915	0	3358	88%
Scenario 3	0	3206	3206	3206	0	0	9617	50%
Scenario 4	0	3206	5649	3206	947	0	13007	58%
Scenario 5	0	3206	5587	3206	868	0	12866	58%

In terms of costs from energy price increases, if Greece implements a social support policy framework (such as on-bill financing or cost coverage to low-income groups from higher energy costs), then the total energy costs passed on to consumers on a yearly basis and cumulatively (upon which a support scheme could be based) are presented below.

Table 25 Energy costs

Total energy costs (m EUR)	2025	2030	2035	2040	2045	2050	Cumulative costs (m EUR)
Baseline	240	247	254	260	266	272	1,762
Scenario 1	240	252	264	275	288	299	1,841
Scenario 2	240	247	186	188	167	168	1,419
Scenario 3	240	221	204	195	200	204	1,487
Scenario 4	240	221	154	147	142	144	1,271
Scenario 5	240	222	154	147	140	142	1,268

In all scenarios, except the imposition of carbon pricing, the low-income groups will reduce their energy costs cumulatively in the long run. For the ETS2 (Scenario 1), there will be a requirement to support the low-income households due to the increase in energy costs for such years (calculated as the difference of the energy costs in the scenario with the baseline costs) as shown in the following table.

Table 26 Energy costs difference from baseline

Energy costs difference from baseline (m EUR)	2030	2035	2040	2045	2050
Scenario 1	5	10	15	22	27

More specifically, in the period 2030-2040 an extra support of €15 million will be required to cover the increased bills of the households and €27 million for the period 2040-2050.

Adverse impacts of policy introduction on low-income groups

Based on the methodology described in the introductory part of this report, we calculate the compensating variation of the household or the rise in income that the household would need to cover the expenses introduced. The expenditure side of the calculation includes both energy expenditure and the expenditure for investments for the specific scenario introduced in comparison to the baseline scenario. The income remains the same as in the baseline scenario, forecasted from the available income data.

Table 27 Adverse impacts of policy introduction per household

Rise in income needed to cover both variation in energy price and the cost of scenario (EUR)							AVG (EUR)	Share in income (%)
Year	2019	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**		
Scenario 1			9.92	19.85	29.77	43.66	53.59	31.36	0.70
Scenario 2			0.00	382.26	-142.90	-2.78	-206.41	6.03	0.14
Scenario 3			796.68	749.05	719.27	-130.99	-134.96	399.81	8.97
Scenario 4			796.68	1,167.03	624.01	-45.65	-254.05	457.60	10.27
Scenario 5			798.66	1,153.94	624.01	-66.29	-258.02	450.46	10.11

To be able to cover expenses of energy expenditure change and share of costs for covering implementation of policies, without the measures/instruments introduced, low-income

households in Greece would need a rise in income of less than 1% for first two scenarios and approximately 9-10% in scenarios 3,4 and 5. This would mean that the average yearly household income would have to rise by €31 in Scenario 1, €80 in Scenario 6, but around €400-458 for Scenarios 3,4,5 of the €5,190 average projected income for low-income groups to 2050. Taking into consideration that the disposable income is the most important primary indicator of energy poverty, this result would mean that an additional number of citizens would be classified as vulnerable groups. Therefore, it is of highest importance to use the available funding to create measures to avoid adverse effects on households, as low-income households react to lower disposable income with negative impacts on arears, comfortability and causally with worsening of their social life and health, as described in the methodology.

Policy instruments

The three most important policy instruments that can play a role for alleviating the costs of low-income groups during the implementation of the three Fit-for-55 package policies are the following:

Measure	**Exoikonomo Programme**
Description	The "Exoikonomo" program will be operational officially until the end of 2021, while the accomplishment of the foreseen energy upgrade is estimated within 2022-2023. The policy measure will continue to be implemented under the National Recovery and Resilience Plan in a next round during the second half of 2022 and in the following years through programmes financed by the NSRF 2021-2027 aiming at the radical confrontation of the energy poverty phenomenon. Generally, the policy measure for the energy upgrade of the energy poor households' buildings is considered as the most significant for combating energy poverty on annual basis. The following energy efficiency interventions are considered as eligible: a) energy savings: replacement of household frames (windows/doors etc.), b) installation/upgrading of thermal insulation, heating/cooling system upgrade, hot water system using Renewable Energy Sources RES or heat pumps and b) new smart technologies and systems of energy production (thermal and/or electricity). Depending on the real energy savings, the beneficiary can save up to 30% of the primary energy savings. The average investment cost is estimated at approximately €18,000. Taking into consideration that the foreseen subsidy is equal to 75% for a family with income up to €10,000, the public financial aid is equal to €13,500.
Proposal of changes	Design a specialized programme targeted to the energy renovation of the low-income households' buildings. Arrangement of a dedicated budget for low-income and energy poor households in the case the design of a specialized programme is not feasible.

	Application of a simplified application process to stimulate uptake and the active participation of the low-income households. Provision of adequate information for the delivered benefits to the low-income households. Increase of the existing subsidy from 75% to higher percentages (i.e. up to 95%). Facilitation of the access to banking financing for low-income households. Specification of specialized provisions for low-income households, who dwell in rented buildings.
Evolution of measure	Gradual application of the proposed changes taking into consideration the impacts of the measures for the alleviation of imposed burden to the low-income households, as resulted by the established monitoring and evaluation mechanism.
Additional funding	-
Start year and duration	2021 – 2030 (10 years)

Measure	**Energy Efficiency Obligation scheme**
Description	The Energy Efficiency Obligation (EEO) scheme for the period 2021-2030 will be launched within 2022 with the adoption of the respective legislative framework. Specifically, the regulation for the operational framework of the EEOs, under a Ministerial Decision, will be completed in the middle of 2022. In order to incentivize such activities by the obligated parties, it is foreseen to increase the accounted delivered energy savings by a factor equal to 40% for the case of technical measures targeted energy poor households by the obligated parties. Furthermore, an increase of the delivered energy savings by a factor equal to 10% is provided to the obligated parties that carry out targeted information and awareness-raising measures in energy poor households.
Proposal of changes	Co-financing of energy efficiency measures with the energy suppliers. Differentiation of the implemented measures between energy suppliers (mainly efficient heating and cooling systems) and distributors (energy upgrade of building envelope). Setting an obligation to energy distributors for implementing measures to low-income households.

Evolution of measure	Gradual application of the proposed changes taking into consideration the impacts of the measures for the alleviation of imposed burden to the low-income households, as resulted by the established monitoring and evaluation mechanism.
Additional funding	-
Start year and duration	2022 – 2030 (9 years)

The analysis of impacts of the proposed measures

Both Exoikonomo Programme and Energy Efficiency Obligation scheme contribute to the implementation of energy efficiency measures, which deliver considerable multi-benefit impacts. Based on the COMBI database, for similar introduced measures in Greece the reduction of the GHG emissions amounts at 0.7196 Mt CO_2 reduced.

Environmental impacts of energy efficiency measures

Climate change: Both the Exoikonomo Programme and Energy Efficiency Obligation scheme offer a range of energy efficient interventions which, inherently, reduce GHG emissions. The refurbishment of building envelopes and the replacement of conventional heating and cooling systems with new energy efficient ones protect ecosystems and prevent further degradation through reduced emissions.

Air quality: Both the Exoikonomo Programme and Energy Efficiency Obligation scheme provide better air quality as they reduce polluting emissions, and therefore improve the overall quality of life for the environment and citizens. Overall, energy efficiency measures provide better air quality by reducing air pollution emissions, and related environmental benefits occur due to the avoidance of emissions from inefficient stoves, fossil fuels or waste burning for heating.

Social impacts of energy efficiency measures

Health & wellbeing: All of the proposed interventions are aimed to improve the overall health and wellbeing of its residents through interventions in the form of improved thermal insulation and retrofitting of buildings, occupants should see an increase in their comfort of living. The reduction on the cost of living (reflected in reduced energy bills) also benefits the wellbeing. In this case, replacing old boilers with efficient ones can have positive impacts on health and wellbeing by providing better living conditions (ability to keep home to adequate temperature.). Energy efficiency measures can also have positive impacts in terms of mental health as households can generate important energy savings and avoid arrears on energy bills.

Improved social inclusion: The energy-bill cost reductions introduced through the proposed measures lead to higher disposable income and buying power of its residents.[11] Energy savings provide fewer energy bills and enhance social inclusion by allowing households to spend on other goods and services as "feelings of social exclusion and isolation (…) extend beyond the traditional impacts of energy poverty (health risks, restricted available income, indebtedness, risk of disconnection from suppliers, etc.) and hint at the systemic implications of the everyday experience of domestic energy deprivation."[11]

Economic impacts of energy efficiency measures

Education, jobs, and productivity are all promoted and touched upon in one way or another through the wide range of interventions proposed including the retrofitting of buildings (specifically residential with new windows for better lighting), thermal insulation and living comfort for improved education and productivity, as well as the stimulation of RES creating jobs.

Increased economic activity: Through the retrofitting and renovation activities of residential buildings, many market actors ranging from (building) contractors, energy service providers installing new PV and larger scale distributed RES (wind/solar parks amongst others), policy makers, and regulators are all necessary and assigned work bringing significant economic activity to the region where works are performed. In 2017, the European Commission provided four different scenarios that assess increased targets for the EU's 2030 energy efficiency target. For the GDP impact, each scenario resulted in a positive change, from a 0.1%-2% increase in GDP in the least ambitious and most ambitious scenarios of increased energy efficiency respectively.[12]

Education, jobs, and productivity: Data has shown that energy efficiency provides more job opportunities in Europe.[13] Cost-effective energy efficiency improvements can also have positive impacts by boosting economic activity that can turn into higher employment rates. A 2016 study assessed the impact of the EU's Ecodesign Directive projects on the efficiency measures developed, which would lead to 0.8 million additional jobs by 2020. Energy service companies and energy utilities are the two main players and therefore employers within the sector, which employ more than 1 million people globally[14], but this figure will grow with the adoption of energy efficiency policies.

Impact analysis

Environmental	Positive
Social	Positive
Economic	Positive

Links and co-benefits between the measures

The two examined measures complement each other as they are both centred around energy efficiency, providing specific and adaptive measures for households and/or vulnerable households. What differentiates the measures is their scale, as the Exoikonomo Programme provides overall energy efficient refurbishments, whereas the Energy Efficiency Obligation Scheme will aim primarily at the further installation of energy efficient heating and cooling systems (i.e., heat pumps).

Recommendations for procedural dimension

The distributional dimension of vulnerability includes, inter alia, energy affordability and energy efficiency assessed in *Workstream 2.* No meaningful procedural elements have been identified as energy poverty has been recognised as a clear problem in policy documents and an official definition of energy poverty is available clear indicators to measure the problem have been developed. Nevertheless, emphasis must paced on the implementation of the most cost-effective policy measures for the alleviation of energy poverty including their monitoring and assessment to decide if their contribution to the alleviation of the energy poverty is considerable or if

additional adjustments and adaptation are required. Indisputably, the findings of the current analysis must be taken into account during the update of the Action Plan for the alleviation of Energy Poverty in Greece.

Conclusions

To conclude, the proposed changes for both the Exoikonomo Programme and Energy Efficiency Obligation scheme can contribute considerably to the alleviation of energy poverty in the low-income households and should be applied.

The potential imposition of carbon pricing is not as effective when compared to other examined policies and it should be selected only as a supplementary policy. Energy poverty can be tackled effectively by the introduction of MEPS, as the potential increase of the final energy consumption due to the rebound effect will not facilitate the achievement of the energy efficiency and emission reduction targets. Additional proposals for the modification of the Exoikonomo Programme include the establishment of a one-stop shop facilitating the participation of the low-income households to the programme, the conduction of an ex-post study for assessing the actual benefits of the programmes to low-income households, the prioritization of the rented-buildings for providing subsidy, the provision of guarantees to banks for the unhindered financing of the low-income households and the integration of additional eligible categories of households to the existing ones (i.e. single-parent families and families with elderly people).

The Energy Efficiency Obligation scheme can substitute bank financing and should play an essential role for the alleviation of energy poverty. Nevertheless, the potential synergies must be maximized between the Energy Efficiency Obligation scheme and the potential imposition of carbon pricing, which will impose additional burdens to the energy suppliers.

Finally, additional technologies should be scrutinised in the scenario of phasing out fossil fuels boilers instead to heat pumps, such as green hydrogen and hydrotreated vegetable oil. Last but not least, the examined polices should focus on specific regions in Greece, such as islands, due to the fact that their peculiar conditions magnify the problem of energy poverty for low-income households.

10.4 Hungary

Social Climate Fund

The objectives of the EU Social Fund (€72 billion) is to a) finance temporary direct income support for vulnerable households and b) support measures and investments that reduce emissions in road transport and buildings sectors and as a result reduce costs for vulnerable households, micro-enterprises and transport users. The spending should be frontloaded to precede and accompany a smooth introduction of the new ETS. The amount of €48.5 billion for the period 2028-2032 is subject to the availability of the funds under the annual ceilings of the applicable multiannual financial framework. The Fund will be operational as of 2025, and so Hungary must finance at least 50% of the total costs of the Social Climate Plans. The amount attributed to Hungary is €3.13 billion for 2025-2032, based on the share of 4.33% for the country (according to the Regulation of the Social Climate Fund). If the available funding does not match the costs of the introduction of ETS2 and related measures, additional funding is required, which can come from the resources linked to ETS2 or others.

Table 28 Allocation of SCF to Hungary[25]

Member State	Share as % of total	TOTAL 2025-2032 (in EUR, current prices)	Amount for 2025-2027 (in EUR, current prices)	Amount for 2028-2032 (in EUR, current prices)
Hungary	4.33	3,129,860,199	1,027,391,783	2,102,468,416

As visible from the description of the Fund, it could cover multiple types of measures, including building renovations, electrification and financial aid. The final application will depend on the national Social Climate Plan, but the possible financing of the combination of measures supports scenarios where all policies are combined and co-financed.

Revenues from auctions of national allowances

Hungary will receive an amount of €6.92 billion cumulatively until 2040 from the net auctioned allowances (minus the ones allocated to the innovation fund and the social climate fund).

Table 29 Auction revenues

Year	Central_MSR1	Revenues
2026	21.6	1,203.65
2027	14.9	829.15
2028	11.3	628.98
2029	9.6	533.60
2030	9.8	543.89
2031	10.6	588.52

[25] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0568

2032	9.5	528.36
2033	8.4	468.21
2034	7.3	408.05
2035	6.3	347.89
2036	5.2	287.73
2037	4.1	227.58
2038	3.0	167.42
2039	1.9	107.26
2040	0.8	47.11
		6, 917.41

However, the revenues could be spent based on the priorities of the country and are not dedicated only to low-income households, but to the low-carbon measures in general. Some of the priorities could cover the phase-out of boilers or MEPS implementation in the cases where ETS2 is combined with one of those measures.

Recovery and Resilience Fund

Hungary's plan finds that it dedicates 41% instead of the expected 37% of its total allocation for climate protection to measures over the next six years, and so there will be a strong focus on clean mobility (with a total budget size of €7 billion)[26].

Modernisation fund

The total number of allowances for the period 2021-2030 for Hungary is €19,623,677 contributing to the modernization fund (as a 2% of the ETS CAP). The funding part consists of the revenues from the auctioning of 2% of the total allowances under the EU ETS. This is estimated as a total amount of €485 million. There are no specific plans for energy poverty under the modernization fund. MS mainly do not finance low-income related energy issues from the MF, but it is not ineligible as energy efficiency in buildings is one of the Fund's targets.

Solidarity provision from ETS1

Through the Solidarity provision, an estimated number of additional allowances that Hungary receives can be calculated at €24,740,000 using a 28% increase of allowances to be auctioned which is taken from Annex II(a) of the directive and is gotten from either the verified emissions under the EU ETS for 2005, or the average of the period 2005 to 2007. This figure can be used to calculate the estimated value of these allowances over phase 4 using a limited price range for the current spot price (at €20/EUA) and the highest expected price level (at €35/EUA) resulting in €495.61 million and €743.42 million respectively.[18]

Just transition fund

[26] https://visegradpost.com/en/2021/06/01/hungarys-recovery-plan-aims-to-relaunch-the-economy-and-improve-competitiveness/#:~:text=Following%20eight%20months%20of%20constructive%20preparatory%20work%2C%20the,it%20has%20decided%20to%20utilize%20only%20non-refundable%20funds.

Using the method for calculating the fair, balanced and effective distribution of the Just Transition Funds resources, Hungary is allocated €66 million of the total available funding (€7.5 billion). This results in a total estimated expected investment to be mobilized under pillar 1, 2, and 3 for Hungary at €879 million of which the total estimated funding under Pillar 1 is €235 million.[27]

The priority investment areas and framework conditions for effective delivery of the Just Transition Fund investments in Hungary[28] (2021-2027) are for the Mátra power plant in Heves county with the associated two coal mines, which are the biggest CO_2 emitters. The Baranya county relies heavily on energy-intensive industries (treatment and disposal of non-hazardous waste and manufacture of cement) where process related greenhouse gas emissions intensity significantly exceed the EU average. The Mátra power plant produces 15% of the total electric power but accounts for nearly 50% of the energy sector emissions. A total of 2,500 people work in the two coal mines and the coal power plant. Coal is used for heating in the country, especially in the poorest households, and contributes significantly to Hungary's greenhouse gas emissions. Moving away from fossil fuel production is likely to lead to a substantial reconversion of extraction sites and energy-generating plants. As a result, a significant number of people directly or indirectly employed by the fossil fuel value chain could be affected by the shift to a greener economy. Workers affected by this transition would need to be equipped with new and in-demand skills to increase their employability prospects and receive tailored support by employment services to find new jobs. The smart specialisation strategies provide an important framework to set priorities for innovation in support of economic transformation. The Just Transition Fund has the potential to promote economic diversification and reskilling and increase the attractiveness of the county for investments. In order to tackle these transition challenges, priority investment needs have been identified to cover the socio-economic costs of the transition. Key actions of the Just Transition Fund could target in particular:

- investments in the deployment of technology and infrastructures for affordable clean energy, in
- greenhouse gas emission reduction, energy efficiency and renewable energy;
- investments in enhancing the circular economy, including through waste prevention, reduction,
- resource efficiency, reuse, repair and recycling;
- investments in regeneration and decontamination of sites, land restoration and repurposing projects;
- upskilling and reskilling of workers;
- job-search assistance to jobseekers;
- active inclusion of jobseekers;
- technical assistance.

A complete overview of the distribution of the JTF resources[29] is given below:

- Industrial GHG emissions of regions with a high carbon intensity: 4.503 (1,000 TCO_2 equivalent)
- % of Industrial GHG emissions: 0.5%

[27] https://ec.europa.eu/commission/presscorner/detail/en/qanda_20_66
[28] https://ec.europa.eu/info/sites/default/files/annex_d_crs_2020_en.pdf
[29] https://ec.europa.eu/commission/presscorner/detail/en/qanda_20_66

- Employment in industry in regions with carbon-intensive industry: 85 (thousand); (1.2%)
- Initial share after capping: 0.6%
- Share after GNI per head adjustment: 0.9%
- Final share after adjustment for minimum aid intensity: 0.9%
- Allocation: €65.8 million
- Aid intensity: €16 per person

Costs from introduction of scenarios

The costs that need to be financed by the various funding streams and the specific policy instruments to do that (see below) consist of investment costs (technology and installation costs for boilers and energy refurbishments) and costs to consumers from the increased energy prices.

The investment costs should normally be financed through various policies and subsidy schemes from the state budget, and should reach a very high or maximum financing rate (over 95% up to 100%) for low-income groups (first quintile or decile of the income categories). These groups cannot use their own financing means for such investments as they are often locked-in to using fossil fuel technologies, live in low insulated buildings and cannot carry out changes due to the split incentive problem (as their landlords might object in undertaking investments), and other known barriers (see WS1 report). The investment costs required from the five scenarios are presented below.

Table 30a Investment costs per scenario

Scenario 2	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**Total investment costs (m EUR)**
	Heat pumps	0	0	138	0	1,547	0	**1,685**
Scenario 3	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Building envelope	0	3,429	3,429	3,302	0	0	**10,160**
Scenario 4	**Investments (m EUR)**	**2025**	**2030**	**2,035**	**2040**	**2045**	**2050**	
	Heat pumps	0	0	138	0	1,556	0	**11,854**
	Building envelope	0	3,429	3,429	3,302	0	0	
	Total	0	3,429	3,567	3,302	1,556	0	
Scenario 5	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Heat pumps	0	0	84	0	1,292	0	**11,536**
	Building envelope	0	3,429	3,429	3,302	0	0	
	Total	0	3,429	3,513	3,302	1,292	0	

The highest costs are presented since they require technological change when the banning of fossil fuel boilers is combined with the Minimum Energy Performance Standards (Scenario 4) and when the latter are combined with the ETS 2 on heating fuels (Scenario 5). The respective policies (see below) should also aim for the largest financing gap in the 2030-2040 period, where the majority of funds must be delivered. For instance the Social Climate Fund will have a duration up to 2032 (with €3.13 billion) and thus the other funds will need to cover the gap for these

investment costs (approximately €300 million, mainly from the auctions from ETS2 allowances or from the Just Transition Fund (some part of the €235 million from Pillar 1) and the Modernization Fund (some part of the €485 million). Nevertheless, it is important to consider that in case the costs of heat pumps remain high up to 2030, thus hindering the full effects of the economies of scale, and the costs of the insulation materials remain high, then the investment costs in all scenarios would be substantially higher and the existing funds would not be able to cover the required financing gaps (see Table below).

Table 28b Investment costs for different scenarios with higher costs

Investments (million €)	2025	2030	2035	2040	2045	2050	Total	Increase
Scenario 2	0	0	259	0	2901	0	3159	88%
Scenario 3	0	5144	5144	4953	0	0	15240	50%
Scenario 4	0	5144	5402	4953	2918	0	18416	55%
Scenario 5	0	5144	5301	4953	2423	0	17820	54%

In terms of costs from energy price increases, if Hungary were to implement a social support policy framework (such as on-bill financing or cost coverage to low-income groups from the higher energy costs), then the total energy costs passed on to consumers on a yearly basis and cumulatively (upon which a support scheme could be based) are presented below.

Table 31 Energy costs

Total energy costs (m EUR)	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**Cumulative costs (m EUR)**
Baseline	218	227	237	247	253	259	**1,441**
Scenario 1	218	216	230	244	259	273	**1,440**
Scenario 2	218	227	239	249	186	193	**1,312**
Scenario 3	218	210	203	201	207	212	**1,251**
Scenario 4	218	210	204	202	160	166	**1,160**
Scenario 5	218	212	207	207	148	153	**1,145**

In all scenarios, except the fossil fuel boilers phase out, the low-income groups will reduce their energy costs cumulatively in the long run. For the ETS2 (Scenario 1) and phasing out of fossil fuel boilers (Scenario 2), there will be a requirement to support the low-income households due to the increase in energy costs for such years (calculated as the difference of the energy costs in the scenario with the baseline costs) as shown in the table below. For these amounts, as they extend beyond the lifetime of the EU Social Climate Fund, the other funding streams must be used.

Table 32 Energy costs difference

Energy costs difference from baseline (m EUR)	**2030**	**2035**	**2040**	**2045**	**2050**
Scenario 1	-11	-7	-3	6	12
Scenario 2	0	2	2	-67	-66

Adverse impacts of policy introduction on low-income groups

Based on the methodology described in the introductory part of this report, we calculate the compensating variation of the household or the rise in income that the household would need to cover the expenses introduced. The expenditure side of the calculation includes both energy expenditure and the expenditure for investments for the specific scenario introduced in comparison to the baseline scenario. The income remains the same as in the baseline scenario, forecasted from the available income data.

Table 33 Adverse impacts of policy introduction per household

Rise in income needed to cover both variation in energy price and the cost of scenario								AVG (EUR)	Share in income (%)
	2019	2025	2030	2035	2040	2045	2050		
Scenario 1			-28.42	-18.08	-7.75	15.50	36.17	-0.52	-0.01
Scenario 2			0.00	76.47	5.17	626.2	-170.5	107.47	3.03
Scenario 3			1,727.77	1,683.85	1,587.24	-118.8	-121.4	951.72	26.80
Scenario 4			1,727.8	1,757.7	1,589.8	563.7	-240.2	1,079.75	30.41
Scenario 5			1,732.9	1,737.6	1,602.7	396.29	-273.84	1,039.14	29.26

This means that the average yearly household income would have to rise by €110 in Scenario 2, but around €950 for Scenario 3 and around €1,080 for Scenarios 4 and 5 of the average projected income for low-income groups to 2050. Taking into consideration that the disposable income is the most important primary indicator of energy poverty, this result would mean that an additional number of citizens would be classified as vulnerable groups. Therefore, it is of high importance to use the available funding to create measures that avoid adverse effects on households, as low-income households react to lower disposable income with negative impacts on arears, comfortability and causally with worsening of their social life and health.

Policy instruments

Measure	**Support for residential solar PV systems and electrification of heating systems in combination with PV panels**
Description	The scheme aims to grant financial support to (100% grant support) Hungarian households living under the national average salary levels in order to install PV panels and/or change heating systems. The household income limit is, however, rather high and the process is so complicated that the poorest strata will probably not have access to the grant. In addition, the originally stated goal of the RRP (to improve air quality in the most problematic regions and to reduce energy poverty) does not seem to be adequately addressed by the call. The electrification of heating systems without proper insulation of the houses is ineffective and uneconomic yet the call doesn't include such measures (aside from the change of windows and doors, meaning that no insulation or other building renovation measures are suggested). As such, those living in the worst conditions cannot afford to complement the grant from their own resources.

Proposal of changes	The scheme must safeguard the substitution of the fossil fuel heaters with heat pumps at a cost of an average of €1.5 billion up to 2045 with the higher upfront costs in the period 2030-2035 with €130 million. These costs do not include the installation of a PV system, but rather refer to heat pump costs. These costs can be financed primarily from the EU Social Climate Fund (up to 2032) and the remaining from the Modernization Fund or the Revenues from the auctioned allowances.

The analysis of impacts of the proposed measures

Policy measure 1: Support for PV systems

Environmental impacts of energy efficiency measures

Climate change: The use of renewable energy, in this case solar, reduces carbon emissions and therefore has less detrimental impacts on the environment.

Air quality, health & wellbeing: Renewable energy provides better air quality as it reduces polluting emissions, and therefore improves overall quality of life for the environment and citizens. "Wind, solar and hydropower produce little or no air pollution. Other renewable energy technologies, such as biomass and geothermal, do emit air pollutants, but at much lower rates than most conventional fuels. Air pollution has become a critically important issue in many developing countries, where up to 2.9 billion people still rely on wood, coal and charcoal for cooking and heating homes. Cleaner options, including biomass and solar technologies, can play a role in this regard."[30]

Social impacts of energy efficiency measures

Improved social inclusion: The energy-bill cost reductions introduced through the measure leads to higher disposable income and buying power of its residents.[11] Energy savings provide fewer energy bills and enhance social inclusion by allowing households to spend on other goods and services as "feelings of social exclusion and isolation (…) extend beyond the traditional impacts of energy poverty (health risks, restricted available income, indebtedness, risk of disconnection from suppliers, etc.) and hint at the systemic implications of the everyday experience of domestic energy deprivation."[11]

Economic impacts of energy efficiency measures

IRENA states that: "Renewable energy provides a significant - and growing - number of jobs worldwide each year. The renewable energy sector, according to IRENA's estimates, employed a record 10.3 million people worldwide in 2017, driven by rising investments. This, in turn, was the result of rapidly falling costs, technological improvements and government policies to support renewables."[31]

[30] https://www.irena.org/benefits
[31] https://www.irena.org/benefits

Impact analysis

Environmental	Positive
Social	Positive
Economic	Positive

Policy measure 2: Home Renovation Program

Environmental impacts of energy efficiency measures

Climate change: The Home Renovation program offers renovation interventions which, inherently, reduces GHG emissions by being more energy efficient.

Air quality: Overall, energy efficiency measures provide better air quality by reducing air pollution emissions and related environmental benefits happen by avoiding emissions from heating, etc.

Social impacts of energy efficiency measures

Health & wellbeing: Renovation measures improve the overall health and wellbeing of residents through interventions in the form of improved thermal insulation and retrofitting of buildings, therefore occupants should see an increase comfort of living. The reduction on the cost of living (reflected in reduced energy bills) also impacts health and wellbeing by providing better living conditions via the ability to keep one's home at adequate temperatures. Energy efficiency measures can also have positive impacts in terms of mental health as households can generate energy savings and avoid arrears on energy bills.

Improved social inclusion: The energy-bill cost reductions introduced through the measure leads to higher disposable income and buying power of its residents.[11] Energy savings provide fewer energy bills and enhance social inclusion by allowing households to spend on other goods and services as "feelings of social exclusion and isolation (…) extend beyond the traditional impacts of energy poverty (health risks, restricted available income, indebtedness, risk of disconnection from suppliers, etc.) and hint at the systemic implications of the everyday experience of domestic energy deprivation."[11]

Economic impacts of energy efficiency measures

Increased economic activity: Through the retrofitting and renovation activities of residential buildings, many market actors ranging from (building) contractors, energy service providers installing new PV and larger scale distributed RES (wind/solar parks amongst others), policy makers, and regulators become necessary and sought after, and thus increase economic activity when they are employed.

Education, jobs, and productivity: Data has shown that energy efficiency provides more job opportunities in Europe.[13] Cost-effective energy efficiency improvements can also have positive impacts by boosting economic activity that can turn into higher employment rates. A 2016 study assessed the impact of the EU's Ecodesign Directive projects on the efficiency measures developed, which would lead to 0.8 million additional jobs by 2020. Energy service companies

and energy utilities are the two main players and therefore employers within the sector, which employ more than 1 million people globally.[14]

Impact analysis

Environmental	Positive
Social	Positive

Conclusions

For Hungary to have more effective policies, there needs to be a national definition of energy poverty. As we have seen, the measures proposed do not directly tackle energy poverty and do not specifically target vulnerable households, showing a lack of overall measures and policies driven towards the issue. Taking steps to provide better measures on this would entail more specificity, more data and specific targeting of who can benefit from renovation, renewable energy measures. Furthermore, the biomass boilers for heating have a high share in Hungary but they are typically in bad conditions, which requires an enforcement of heating modernization and insulation simultaneously. Along these lines, biomass will continue to play an important role in the transition as gas networks are extensive – hence phasing out of new gas boilers after 2030 will not be easily socially feasible (as gas is still considered a better solution than polluting wood stoves, wet wood, wastes and others). The presence of district heating with biomass or geothermal is a more interesting alternative, but the price regulation of district heating needs first to be reviewed.

In order to consider electrification of heating (through heat pumps) a substantial funding must be allocated to bring up the overall conditions of homes to a better condition (e.g. through electrical wiring), extend and upgrade the incumbent electricity grid and educate people on the use and advantages of heat pumps.

The proposed policies must be accompanied with the setting up of a comprehensive cadastre in Hungary, to identify the options and the magnitude of the building stock. For the building registry to be reliable in-site inspection must be included, which is an extra cost that must allocated to these policies. Updating the building certification regulation is necessary and energy consumption monitoring is necessary before and after renovation. An important element for these policies is to first define which buildings are worth and feasible to be renovated (not only through the economic but also the technical potential), as mud houses are widespread among low-income classes and hence market prices are extremely low, without any worth in renovation. If on top of that fees are introduced for the assigning of energy classes or renovation passports, then it will be impossible to cover even these costs from the low-income groups. It is required thus that the Renovation Passport for MEPS becomes a free state service for the energy poor groups.

Finally, alternative supporting policies could play a role for the low-income groups, such as energy communities for raising the RES share and promoting net metering solutions, or the newly introduced EEO scheme that introduces buy-out option for obligated parties, where collected fund is planned to be used for the energy poor (conditions to be defined).

10.5 Italy

Social Climate Fund

The objectives of the EU Social Fund (€72 billion) are to a) finance temporary direct income support for vulnerable households and b) support measures and investments that reduce emissions in road transport and buildings sectors and as a result reduce costs for vulnerable households, micro-enterprises and transport users. The spending should be frontloaded to precede and accompany a smooth introduction of the ETS2 but does not cover scenarios without it. The amount of €48.5 billion for the period 2028- 2032 is subject to the availability of the funds under the annual ceilings of the applicable multiannual financial framework. The Fund will be operational as of 2025 and Italy must finance at least 50% of the total costs of the Social Climate Plans. The amount attributed to Italy is of €7,806,923,117 for the 2025-2032 period, based on the share of 10.81% for the country (according to the Regulation of the Social Climate Fund). The amount between 2025-2037 is of €2,562,660,358 and for 2028-2032, the amount is of €5,244,262,759. If the available funding does not match the costs of the introduction of ETS2 and related measures, additional funding is required, which can come from the resources linked to ETS2 or others.

Table 34 Allocation of SCF to Italy[32]

Member State	Share as % of total	TOTAL 2025-2032 (in EUR, current prices)	Amount for 2025-2027 (in EUR, current prices)	Amount for 2028-2032 (in EUR, current prices)
Italy	10.81	7, 806, 923, 117	2, 562, 660, 358	5, 244, 262, 759

As visible from the description of the Fund, it could cover multiple type of measures, including building renovations, electrification and financial aid. The final application will depend on the national Social Climate Plan, but the possible financing of the combination of measures supports the idea of scenarios where all policies are combined and co-financed.

Recovery and Resilience Fund

Italy will receive an amount of €68.9 billion in grants and €122.6 billion in loans from the RRF. Italy's plan devotes 37.5% of its total allocation to measures that support climate objectives and 25.1% to digital transition[33]. Key investments in the green transition are energy efficiency in residential and public buildings (€15.3 billion), sustainable mobility (€34 billion) and development of renewable energies and the circular economy and improvement in waste and water management (€11.2 billion). Those investments are accompanied by important reforms aimed at improving the efficiency in the use and management of water resources and local public services, increasing recycling rate, deploying of charging points for electric vehicles, increasing

[32] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0568
[33] https://ec.europa.eu/info/business-economy-euro/recovery-coronavirus/recovery-and-resilience-facility/italys-recovery-and-resilience-plan_en

competition in the electric market, improving the functioning of concessions in Italian ports or simplifying the various legal frameworks for the acceleration of energy efficiency interventions and transport infrastructure projects.

Revenues from ETS auctioned allowances

Italy will cumulatively receive €48.2 billion (in the period 2026-2040) from the auctioned allowances (that are net from the contributions to the Innovation Fund and the Social Climate Fund). The majority of the funding (€42.3 billion) will be streamed in the first period of the implementation of the measures (2025-2035) and can be used for covering the costs for low-income households.

Table 35 Revenues from auctions of national allocations

Year	Central_MSR1	Revenues
2026	150.8	8,388.84
2027	103.9	5,778.75
2028	78.8	4,383.72
2029	66.9	3,718.96
2030	68.2	3,790.68
2031	73.7	4,101.69
2032	66.2	3,682.43
2033	58.7	3,263.16
2034	51.1	2,843.90
2035	43.6	2,424.64
2036	36.1	2,005.37
2037	28.5	1,586.11
2038	21.0	1,166.84
2039	13.4	747.58
2040	5.9	328.31
		48,210.99

However, the revenues could be spent based on the priorities of the country and are not dedicated only to low-income households, but to the low-carbon measures in general. Some of the priorities could be covering of phase-out expenses or MEPS implementation in cases where the ETS2 is combined with one of those measures.

Just transition fund

The priority investment areas and framework conditions for effective delivery for the 2021-2027 Just Transition Fund investments in Italy[34] will take place in the urban area of Taranto (province of Taranto), which hosts one of Europe's largest steel mills and one of the three biggest coal-fired power plants in Italy, large industrial pollution stems from GHG, but also from other pollutants and particle matters. This area is economically heavily dependent on the steel mill, which employs ca. 10,000 employees, with a further ca. 10,000 estimated to work in ancillary companies. These jobs are at risk. The area's heavy dependence on fossil fuels poses a massive decarbonisation challenge and calls for major efforts in supporting an integrated transition strategy to accompany Taranto's long-term shift towards economic alternatives and further development of the steel cluster. Based on this preliminary assessment, it appears warranted that the Just Transition Fund concentrates its intervention on that area. In order to tackle these challenges, priority investment needs have been identified to make the economies of this area more modern and competitive. Key actions of the Just Transition Fund could target in particular:

- investment in the deployment of technology and infrastructures for affordable clean energy, energy efficiency and renewable energy, including in industrial sites that emit high GHG with the aim to reduce emissions;
- investment in regeneration and decontamination of sites, land restauration and repurposing projects;
- investment in the creation of new firms , including through business incubators and consulting services, considering Smart Specialisation Strategies

More practical examples and key actions that are to be considered under the JTF are (non-exhaustive list taken from the IT Country Report): investments in the deployment of technology and infrastructures for affordable clean energy, in greenhouse gas emission reduction, energy efficiency and renewable energy; investments in the creation of new firms, productive investments in SMEs, including start-ups, upskilling and reskilling of workers and investments in regeneration and decontamination of sites.

A complete overview of the distribution of the JTF resources[35] is given below:

- Industrial GHG emissions of regions with a high carbon intensity: 59,472 (1000 TCO_2 equivalent)
- % of Industrial GHG emissions: 6.6%
- Employment in industry in regions with carbon-intensive industry: 395 (thousand); (5.5%)
- Initial share after capping: 4.8%
- Share after GNI per head adjustment: 5.0%
- Final share after adjustment for minimum aid intensity: 4.9%
- Allocation: €364.3 million
- Aid intensity: €6 per person

Other sources of funding

The Italian National Energy and Climate Plan lists a number of measures which the government intends to prioritize in order to fight energy poverty. In particular, these are setting up a National Observatory of Energy Poverty, reviewing the existing instruments (in particular the electricity

[34] https://ec.europa.eu/info/sites/default/files/annex_d_crs_2020_en.pdf
[35] https://ec.europa.eu/commission/presscorner/detail/en/qanda_20_66

and gas social bonuses), subsidies for low income families, and putting in place a programme for making social housing buildings more energy efficient. No specific amount is mentioned for the alleviation of Energy Poverty.

Costs from introduction of scenarios

The costs that need to be financed by the various funding streams and the specific policy instruments to do that (see below) consist of investment costs (technology and installation costs for boilers and energy refurbishments) and costs to consumers from the increased energy prices.

The investment costs should, normally, be financed through various policies and subsidy schemes from the state budget, and they should reach a very high or maximum financing rate (over 95% up to 100%) as the category of population we refer to are low-income groups (first quintile or decile of the income categories). These groups cannot use own financing means for such investments and they are the ones locked-in fossil fuel technologies, low insulated buildings and cannot carry out changes due to the higher split incentive problem (as their landlords might object in undertaking investment costs) and other known barriers (see WS1 report). The investment costs required from the five scenarios are presented below.

Table 36a Investment costs for different scenarios

Scenario 2	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**Total investment costs (m EUR)**
	Heat pumps	0	0	528	0	10596	0	**11,124**
Scenario 3	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Building envelope	0	10,373	10,373	10,373	0	0	**31,119**
Scenario 4	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Heat pumps	0	0	528	0	10,646	0	**33,292**
	Building envelope	0	10,373	10,373	10,373	0	0	
	Total	0	10,373	10,900	10,373	1,646	0	
Scenario 5	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Heat pumps	0	0	516	0	10,101	0	**41,735**
	Building envelope	0	10,373	10,373	10,373	0	0	
	Total	0	10,373	10,888	10,373	10,101	0	

The highest costs are presented as they require technological change when the banning of fossil fuel boilers is combined with the Minimum Energy Performance Standards (Scenario 4) and when the latter are combined with the ETS 2 on heating fuels (Scenario 5). The respective policies (see below) should also aim at the largest financing gap in the 2030-2040 period, where the majority of funds must be delivered. For instance, the Social Climate Fund will have a duration up to 2032

(with €1.7 billion) and thus the other funds will need to cover the gap for these investment costs. Nevertheless, it is important to consider that in case the costs of heat pumps remain high up to 2030, thus hindering the full effects of the economies of scale, and the costs of the insulation materials remain high, then the investment costs in all scenarios would be substantially higher and the existing funds would not be able to cover the required financing gaps (see Table below).

Table 34b Investment costs for different scenarios with higher costs

Investments (million €)	2025	2030	2035	2040	2045	2050	Total	Increase
Scenario 2	0	0	990	0	19868	0	20858	88%
Scenario 3	0	15560	15560	15560	0	0	46679	50%
Scenario 4	0	15560	16550	15560	19961	0	67630	60%
Scenario 5	0	15560	16527	15560	18939	0	66585	60%

In terms of costs from energy price increases, if Italy implements a social support policy framework (such as on-bill financing or cost coverage to low-income groups from the higher energy costs), then the total energy costs passed on to consumers on a yearly basis and cumulative (upon which a support scheme could be based) are presented below.

Table 37 Energy costs

Total energy costs (m EUR)	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**Cumulative costs (m EUR)**
Baseline	2,033	2,153	2,267	2,375	2,421	2,467	**13,716**
Scenario 1	2,033	2,208	2,382	2,545	2,689	2,825	**14,682**
Scenario 2	2,033	2,153	2,251	2,355	1,481	1,493	**11,766**
Scenario 3	2,033	1,959	1,881	1,857	1,893	1,929	**11,552**
Scenario 4	2,033	1,959	1,869	1,846	1,276	1,287	**10,270**
Scenario 5	2,033	1,971	1,892	1,880	1,206	1,216	**10,198**

In all scenarios, except the first one, the low-income groups will reduce their energy costs cumulatively in the long run. For ETS2 prices (Scenario 1), there will be a requirement to support the low-income households due to the increase in energy costs for such years (calculated as the difference of the energy costs in the scenario with the baseline costs) as shown in the table below.

Table 38 Energy costs difference from baseline

Energy costs difference from baseline (m EUR)	**2030**	**2035**	**2040**	**2045**	**2050**
Scenario 1	-55	-115	-170	-268	-358

More specifically, €812 million for the period 2040-2050 (in the case of ETS2) will be required for the increased bills of the households.

Adverse impacts of policy introduction on low-income groups

Based on the methodology described in the introductory part of this report, we calculate the compensating variation of the household or the rise in income that the household would need to cover the expenses introduced. The expenditure side of the calculation includes both energy expenditure and the expenditure for investments for the specific scenario introduced in comparison to the baseline scenario. The income remains the same as in the baseline scenario, forecasted from the available income data.

Table 39 Adverse impacts of policy introduction per household

Rise in income needed to cover both variation in energy price and the cost of scenario (EUR)								AVG (EUR)	Share in income (%)
Year	2019	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**		
Scenario 1			-3.98	-1.45	0.72	5.78	10.12	2.24	0.03
Scenario 2			0.00	79.46	1.08	73.03	-22.41	26.23	0.34
Scenario 3			224.87	209.32	198.84	-43.02	-43.38	109.33	1.40
Scenario 4			224.87	284.45	196.31	33.12	-64.71	134.81	1.73
Scenario 5			225.59	240.13	191.97	12.73	-76.64	118.75	1.52

This means that the average yearly household income would have to rise by €2 in Scenario 1, €27 in Scenario 2 and around €140 for Scenarios 3, 4 and 5 of the €10,550 average projected income for low-income groups to 2050. Taking into consideration that the disposable income is the most important primary indicator of energy poverty, this result would mean that an additional number of citizens would be classified as vulnerable groups. Therefore, it is of highest importance to use the available funding to create measures to avoid adverse effects on households, as low-income households react to lower disposable income with negative impacts on arears, comfortability and causally with worsening of their social life and health.

Policy instruments

Measure	**Electricity bonus**
Description	The electric bonus is a measure to provide financial assistance to households to pay their electricity bills. Families wishing to access those social bonuses must have an income of less than €8,107.50 (as per their Equivalent Economic Status Indicator), increased to €20,000 for large families (with more than three dependent children). As well as these social bonuses, there is also an electricity bill discount available to people reliant on life-saving medical equipment (known as the 'physical ailment social bonus'), which is granted irrespective of income. It is automatically granted to people receiving the citizenship income (Article 5(7) of Decree-Law No 4 of 20 January 2019 (transposed in amended form by Law 26 of 28 March 2019)).

	933,000 persons received an electric bonus in 2014. In 2018 the total amount granted for the electricity bonus was around €120 million and around 2.9 million families benefited at least once from it (roughly €4 per household).
Proposal of changes	The measure has already been improved in 2019: the need to apply for the electricity bonus was removed, and eligible consumers automatically benefit from it. Given the rise in energy prices and the post pandemic impacts on vulnerable consumers, the measure could be expanded to higher thresholds of income. If the same proportions remain (with a range of €40-45 per household), in the case of the ETS2 scenario a dedicated €55 million would be required for the low-income households (hence it could cover about 1.2 million households out of the 2.8 million households falling under the low-income group category).
Evolution of measure	Not applicable
Additional funding	JTF/SCF
Start year and duration	2009 –
Organisations in charge of implementation	Italian Government
Target groups	Low income households

Measure	**Thermal bonus**
Description	This measure provides subsidies to companies and households for thermal improvements of housing. Its amount varies between €30 and €245 depending on the number of family members and on the climatic zone. Around €900 million per year (200 for PAs).
Proposal of changes	The measure has already been improved in 2019: the need to apply for the gas bonus was removed, and eligible consumers automatically benefit from it. Given the rise in energy prices and the post pandemic impacts on vulnerable consumers, the measure could be expanded to higher thresholds of income.
Evolution of measure	Not applicable
Additional funding	JTF, SCF

Start year and duration	2009 –
Organisations in charge of implementation	Italian Government
Target groups	Low income households

Measure	**Bonus 110**
Description	110% tax reduction – SUPERBONUS 110 is a temporary push for renovation of buildings, introduced in 2020 and lasting until 2023. It can only be used for deep renovation, as it foresees at least one "driving" measure, which can be accompanied by "driven" ones. Some driving measures are complete insulation (coating and windows) of the house, substitution of heating systems and/or anti-seismic measures. Driven measures can be other energy efficiency interventions, EV recharging structures, PVs, etc. However, the Budget Law for 2018 introduced the possibility for consumers to reassign credit to construction companies or banks (with a cost which is usually 10% of the value, making EE measures cost-free for consumers in case of superbonus 110%). The same applies for social housing companies.
Proposal of changes	The measure was highly effective in pushing energy renovation but its administrative complexity was seen as a barrier for its access, which discouraged many vulnerable consumers from benefitting from it. The measure should be simplified.
Evolution of measure	The measure was introduced in 2020 and is due to end in 2023. This very short duration did not create the right conditions for the market to adapt to it, leading (together with other unpredictable factors) to the price raise – both in terms of material and in terms of staff cost. Also, the measure should have been simplified and coupled with a communication campaign.
Additional funding	RRF
Start year and duration	2020 – 2023
Organisations in charge of implementation	Italian government in collaboration with ENEA and Tax Agency
Target groups	No specific target group

The analysis of impacts of the proposed measures

Policy measures 1 Electricity and Thermal social bonus

Environmental impacts of energy efficiency measures

Climate change: The Electricity and Thermal social bonus seemingly have no effect on climate change as they are meant to help households sustain a minimum standard of living and afford their electricity and thermal bills.

Air quality: Similar to their effects on climate change, these measures do not yield any changes in relation to the baseline of air quality in Italy.

Social impacts of energy efficiency measures

Health & wellbeing: The purpose of the two measures is to make sure vulnerable consumers can have a decent quality of life, by supporting their energy expenses. The physical and mental strain that is avoided due to this type of aid have been found as significant in some studies, where the primary health outcomes of homelessness avoidance reported were improvements in general physical and mental health, well-being, and quality of life.[36]

Improved social inclusion: Beneficiaries of these measures are able to avoid structural-economic exclusion, which includes material (income and goods) and non-material (social rights) aspects, as well as socio-cultural exclusion that involves reduced social relations and cultural integration.[37]

Economic impacts of energy efficiency measures

Increased economic activity: For those who do not have access to emergency social or financial resources, unexpected financial costs can result in the inability to pay necessities such as utility bills or rent, thus causing health hazards in the home or homelessness. These types of governmental aid thus greatly reduce the likelihood of homelessness in vulnerable populations, where the estimated economic benefits of supplying grants to vulnerable households exceeds the estimated costs on society.[38]

Education, jobs, and productivity: In the absence of this measure, beneficiaries who would lose access to utilities or their housing would most likely face the cascading risk of also losing their job39, which would result in emotional strain for them. In addition, many that are homeless or close to being homeless struggle to find or maintain a job due to numerous individual and institutional barriers40 and thus are unable to be a productive member of society.

Impact analysis

Environmental	Neutral
Social	Positive
Economic	Positive

[36] 10.1111/hsc.13486
[37] https://pure.hva.nl/ws/portalfiles/portal/5513844/10.1007_s11205_016_1486_z.pdf
[38] 10.1126/science.aag0833
[39] https://doi.org/10.1177/1359105307080581
[40] https://socialinnovation.usc.edu/wp-content/uploads/2020/08/Homelessness-and-Employment.pdf

Policy measures: SuperBonus 110

Environmental impacts of energy efficiency measures

Climate change: The Superbonus 110 offers a range of energy efficient interventions through insulation (coating and windows) of the house, substitution of heating systems which, inherently, reduces GHG emissions.

Air quality: Overall, energy efficiency measures provide better air quality by reducing air pollution emissions by avoiding heating practices that make use of fossil fuels or waste burning.

Social impacts of energy efficiency measures

Health & wellbeing: The intervention is also aimed to improve the overall health and wellbeing of its residents through interventions in the form of improved thermal insulation and retrofitting of buildings, therefore occupants should see an increase in comfort of living. The reduction on the cost of living (reflected in reduced energy bills) also benefits their wellbeing. In this case, replacing old technologies with efficient ones can have positive impacts on health and wellbeing by providing better living conditions (ability to keep home to adequate temperature). Energy efficiency measures can also have positive impacts in terms of mental health as households can generate important energy savings and avoid arrears on energy bills.

Improved social inclusion: The energy-bill cost reductions introduced through the proposed measures lead to higher disposable income and buying power of its residents.[11] Energy savings provide fewer energy bills and enhance social inclusion by allowing households to spend on other goods and services as "feelings of social exclusion and isolation (…) extend beyond the traditional impacts of energy poverty (health risks, restricted available income, indebtedness, risk of disconnection from suppliers, etc.) and hint at the systemic implications of the everyday experience of domestic energy deprivation."[11]

Economic impacts of energy efficiency measures

Education, jobs, and productivity are all promoted and touched upon in one way or another through the wide range of interventions proposed including the retrofitting of buildings (specifically residential with new windows for better lighting), thermal insulation and living comfort for improved education and productivity, as well as the stimulation of RES creating jobs.

Increased economic activity: Through the retrofitting and renovation activities of residential buildings, many market actors ranging from (building) contractors, energy service providers installing new PV and larger scale distributed RES (wind/solar parks amongst others), policy makers, and regulators are all necessary and assigned work bringing significant economic activity to the region where works are performed. In 2017, the European Commission provided four different scenarios that assess increased targets for the EU's 2030 energy efficiency target. For the GDP impact, each scenario resulted in a positive change, from a 0.1%-2% increase in GDP in the least ambitious and most ambitious scenarios of increased energy efficiency respectively.[12]

Education, jobs, and productivity: Data has shown that energy efficiency provides more job opportunities in Europe.[13] Cost-effective energy efficiency improvements can also have positive impacts by boosting economic activity that can turn into higher employment rates. A 2016 study assessed the impact of the EU's Ecodesign Directive projects on the efficiency measures

developed, which would lead to 0.8 million additional jobs by 2020. Energy service companies and energy utilities are the two main players and therefore employers within the sector, which employ more than 1 million people globally.[14]

Impact analysis

Environmental	Positive
Social	Positive

Links and co-benefits between the measures

The superbonus 110 and the electricity and gas bonusses will provide better living conditions, one by guaranteeing a higher disposable income and one by providing financial aid to improving the households. However, only the electricity and gas bonusses target vulnerable households. The superbonus 110 has no specific target group, which means that alleviating energy poverty is only one of its many objectives. The measures do link with one another by offering better living conditions in terms of costs and health.

Conclusions

Italy is still far from having a complete and coherent set of measures for energy poverty alleviation. Similarly to other European member states, Italy lacks a clear definition of both *energy poverty* and of *vulnerable consumers* in the first place. This leads to a lack of indicators to measure energy poverty. If on one hand, a part of the scientific community would prefer to have a set of complex multi-variable indicators, on the other hand the majority of researchers and policy makers still see energy poverty one of the many types poverty. However, this thesis becomes hard to maintain, considering that energy poverty and poverty do not have a direct correlation and, especially in the last years, energy poverty seems to be decreasing in Italy, whereas indicators for general poverty seem to suggest that the latter is moving in the opposite direction. Further studies and further data collection is therefore needed, especially for what concerns determinants other than income (e.g. quality of the building stock, gender, literacy, etc.). For the afore mentioned reasons, Italy does not have any measure in place targeting specifically energy poors: the electricity and gas bonusses target low-income households, whereas other measures such as the superecobonus 110 (and similarly ecobonus and sismabonus) do not have a specific target group, but only some additional features like the possibility to assign credit to a third party such as a bank, which should favour low-income groups to benefit from them without having to anticipate liquidity. Measures such as the superecobonus 110 are therefore a great asset to renew Italy's building stock, including vulnerable consumers', and could have a positive effect on energy poverty. However, the very complex process required to access the credit, and the short duration of the measure (less than three years) created on one hand a perception of high risk and mistrust, and on the other hand a distortive effect on the house-renovation market, leading to price increase for both material and labour force and therefore in some cases to the opposite effect of the one they were conceived for. In order for them to be more effective on energy poverty alleviation, such measures would need to be simplified, stretched over a longer period of time and coupled with an information campaign targeting consumers. This could be partially covered through the funding streams described at the beginning of the document, such as the Social Climate Fund, the Just Transition Fund or the Recovery and Resilience Plans, which should also

be used to expand the eligibility basis for energy price support measures (e.g. electricity and gas bonusses).

Some of Italy's structural problems should also be addressed. Italy is well known for having a very low absorbent capacity for what concerns European funds, which is caused by a red tape problem coupled with an inadequate preparation of the public sector. Moreover, the average spending power of the Italian households is decreasing due to the fact that jobs are underpaid and salaries are not increasing adequately, causing an income problem also for people working full-time.

According to the Italian NECP, the government seems to be willing to move forward on the matter of definition and alleviation of energy poverty, and some steps have already been taken, such as the creation of an independent Italian energy poverty observatory (although not yet the GSE-led one described in the NECP). However the road ahead appears to be still long.

10.6 Poland

Social Climate Fund

The objectives of the EU Social Fund (€72 billion) are to a) finance temporary direct income support for vulnerable households and b) support measures and investments that reduce emissions in road transport and buildings sectors and as a result reduce costs for vulnerable households, micro-enterprises and transport users. The spending should be frontloaded to precede and accompany a smooth introduction of the new ETS. The amount of €48.5 billion for the period of 2028- 2032 is subject to the availability of funds under the annual ceilings of the applicable multiannual financial framework. The Fund will be operational as of 2025 and Poland must finance at least 50% of the total costs of the Social Climate Plans. The amount attributed to Poland is of €12,714,118,688 for the 2025-2032 period, based on the share of 17.61% for the country (according to the Regulation of the Social Climate Fund). If the available funding does not match the costs of the introduction of ETS2 and additional measures, additional funding is required. It can come from the resources linked to ETS2 or others.

Table 40 Allocation of SCF to Poland[41]

Member State	Share as % of total	TOTAL 2025-2032 (in EUR, current prices)	Amount for 2025-2027 (in EUR, current prices)	Amount for 2028-2032 (in EUR, current prices)
Poland	17.61	12, 714, 118, 688	4, 173, 471, 093	8, 540, 647, 595

As visible from the description of the Fund, multiple types of measures could be covered, including building renovations, electrification and financial aid. The final application will depend on the national Social Climate Plan, but the possible financing of the combination of measures supports the idea of scenarios where all policies are combined and co-financed.

Revenues from ETS2

Poland's plan finds that it devotes 17.61% of its total allocation to measures that support climate objectives. Poland will have about €58 billion at its disposal from the National Recovery Plan.[42]

Revenues from auctions of national allocations

Based on the allocation of auctions between countries, total revenues from ETS2 in Poland are modelled as is shown in Table 39 (net from the national contributions to the Innovation Fund and the Social Climate Fund). These numbers are not exact as the only values available are calculations from ETS2 forecast of Vivid Economics. Of that, 25% should be allocated to Social Climate Fund. The majority of funding (€26 billion) is estimated to flow in the period 2025-2035, which can be used to cover the additional costs of low-income groups.

[41] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0568
[42] https://www.gov.pl/web/planodbudowy/kpo-wyslany-do-komisji-europejskiej

Table 41 Revenues from national allocations

Year	Central_MSR1	Revenues without SCF
2026	92.6	5,150.89
2027	63.8	3,548.25
2028	48.4	2,691.68
2029	41.1	2,283.51
2030	41.8	2,327.54
2031	45.3	2,518.51
2032	40.7	2,261.07
2033	36.0	2,003.64
2034	31.4	1,746.20
2035	26.8	1,488.77
2036	22.1	1,231.33
2037	17.5	973.90
2038	12.9	716.46
2039	8.3	459.02
2040	3.6	201.59
		29,602.36

However, the revenues could be spent based on the priorities of the country and are not dedicated only to low-income households, but to low-carbon measures in general. One of the priorities could be covering of phase-out expenses or the MEPS implementation in cases where the ETS2 is combined with one of those measures.

Modernisation fund

The total number of allowances for the period of 2021-2030 in Poland is €119,643,793 contributing to the modernization fund (as a 2% of the ETS CAP). The funding part consists of the revenues from the auctioning of 2% of the total allowances under the EU ETS and the additional allowances transferred (Art 10). As of 2025, additional allowances may be added to the fund, depending on how much is needed for the free allocation to industry. The key element that must be checked prior to allocating the modernisation fund for the low-income groups are to provide evidence that the investment proposal is in line with the State aid rules, confirm that the investment complies with any other applicable requirements of Union and national law, and confirm that there is no double funding of the same costs with another Union or national instrument. Furthermore, Poland submitted to the EIB an investment proposal "Cogeneration for District Heating" for which it envisages a contribution from the Modernisation Fund[43].

Solidarity provision from ETS1

Through the Solidarity provision, an estimated number of additional allowances that Poland receives can be calculated at €272,460,000 using a 39% increase of allowances to be auctioned

[43] https://modernisationfund.eu/wp-content/uploads/2021/12/MF-2021-2-PL-0-003-Cogeneration-for-District-Heating.pdf

which is taken from Annex II(a) of the directive and is gotten from either the verified emissions under the EU ETS for 2005, or the average of the period 2005 to 2007. This figure can be used to calculate the estimated value of these allowances over phase 4 using a limited price range for the current spot price (at €20/EUA) and the highest expected price level (at €35/EUA) resulting in €5.4 billion and €8.1 billion respectively.

Just transition fund

Using the method to calculate the fair, balanced and effective distribution of the Just Transition Funds resources, Poland has allocated €2,000 million or a share of 26.7% of the total available funding (€7.5 billion). This results in a total estimated expected investments to be mobilized under pillar 1, 2 and 3 for Poland at ~€27.3 billion, of which the total estimated funding under pillar 1 is €7.7 billion[44].

The priority investment areas and framework conditions set for the delivery of the Just Transition Fund are outlined by the commission and work towards an effective delivery of the fund investments in Poland. These areas and conditions were derived from the broader analysis of territories that face serious socio-economic challenges detailed in the 2019 Country Report for Poland.

Despite moving away from coal production since the 1990s, Poland's economy is still strongly dependent on coal mining as can be seen by the country's 78,000 workers in the industry, which amount to almost half of the number of coal miners within the EU[45]. The transition process will likely impact all coal mining regions in Poland, namely Silesia, the largest of the mining regions with 18 functioning mines, Wielkopolska, in which 6,000 people are employed in lignite extraction and power generation-related positions, Lower Silesia, Łódzkie, Lubelskie and Malopolska. For the first two, along with the Wałbrzych region, which suffers from low levels of economic development, the highest unemployment rate in Lower Silesia, social issues and degradation of infrastructure, there are ongoing transition planning efforts that have been triggered by the Coal Regions in Transition Initiative. In order to move away from the coal and lignite extraction industries in the entirety of the country, Poland would require economic diversification, reskilling and upskilling, counteracting depopulation and creating new jobs in areas other than mining and lignite-based power generation.

When moving forward with the Just Transition Fund, it should be noted that some areas are more vulnerable than others, such as Wielkopolska due to its open-pit lignite mines that create environmental challenges, such as lowering of groundwater and droughts and Wałbrzych which suffers from high poverty and depopulation, low GDP/capita, as well as geological and water problems related to underground mining structures that may prevent the efficient development of the area.

The overview of the distribution of the JTF resources is given in the text below[19]:

- Industrial GHG emissions of regions with a high carbon intensity: **153,192** (1,000 TCO_2 equivalent)

[44] https://ec.europa.eu/commission/presscorner/detail/en/qanda_20_66
[45] https://ec.europa.eu/info/sites/default/files/annex_d_crs_2020_en.pdf

- Employment in industry in regions with carbon-intensive industry: **1,953** (thousand); (**27.3%)**
- Employment in mining of coal and lignite: **139,000; 56.9%**
- Share in Industrial GHG emissions: **17.0%**
- Initial share after capping: **26.7%**
- Share after GNI per head adjustment: **26.7%**
- Final share after adjustment for minimum aid intensity: **26.7%**
- Allocation: €**2000** million
- Aid intensity: €**57.2** per person

Other sources of funding

Poland's National Recovery and Resilience Facility will benefit from €23.9 billion in grants and €12.1 billion in loans, for a combined €35.2 billion to support its Recovery and Resilience Plan (RRP). Of the plan's total allocation, 47% will be given to measures that support climate objectives.[46]

The Polish Reconstruction Fund (Krajowy Plan Odbudowy or KPO) is intended to support in restoring the resilience of the economy and prepare for future unforeseen circumstances. Poland will have around €58 billion at its disposal for this.[47]

The National Fund for Environmental Protection and Water Management can also be considered a source of funding for future energy efficient measures. "The National Fund's offer addressed to Polish families is in demand. The PROSUMENT programme was funded by the National Fund for Environment Protection and Water Management and supports the development of civil power engineering from renewable energy sources. In 2014-2020, the National Fund allocated PLN 800 million of financial support for construction of small installations, producing energy from renewable sources for own consumption. The National Fund (with the budget of PLN 300 million) also offers individuals surcharges to credits contracted for construction of energy-saving houses."[48]

In order to give a boost to prosumer energy production through RES, additional schemes were put in place, such as 'My Electricity Bill' (Mój Prąd) with a pool of funds of PLN 1 billion.[49] The Scheme, whose goal is to increase energy production from solar sources, foresees the co-financing of new 2-10 kW solar photovoltaic micro installations, with an estimated 200,000 beneficiaries that will take advantage of the subsidies.

Approximately €1.4 billion has been allocated to support energy efficiency measures as part of the Operational Programme Infrastructure and Environment 2014-2020 (OPI&E), and around €2 billion as part of the Regional Operational Programmes (ROP).[49] Out of this amount, approximately €320 million has been allocated through the ROP as repayable assistance, which concerns investments in energy efficiency of buildings, energy efficiency of enterprises, high-efficiency cogeneration and energy-efficient heating and cooling systems.

[46] https://ec.europa.eu/commission/presscorner/detail/en/IP_21_2221
[47] https://www.gov.pl/web/planodbudowy/kpo-wyslany-do-komisji-europejskiej
[48] https://www.gov.pl/web/nfosigw-en/priority-programmes84
[49] https://ec.europa.eu/energy/sites/ener/files/documents/pl_final_necp_part_1_3_en.pdf

Poland's NECP also details a number of NFOŚiGW funds,[49] detailed below.

Table 42 Poland's NFOSiGW Funds

Name / Type	Funding area	Amount of funds	Horizon	Additional information
a) Energy Plus	Measures improving energy efficiency, low-carbon energy sources, including renewable energy sources and high-efficiency cogeneration, district heating, environmental education, other green investments, improving air quality, low-carbon transport	a) PLN 4,000 million	2019-2025	Details of the NFOŚiGW power sources are available at: https://nfosigw.gov.pl/o-nfosigw/o-nas/ http://nfosigw.gov.pl/oferta-finansowania/ * The My Electricty programme is financed from the climate account. The funds come from the ETS and the National Fund for Environmental Protection and Water Management (NFOŚiGW) acts as the National Green Investment System Operator. ** Funds to be disbursed until 2029.
b) Poviat District Heating – pilot Programme**		b) PLN 500 million		
c) Agro-energy		c) PLN 200 million		
d) Polish Geothermal Energy Plus		d) PLN 600 million		
e) My Electricity*		e) PLN 1,000 million		
f) Co-financing of projects financed under Axis I of OPI&E 2014-2020		f) PLN 2,000 million		
g) 'Clean Air'		g) PLN 103,000 million		

Lastly, state funds, like the Thermomodernisation and Renovation Fund could be arranged.

Costs from introduction of scenarios

The costs that need to be financed by the various funding streams and the specific policy instruments to do that (see below) consist of investment costs (technology and installation costs for boilers and energy refurbishments) and costs to consumers from the increased energy prices. The investment costs should normally be financed through various policies and subsidy schemes from the state budget, and should reach a very high or maximum financing rate (over 95% up to 100%) for low-income groups (first quintile or decile of the income categories). These groups cannot use their own financing means for such investments as they are often locked-in to using fossil fuel technologies, live in low insulated buildings and cannot carry out changes due to the split incentive problem (as their landlords might object in undertaking investments), and other known barriers (see WS1 report). The investment costs required from the five scenarios are presented below.

Table 43a Investment costs per scenario

Scenario 2	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**Total investment costs (m EUR)**

	Heat pumps	0	0	6,987	0	2,958	0	**9,945**
Scenario 3	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Building envelope	0	8,177	8,177	8,177	0	0	**24,531**
Scenario 4	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Heat pumps	0	0	6,987	0	2,958	0	**34,476**
	Building envelope	0	8,177	8,177	8,177	0	0	
	Total	0	8,177	1,5164	8,177	2,958	0	
Scenario 5	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Heat pumps	0	0	5,479	0	2,523	0	**32,534**
	Building envelope	0	8,177	8,177	8,177	0	0	
	Total	0	8,177	13,657	8,177	2,523	0	

The highest costs are presented since they require technological change when the banning of fossil fuel boilers is combined with the Minimum Energy Performance Standards (Scenario 4) and when the latter are combined with the ETS 2 on heating fuels (Scenario 5). The respective policies (see below) should also aim at the largest financing gap in the 2030-2040 period, where the majority of funds must be delivered. For instance, the Social Climate Fund will have a duration up to 2032 (€12.8 billion) and thus other funds will need to cover the gap for these investment costs (Scenario 5 remaining almost €20 billion to 2050). Nevertheless, it is important to consider that in case the costs of heat pumps remain high up to 2030, thus hindering the full effects of the economies of scale, and if the costs of insulation materials remain high, then the investment costs in all scenarios would be substantially higher and existing funds would not be able to cover the required financing gaps (see Table below).

Table 41b Investment costs for different scenarios with higher costs

Investments (million €)	2025	2030	2035	2040	2045	2050	Total	Increase
Scenario 2	0	0	13101	0	5546	0	18647	88%
Scenario 3	0	12266	12266	12266	0	0	36797	50%
Scenario 4	0	12266	25366	12266	5237	0	55134	61%
Scenario 5	0	12266	22539	12266	4731	0	51800	59%

In terms of costs from energy price increases, if Poland implements a social support policy framework (such as on-bill financing or cost coverage to low-income groups from the higher energy costs), then the total energy costs passed on to consumers on a yearly basis and cumulatively (upon which a support scheme could be based) are presented below.

Table 44 Energy costs

Total energy costs (m €)	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**Cumulative costs (m EUR)**
Baseline	589	609	627	645	655	664	**3,789**

Scenario 1	589	483	507	529	552	573	**3,233**
Scenario 2	589	609	563	579	521	529	**3,390**
Scenario 3	589	560	531	519	527	534	**3,260**
Scenario 4	589	560	557	544	487	496	**3,233**
Scenario 5	589	571	523	514	431	438	**3,066**

In all scenarios, low-income groups will reduce their energy costs cumulatively in the long run and would not require extra support to finance energy bills.

Adverse impacts of policy introduction on low-income groups

Based on the methodology described in the introductory part of this report, we calculated the compensating variation of households, the rise in income that households would need to cover the expenses introduced. The expenditure side of the calculation includes both energy expenditure and the expenditure for investments for the specific scenario introduced in comparison to the baseline scenario. The income remains the same as in the baseline scenario, forecasted from the available income data.

Table 45 Adverse impacts of policy introduction per household

Rise in income needed to cover both variation in energy price and the cost of scenario (EUR)								**AVG (EUR)**	**Share in income (%)**
Year	2019	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**		
Scenario 1			-57.78	-55.03	-53.20	-47.23	-41.73	-50.99	-0.92
Scenario 2			0.00	611.48	-30.27	209.85	-61.91	145.83	2.62
Scenario 3			727.50	705.95	692.19	-58.70	-59.62	401.46	7.22
Scenario 4			727.50	1358.70	703.66	179.12	-77.04	578.39	10.39
Scenario 5			732.55	1204.89	689.90	128.68	-103.64	530.47	9.53

To be able to cover expenses of energy expenditure change and share of costs for covering implementation of policies, without the measures/instruments introduced, low-income households in Poland need a rise in income of around 2.6% for the second scenario and 7-10% in scenarios 3, 4 and 5. But low-income households won't need a rise in income for the first scenario.This means that the average yearly household income would have to rise of around €140 in Scenario 2, around €400 in Scenario 3, but around €550 for Scenarios 4 and 5 of the €7733.13 average projected income for low-income groups to 2050. Taking into consideration that the disposable income is the most important primary indicator of energy poverty, this result would mean that an additional number of citizens would be classified as vulnerable groups.

Therefore, it is of highest importance to use the available funding to create measures to avoid adverse effects on households, as low-income households react to lower disposable income with negative impacts on arrears, comfortability and causally worsening their social life and health, as described in the methodology.

Policy instruments

Measure	Clean Air Programme[50] and the Anti Smog Tariff[51]
Description	One of The Clean Air Program's main objectives is to provide cleaner and more efficient heating in residential housing, improve general air quality and fight smog, as Poland has some of the most polluted cities in Europe. Part of the program targets vulnerable electricity consumers that are given access to a flat-rate energy allowance which is specified each year by the Ministry of Energy and can vary depending on electricity consumption limits and average electricity prices for household consumers, giving vulnerable consumers easier financial access to cleaner energy sources. The Anti-Smog Tariff was put in place in December 2017 under the Ministry of Energy, in order to reduce heating with oil or coal and switch to electric heating alternatives to improve air quality and prevent the smog created by oil and coal use. Every year, 48,000 Poles die prematurely due to air pollution, thus the government allocated PNL 100 billion to improve air quality. As a result, electricity rates have been introduced to this tariff and are 30 to 50% lower than the G11 tariffs most commonly used in Poland. In addition, there are co-financing programs available for vulnerable consumers to replace their boilers.
Proposal of changes	The clean air program is in urgent need of reform to meet its targets, as it intended to replace the three million old-fashioned residential coal furnaces in Poland within ten years, yet only 70,000 have been removed by January 2021.[52] The low uptake and poor implementation, with rural populations facing particular difficulties accessing funds, means that new measures must be taken to change how the program is perceived and ran. In addition to these measures, Poland can make the Krakow-based mobile app, which updates residents on air quality, a well-known app used in all households via promotional campaigns. This should emphasize the need to change the country's baseline for heat production at the residential level. In addition, the app allows neighbours to report properties they suspect of burning illegal materials as sources of heat and send a geotagged photo of the building in question. This data can then be used by the Ministry of Energy to target these homes, which most likely house vulnerable families due to their burning low-quality coal or trash, and offer them the option of receiving a fine for this behaviour (if additional incentive is needed), or forgo the fine and move forward with upgrading their heating systems via innovative co-financing, or ideally, 100% subsidies for transitioning to green energy systems. **This use of the application should promote**

[50] http://nfosigw.gov.pl/czystepowietrze/o-programie-czystepowietrze-/
[51] Poland strives for anti-smog solutions to improve air quality - LIFA air (lifaair.com)
[52] Pioneering anti-smog measures improve air in one of Poland's most polluted cities | Notes From Poland

	sustainable practices and inclusive funding rather than be used as a tool to reprimand the energy poor.
Start year and duration	2018-2029
Organisations in charge of implementation	Ministry of Energy
Target groups	Vulnerable groups

Measure	**Thermomodernisation and Renovation Fund**[53]
Description	The Thermomodernisation and Renovation Fund was launched in 2008 and aims at providing financial assistance to improve energy efficiency of existing buildings through thermomodernisation renovations to existing buildings for better energy efficiency and savings. The goal is to achieve 700 total annual savings by 2030. One of the particularities of the fund in 2021 is that it includes municipalities in the implementation of thermomodernisation and enables them to target vulnerable consumers and give them access to these renovations, in order to reduce energy poverty. Over 31,000 bonuses were granted from the Thermomodernisation and Renovation Fund in 2009-2019. The total amount of support granted exceeded PLN 1.7 billion and covered 460,800 dwellings. The municipality has to provide its own contribution of at least 30%, while the remaining contribution is provided by the Thermomodernisation and Renovation Fund (the State) of up to 70%. The program is taking place again between 2019-2024 and the budget is of PLN 1.2 billion. Part of the fund contains a bonus for single dwelling residential buildings from 2021 to 2030, which is: "a tax relief aimed at creating an incentive for the thermal modernization of single-dwelling residential buildings through the personal income tax."
Proposal of changes	The highest and most plentiful aids and bonuses should be allotted to vulnerable or low-income households which would benefit from these funds more than their higher income counterparts. As such, the bonuses and assistance funds should be separated into brackets, with the replacement of systems and installation of thermomodernisation materials for vulnerable groups earning below a preestablished income to be fully funded, while those earning more would receive fewer subsidies, in line with their income.
Additional funding	The 'Clean Air' and 'Stop Smog' programmes, as well as state funds

[53] https://www.bgk.pl/samorzady/fundusz e-i-programy/funduszterm omodernizacji-i-remontow/

Start year and duration	2019-2030
Organisations in charge of implementation	Local municipalities and the national government
Target groups	Vulnerable groups

The analysis of impacts of the proposed measures

Policy measures 1 and 2: the Clean Air Programme and Anti Smog Tariff as well as the Thermomodernisation and Renovation Fund

Environmental impacts of energy efficiency measures

Climate change: These measures support a range of energy efficient interventions which can reduce GHG emissions if installed. For example, the replacement of heating systems that use oil or coal with electric alternatives will reduce negative human effects on the environment due to a reduction of t CO_2eq emitted. In accordance with the COMBI tool[54], Polish residents can have a significant impact on the number of GHG emissions avoided if switching to energy efficient appliances to decrease energy demand.

Air quality: These programs encourage the replacement of inefficient systems to ease the population's dependence on fossil energy sources used for heating and energy production. Replacing old and polluting boilers or heaters tends to reduce polluting emissions if newly installed systems decrease the total energy usage of households or if energy sources are produced via renewable energy sources.[55]

Social impacts of energy efficiency measures

Health & wellbeing: The measures have been put in place to improve the overall health and wellbeing of Poland's residents both on a personal level via the home and on a larger scale, within their city. By replacing old heating technologies with more efficient ones, and funding other energy saving products like insulation or window replacement, the national government of Poland is helping resident to keep warmer in winter months and cooler in summer months, resulting in positive health effects in the home. These effects relate to increased thermal comfort while in the home, as well as better mental health as more efficient technologies consume less energy resulting in lower energy bills and thus lower chances of arrears on energy bills.[56] Additionally, decreased emissions and air pollutants resulting from efficient technologies means that when residents leave their homes, they're more likely to be met with cleaner air, therefore reducing the number of premature deaths associated with air pollution to below 48,000 per year.[57]

[54] https://combi-project.eu/charts/
[55]https://www.eea.europa.eu/data-and-maps/indicators/greenhouse-gas-emissions-from-energy/assessment
[56] https://doi.org/10.1177/1420326X211039883
[57] https://www.eea.europa.eu/media/newsreleases/many-europeans-still-exposed-to-air-pollution-2015/premature-deaths-attributable-to-air-pollution

Improved social inclusion: The energy-bill cost reductions introduced through the proposed measures lead to higher disposable income and buying power of its residents.[58] Energy savings provide fewer energy bills and enhance social inclusion by allowing households to spend on other goods and services that would result in better integration within their local communities.

Economic impacts of energy efficiency measures

Education, jobs, and productivity are all promoted and touched upon in one way or another through the wide range of interventions proposed; the retrofitting of buildings; specifically residential with new windows for better lighting, thermal insulation and living comfort for improved education and productivity, as well as the stimulation of RES creating jobs.

Increased economic activity: The retrofitting and renovation activities supported by these measures will result in an increased need for several market actors to ensure that all parts of the EE value chain are functioning efficiently and will result in the desired outcome of residential energy retrofits. The more jobs there are in association to these measures, as related to the demand of the grants, the higher the economic activity there will be in each implementing region. This falls in line with the findings of the European Commission, which state that increases in energy efficiency can result in a 0.1-2% increase in GDP.[13]

Education, jobs, and productivity: The measures will lead to higher education, and jobs through the increased local need for skilled personnel implementing the solutions, as data has shown that energy efficiency provides more job opportunities in the EU.[59] In addition, with increased thermal comfort, those working from home or studying from home during the COVID-19 pandemic will be able to increase their productivity, therefore increasing their output quality and quantity. [60]

Impact analysis

Environmental	Positive
Social	Positive
Economic	Positive

Links and co-benefits between the measures

These measures complement each other as they are all centred around energy efficiency, providing specific and adaptive measures for vulnerable households and offering financial assistance to provide cleaner and efficient energy in their homes.

Recommendations for procedural dimension

The distributional dimension of vulnerability includes, inter alia, energy affordability and energy efficiency assessed in *Workstream 2*, while procedural elements include the recognition of energy poverty as a clear problem in policy documents, the presence of an official definition of energy poverty, and the development of clear indicators to measure the problem. The Polish legislation has not developed its own definition yet or adopted a definition from other countries, nor does it use specific indicators to evaluate whom the measures should be targeting. From the perspective of procedural elements recognised in *Workstream 1*, to support the policies suggested above,

[58] https://www.tandfonline.com/doi/full/10.1080/13549839.2015.1075480
[59] https://ec.europa.eu/energy/sites/ener/files/documents/CE_EE_Jobs_main%2018Nov2015.pdf
[60] https://doi.org/10.3390/buildings11060244

Poland can provide a clearer definition of the vulnerable groups based on the income and other chosen indicators.

Conclusions

To conclude, there has been a low number of measures targeting directly low income and vulnerable groups in Poland, although there have been clear efforts to target these groups and provide help, it is still minimal as to what needs to be done.

10.7 Portugal

Social Climate Fund

The objectives of the EU Social Fund (€72 billion) are to a) finance temporary direct income support for vulnerable households and b) support measures and investments that reduce emissions in road transport and buildings sectors and as a result reduce costs for vulnerable households, micro-enterprises and transport users. The Commission will shortly propose a targeted amendment of the Regulation for the multiannual financial framework for the years 2021 to 2027 to accommodate an additional Union spending of an amount of €23.7 billion for the period 2025-2027. The spending should be frontloaded to precede and accompany a smooth introduction of the new ETS. The amount of €48.5 billion for the period 2028- 2032 is subject to the availability of the funds under the annual ceilings of the applicable multiannual financial framework. The Fund will be operational as of 2025 and Portugal must finance at least 50% of the total costs of the Social Climate Plans. The amount attributed to Portugal is €1.36 billion for the period 2025-2032, based on the share of 1.88% for the country (according to the Regulation of the Social Climate Fund). If the available funding does not match the costs of introduction of measures, additional funding is required. It can come from resources linked to ETS2 or other.

Table 46 Allocation of SCF to Portugal[61]

Member State	Share as % of total	TOTAL 2025-2032 (in EUR, current prices)	Amount for 2025-2027 (in EUR, current prices)	Amount for 2028-2032 (in EUR, current prices)
Portugal	1.88	1, 359, 497, 281	446, 261, 573	913, 235, 708

Revenues from ETS2 and RRF

Portugal will receive an amount of €16.6 billion from the RRF and an expenditure of 38% which will support its climate objectives. From these amounts, Portugal's plan supports the green transition through a large-scale investment programme of €300 million to improve the energy-efficiency of residential buildings (with RES integration) and €2.7 billion for increasing the supply of social housing solutions for various target groups. From the latter, there is a support program for access to housing, worth €1.2 billion, which will provide decent and adequate housing for families with the greatest needs and for the most vulnerable groups, which amounts to minimum of 26,000 households by 2026. The investment consists of constructing new buildings or renovating existing dwellings, as well as, wherever necessary, the acquisition of new buildings or the lease of buildings.

Solidarity provision from ETS1

[61] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0568

Through the Solidarity provision, an estimated number of additional allowances that Portugal receives can be calculated at €19,630,000 using a 16% increase of allowances to be auctioned which is taken from Annex II(a) of the directive from the verified emissions under the EU ETS for 2005, or the average of the period 2005 to 2007. This figure can be used to calculate the estimated value of these allowances over phase 4 using a limited price range for the current spot price (at €20/EUA) and the highest expected price level (at €35/EUA) resulting in ~€392 million and €588 million respectively.[18]

Just transition fund

Using the method to calculate the fair, balanced and effective distribution of the Just Transition Funds resources, Portugal is allocated €204 million or a share of 1.2% of total available funding (€7.5 billion). This results in a total estimated, the expected investments to be mobilized under pillar 1, 2, and 3 for Portugal are at ~€1 billion of which the total estimated funding under Pillar 1 is of €283 million.[19] The priority investment areas and framework conditions set for the delivery of the Just Transition Fund are outlined by the Commission and work towards an effective delivery of the fund investments in Portugal. These areas and conditions were derived from the broader analysis of territories that face serious socio-economic challenges detailed in the 2019 Country Report for Portugal.

The top investment priorities identified in Portugal are related to the coal mining regions of Alentejo Litoral (municipality of Sines) and Médio Tejo (in Pego, municipality of Abrantes), where the Portuguese government has committed to decommissioning two coal-fired power plants by September 2023 (in line with the Portuguese Carbon Neutrality Roadmap 2050 targets reflected in Portugal's draft National Energy and Climate Plan).

The interventions of the JTF are concentrated on these regions and are warranted based on the expectation that they will experience substantial job losses as a result from the transition process towards a climate-neutral economy. According to the estimations, around 650 jobs would be affected by the closure of the plats: 350 in Sines, 100 in the port of Sines, and 200 in Pego, corresponding to almost 8% of the total number of people employed in Sines, and 3% in Abrantes. Realistically, the substantial loss of employment is not offset solely through the creation and development of SME's. It is, in exceptional cases, allowed to support larger enterprises through productive investments if they show clear relevance to the territorial just transition plan.

More practical examples and key actions that are to be considered under the JTF are (non-exhaustive list taken from the PT Country Report): investments in the deployment of technology and infrastructures for affordable clean energy, energy efficiency and renewable energy; Investments in the creation of new firms, including through business incubators and consulting services; Investment in enhancing the circular economy, including through waste prevention, reduction, resource efficiency, reuse repair and recycling; productive investments in SMEs, including start-ups; and investment in the regeneration and decontamination of sites, land restoration and repurposing projects.[62]

Complete overview of the distribution of the JTF resources is given below[19]:

[62] https://ec.europa.eu/info/sites/default/files/annex_d_crs_2020_en.pdf

- Industrial GHG emissions of regions with a high carbon intensity: **11,415** (1,000 TCO_2 equivalent)
- Employment in industry in regions with carbon-intensive industry: **41,000** (thousand); Share in EU total: **0.6%**
- Share in EU total in Industrial GHG emissions: **1.3%**
- Initial share after capping: **0.8%**
- Share after GNI per head adjustment: **1.1%**
- Final share after adjustment for minimum aid intensity: **1.1%**
- Allocation: €**79.2** million
- Aid intensity: €**7.7** per person

Costs from introduction of scenarios

The costs that need to be financed by the various funding streams and the specific policy instruments to do that (See below) consist of investment costs (technology and installation costs for boilers and energy refurbishments) and also costs to consumers from the increased energy prices. The investment costs should normally be financed through various policies and subsidy schemes from the state budget, and they should reach a very high or maximum financing rate (over 95% up to 100%) as the category of population we refer to are low-income groups (first quintile or decile of the income categories). These groups cannot use own financing means for such investments and they are the ones locked-in fossil fuel technologies, low insulated buildings and they cannot carry out changes due to the higher split incentive problem (as their landlords might object in undertaking investment costs) and other known barriers (see WS1 report). Furthermore, 90% of are single-family Portuguese buildings whereas half of the population live in multifamily buildings that are difficult to renovate. Ongoing funding schemes do not easily promote building level renovations, especially insulation. Windows, heat pumps and solar PV have the highest measures being submitted in the "More Sustainable Buildings Program". It is challenging to improve insulation; this is even worse under lockdown circumstances, with families preferring quick solutions. Families need to be steered to the most cost-effective and relevant measures – funding should promote what they need and not what they want. The investment costs required from the five scenarios are presented below.

Table 47a Investment costs for different scenarios

Scenario 2	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**Total investment costs (m EUR)**
	Heat pumps	0	0	91	0	52	0	**143**
Scenario 3	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Building envelope	0	986	986	986	0	0	**2,958**
Scenario 4	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Heat pumps	0	0	91	0	43	0	**3,093**
	Building envelope	0	986	986	986	0	0	
	Total	0	986	1078	986	43	0	
Scenario 5	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	

Heat pumps	0	0	89	0	40	0	**3,087**
Building envelope	0	986	986	986	0	0	
Total	0	986	1,075	986	40	0	

The highest costs are presented, as expected since they require technological change, when the banning of fossil fuel boilers is combined with the Minimum Energy Performance Standards (Scenario 4) and when the latter is combined with ETS 2 on heating fuels (Scenario 5). The respective policies (see below) should also aim at the largest financing gap in the 2030-2040 period, where most funds must be delivered. For instance, the Social Climate Fund will have a duration up to 2032 (with €1.36 billion) and thus other funds will need to cover the gap for these investment costs. Regarding MEPS of course, there is a debate on what levels of renovation Portugal will go for, as currently, no significant renovations are being led. ELPRE stated that all buildings should be renovated until 2050, but the level of renovations depends on location, climate zone, initial situation. From the technical perspective, MEPS will not be very demanding in Portugal. It will only be a matter of label changing and repositioning the building stock. A will be labelled under zero emissions and G under 15% of the worst performing buildings. Under MEPS thus, moving for E and F will not be very ambitious, while in contrast, implementing the current ELPR will be more complex and challenging in order to have the building stock renovated to A by 2050.

Nevertheless, it is important to consider that in case the costs of heat pumps remain high up to 2030, thus hindering the full effects of economies of scale and with the costs of insulation materials remaining high, the investment costs in all scenarios would be substantially higher and existing funds would not be able to cover the required financing gaps (see Table below).

Table 45b Investment costs for different scenarios with higher costs

Investments (million €)	2025	2030	2035	2040	2045	2050	Total	Increase
Scenario 2	0	0	171	0	98	0	268	88%
Scenario 3	0	1479	1479	1479	0	0	4437	50%
Scenario 4	0	1479	1650	1479	81	0	4688	52%
Scenario 5	0	1479	1646	1479	75	0	4679	52%

In terms of costs from energy price increases, if Portugal implements a social support policy framework (such as on-bill financing or cost coverage to low-income groups from the higher energy costs), then the total energy costs passed on to consumers on a yearly basis and cumulative (upon which a support scheme could be based) are presented below.

Table 48 Energy costs

Total energy costs (m €)	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**Cumulative costs (m EUR)**
Baseline	52	54	57	60	62	63	**348**
Scenario 1	52	58	63	68	73	78	**392**
Scenario 2	52	54	70	72	69	69	**386**

Scenario 3	52	52	52	53	55	57	**321**
Scenario 4	52	52	78	78	70	70	**400**
Scenario 5	52	52	79	80	68	68	**399**

In all scenarios, low-income households will have higher energy costs cumulative in the long run except in the case of MEPS (Scenario 3). For all four other scenarios, there will be a requirement to support low-income households due to the increase in energy costs for such years (calculated as the difference of the energy costs in the scenario with the baseline costs) as shown in Table 49.

Table 49 Energy costs difference from baseline

Energy costs difference from baseline (m EUR)	2030	2035	2040	2045	2050
Scenario 1	0	4	6	8	11
Scenario 2	0	0	13	12	7
Scenario 4	0	-2	21	18	8
Scenario 5	0	-2	22	20	6

More specifically, in the period of 2030-2040, an extra support of €10 million will be required for the increased bills of households (under the ETS2), and €13 million under phasing out of fossil fuel boilers and €21 and €22 million in the combination of policy scenarios. In the long run (2040-2050), the risk of higher energy poverty can be tackled with higher financing of energy costs with 19, 19, 26 and 26 for scenarios 1, 2, 4, 5, respectively.

Adverse impacts of policy introduction on low-income groups

Based on the methodology described in the introductory part of this report, we calculated the compensating variation of households, the rise in income that households would need to cover the expenses introduced. The expenditure side of the calculation includes both energy expenditure and expenditure for investments for the specific scenario introduced in comparison to the baseline scenario. The income remains the same as in the baseline scenario, forecasted from the available income data.

Table 50 Adverse impacts of policy introduction per household

Rise in income needed to cover both variation in energy price and the cost of scenario (EUR)								AVG (EUR)	Share in income (%)
Year			**2030**	**2035**	**2040**	**2045**	**2050**		
Scenario 1			15.21	22.81	30.41	41.82	57.03	33.46	0.52
Scenario 2			0.00	118.62	45.62	66.15	22.81	50.64	0.79
Scenario 3			742.11	730.71	723.10	-26.61	-22.81	429.30	6.67
Scenario 4			742.11	899.51	818.15	63.11	26.61	509.90	7.92
Scenario 5			742.11	901.03	825.75	53.23	19.01	508.23	7.89

To be able to cover expenses of energy expenditure change and share of costs for covering implementation of policies, without the measures/instruments introduced, low-income

households in Portugal need a rise in income of around 0.5-0.8% for the first two scenarios and 6-8% in scenarios 3,4 and 5.

This means that the average yearly household income would have to rise by €33 in Scenario 1, €50 in Scenario 2, but around €480 for Scenarios 3,4,5 of the €6,437 average projected income for low-income groups to 2050. Taking into consideration that the disposable income is the most important primary indicator of energy poverty, this result would mean that an additional number of citizens would be classified as vulnerable groups. Therefore, it is of highest importance to use the available funding to create measures to avoid adverse effects on households, as low-income households react to lower disposable income with negative impacts on arears, comfortability and causally worsening their social life and health, as described in the methodology.

Policy instruments

The three most important policy instruments that can play a role for alleviating the costs of low-income groups during the implementation of the three Fit-for-55 package policies are the following:

Measure	**Social electricity and natural gas social tariffs**
Description	In 2010, the social tariff was created to ensure that all citizens have access to electrical power and natural gas, regardless of which supplier offers the service. It provides financial assistance to pay energy bills, targeting disabled citizens, households on social benefits, low-income households, pensioners, and unemployed citizens. Since 2016, the discounts have been automatically granted to customers meeting economic and/or social vulnerability criteria. The discount applied to access tariffs to electricity networks corresponds to 33.8 % of the value of transitional sale tariffs, excluding VAT, other taxes, contributions, levies, and late-payment interest. The discount applied to access tariffs to natural gas networks corresponds to 31.2% of the value of transitional sale tariffs, excluding VAT, other taxes, contributions, levies, and late payment interest. As recognised in Portugal's Long-Term National Strategy for Combating Energy Poverty (for public consultation), the measure does not promote energy efficiency, sustainability in housing, and the energy transition in the long term. However, it allows for a reduction in energy costs, ensuring that citizens have access to these services regardless of economic, social or geographic situation.
Proposal of changes	-
Evolution of measure	There will be no increase of the final energy consumption due to the projections of ETS2 price. However, there is an estimated increase in final energy consumption due to the phase-out of heating oil, solid fossil fuels and natural gas, from 2030 to 2050. Therefore, the measure should be

	successful and continued, providing financial assistance to vulnerable groups for paying energy bills. Moreover, it is estimated an increase in total energy costs related to ETS2 (from 2025 to 2050) and phase-out (from 2030 to 2045). From 2025, the discount applied to access tariffs can be increased.
Start year and duration	2008 -

Measure	**Efficiency Voucher**
Description	This measure targets economically vulnerable families in potential energy poverty, which do not reside in social housing and are located in Portugal's mainland. The program aims to improve the thermal comfort of homes of vulnerable groups. It will do so by delivering 100,000 "efficiency vouchers" to economically vulnerable families by 2025, worth €1,300 plus VAT (Value Added Tax) each. The families can use the vouchers to invest in improving the thermal comfort of their home, either through interventions in the surroundings or through the replacement or acquisition of energy efficient equipment and solutions. The present phase of the Programme aims to deliver 20,000 vouchers. The programme's goal is a total estimated allocation of €162 million and 100,000 families reached by 2025.
Proposal of changes	Local governments could be a promising agent for implementing and distributing the "Efficiency Voucher" targeting low-income families. The "Efficiency Voucher" is given based on social tariff support, unrelated to the building stock conditions. The program does not include rented housing. It is not clear how the number of 100,000 vouchers was set. No ex-ante analysis of impacts was done. The household-level funding (1600€) is not enough for deep renovations and impactful structural changes in the household, money should be available for the first step analysis diagnosis of measures by an expert (probably not needed an EPC
Evolution of measure	An increase is estimated in total energy costs related to MEPS (from 2035) and the phase-out of heating oil, solid fossil fuels and natural gas (from 2030). Therefore, the timeline of the measure could be extended beyond 2050, supporting both home renovation and the replacement of boilers.
Start year and duration	2021 – 2025

Measure	**Reduction of VAT taxes on energy prices**

Description	In 2019, through the publication of Decree-Law No. 60/2019, of May 13, the fixed component of the price due by the electricity and natural gas supplies started to be taxed with reduced VAT at a rate of 6% on the mainland and 4% and 5% in the Autonomous Regions of the Azores and Madeira, respectively. The reduction of VAT taxes focuses on consumers who have a contracted power that does not exceed 3.45 kVA in relation to electricity, and that have consumption at low pressure that does not exceed 10,000 m3 in natural gas, per year. This measure resulted in a reduction in VAT on electricity and natural gas in the fixed term for around 2 million consumers. In 2020, in addition to the reduction in the VAT rate, it was also applied to the intermediate rate of 13% on the mainland, and 9% and 12% in the Autonomous Regions of the Azores and Madeira, respectively. This is applied to the supply of electricity that does not exceed a certain level of consumption, and that is related to contracted powers within the normal low voltage (BTN) up to 6.9 kVA. The intermediate VAT rate applies to a level of consumption up to 100 kWh (in a 30-day period), which tends to be below average level of monthly electricity consumption in Portugal per contracted power level in BTN. For large families (households consisting of five or more people), the intermediate VAT rate limit increases by 50% (corresponding to 150 kWh for 30 days). This VAT amendment aims to protect economically vulnerable consumers while stimulating a rationalization of energy use and covers around 5.2 million consumers.
Proposal of changes	-
Evolution of measure	There will be no increase of the final energy consumption due to the projections of ETS2 price, while it is estimated an increase in total energy costs (from 2025 to 2050). Therefore, the measure should be successful and continued, providing financial assistance to vulnerable groups for paying energy bills.
Start year and duration	2019 -

The analysis of impacts of the proposed measures

As the Efficiency Voucher promotes energy efficiency, to provide the impacts of this measure we have gathered data and information on the influence of energy efficient actions. Based on the COMBI database, for similar introduced measures in Portugal there is a ~2% influence on total EU direct GHG emissions at 1.060 Mt CO_2 reduced.

Environmental impacts of energy efficiency measures

Climate change: The Efficiency Voucher offers a range of energy efficient interventions (from interventions in the surroundings or through the replacement or acquisition of energy efficient equipment and solutions) which, inherently, reduces GHG emissions.

Air quality: Included in the Efficiency Voucher is the retrofitting and replacement of inefficient equipment, such as boilers. Replacing old and polluting boilers provide better air quality as it reduces polluting emissions, and therefore improves overall quality of life for the environment and citizens.

Social impacts of energy efficiency measures

Health & wellbeing: All measures are aimed at improving the overall health and wellbeing of residents through interventions in the form of improved thermal insulation and retrofitting of household's buildings and/or the reduction on the cost of living (reflected in reduced energy bills).

Improved social inclusion: The energy-bill cost reductions introduced through the proposed measures lead to higher disposable income and buying power of its residents.[11] Energy savings provide fewer energy bills and enhance social inclusion by allowing households to spend on other goods and services as "feelings of social exclusion and isolation (…) extend beyond the traditional impacts of energy poverty (health risks, restricted available income, indebtedness, risk of disconnection from suppliers, etc.) and hint at the systemic implications of the everyday experience of domestic energy deprivation."[11]

Economic impacts of energy efficiency measures

Education, jobs, and productivity are all promoted and touched upon in one way or another through the retrofitting of buildings, specifically due to new windows resulting in better lighting, thermal insulation and living comfort for improved education and productivity.

Increased economic activity: Through the retrofitting and renovation activities of residential buildings, many market actors ranging from (building) contractors, energy service providers installing new PV and larger scale distributed RES (wind/solar parks amongst others), policy makers, and regulators are all necessary and assigned work bringing significant economic activity to the region where works are performed. In 2017, the European Commission provided four different scenarios that assess increased targets for the EU's 2030 energy efficiency target. For the GDP impact, each scenario resulted in a positive change, from a 0.1%-2% increase in GDP in the least ambitious and most ambitious scenarios of increased energy efficiency respectively.[12]

Education, jobs, and productivity: Data has shown that energy efficiency provides more job opportunities in Europe.[13] Cost-effective energy efficiency improvements can also have positive impacts by boosting economic activity that can turn into higher employment rates. A 2016 study assessed the impact of the EU's Ecodesign Directive projects on the efficiency measures developed, which would lead to 0.8 million additional jobs by 2020. Energy service companies and energy utilities are the two main players and therefore employers within the sector, which employ more than 1 million people globally.[14]

Impact analysis

Environmental	Positive

Social	Positive
Economic	Positive

Links and co-benefits between the measures

These three measures complement each other by focusing on both economic and social benefits as well as on energy efficiency. The social tariffs and the VAT reduction on energy prices protect economically vulnerable consumers, while the VAT reduction also stimulates a rationalization of energy use. On the other hand, the Efficiency Voucher encourages economically vulnerable families to improve building insulation and acquiring energy efficient equipment.

Recommendations for procedural dimension

The distributional dimension of vulnerability includes, inter alia, energy affordability and energy efficiency assessed in *Workstream 2*, while procedural elements include the recognition of energy poverty as a clear problem in policy documents, the presence of an official definition of energy poverty, and the development of clear indicators to measure the problem. Energy poverty is mentioned in Portugal's NECP, LTRS, and the Long-Term National Strategy for Combating Energy Poverty, which highlight the development of monitoring indicators and strategies on energy poverty, establishing objectives to combat energy poverty in the medium and long term, at national, regional and local levels. From the perspective of procedural elements recognised in *Workstream 1*, to support the policies suggested above, Portugal can count on the development of the energy poverty monitoring system to identify vulnerable households and the impact of the measures.

Conclusions

The alleviation of energy poverty has gained momentum in Portugal, being highlighted in national documents such as the NECP and LTRS, which detail a strategy to monitor energy poverty, as well as to implement and finance measures to alleviate it. In 2021, Portugal developed the Long-Term National Strategy for Combating Energy Poverty, focused on decreasing energy poverty, protecting vulnerable consumers, and actively integrating them in the energy and climate transition. Furthermore, the Portuguese long-term strategy for buildings renovation (ELPRE) can be used to benchmark funding needs. Still, since it is not targeted only at low-income households, it has limited comparison capabilities. For the proper implementation of MEPS, insulation and windows should be priority measures, but ongoing funding schemes under the RRP have low number of applications targeting insulation. The ELPRE strategy will need to have more interaction with the energy performance certification and MEPs following the revision due to the EPDB.

However, several measures and strategies have yet to be implemented. This means that Portugal has still few measures and policies which specifically target vulnerable consumers. It is important to mention the social electricity and natural gas tariffs, the reduction of VAT taxes on energy prices, Programa 1º Direito - Support Programme for Access to Housing, and the Efficiency Voucher.

10.8 Romania

Social Climate Fund

To address any social impacts that arise from the new ETS system, the Commission proposes the introduction of the Social Climate Fund (€72 billion). The underlying objectives of the fund are to a) provide finance in the form of temporary direct income support for vulnerable households and b) support measures and investments that reduce emissions in road transport and buildings sectors and as a result reduce costs for vulnerable households, micro-enterprises, and transport users.

All member states, including Romania, are required to finance at least 50% of the total costs of the Social Climate Plans, to this effort member states can use the expected revenues from the inclusion of buildings and road transport into the scope of application of the ETS Directive.[63] The spending should be frontloaded to precede and accompany a smooth introduction of the new ETS. The amount of €48.5 billion for the period 2028- 2032 is subject to the availability of the funds under the annual ceilings of the applicable multiannual financial framework. This Fund should be operational as of 2025. The methodology description to calculate the financial distribution is given in the introduction section of this report. Together with the formula in Annex I and the maximum amounts each member state can receive from the SCF listed in Annex II. We get a high amount for Romania compared to other member states of ~€6.7 billion (or 9.3%).[64] If the available funding does not match the costs of the introduction of ETS2 and related measures, additional funding is required, which can come from the resources linked to ETS2 or others.

Table 51 Allocation of SCF to Romania[65]

Member State	Share as % of total	TOTAL 2025-2032 (in EUR, current prices)	Amount for 2025-2027 (in EUR, current prices)	Amount for 2028-2032 (in EUR, current prices)
Romania	9.26	6, 682, 901, 998	2, 193, 694, 977	4, 489, 207, 021

The allocation could cover multiple types of measures, including building renovations, electrification and financial aid. The final application will depend on the national Social Climate Plan, but the possible financing of the combination of measures supports the idea of scenarios where all policies are combined and co-financed.

Revenues from auctions of national allocations

Based on the allocation of auctions between the countries, revenues for Romania (net from the contributions to the Innovation fund and the Social Climate Fund) will reach €7.46 billion in the period 2026-2040, while the majority of funding (€4.7 billion) is foreseen for the period 2025-2030. Part of this amount can be used to finance the additional costs to low-income groups filling in potential gaps from the Social Climate Fund.

[63] https://eur-lex.europa.eu/resource.html?uri=cellar:9e77b047-e4f0-11eb-a1a5-01aa75ed71a1.0001.02/DOC_3&format=PDF
[64] https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/698777/EPRS_BRI(2021)698777_EN.pdf
[65] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0568

Table 52 Revenues from national allocations

Year	Central_MSR	Revenues
2026	23.4	1,299.15
2027	16.1	894.93
2028	12.2	678.89
2029	10.4	575.94
2030	10.6	587.05
2031	11.4	635.21
2032	10.3	570.28
2033	9.1	505.35
2034	7.9	440.42
2035	6.8	375.49
2036	5.6	310.56
2037	4.4	245.63
2038	3.2	180.70
2039	2.1	115.77
2040	0.9	50.84
		7,466.24

However, the revenues could be spent based on priorities of the country and are not dedicated only to low-income households, but to low-carbon measures in general. One of the priorities could be centred on covering the phase-out expenses or MEPS implementation in cases where ETS2 is combined with one of these measures.

Modernisation fund

The total allowance for the period 2021-2030 for Romania is a €200,766,069 contribution from the modernization fund as 11.98% of the total size which was capped at the revenues from auctioning of 2% of total allowances available under EU ETS.[66] Out of this amount, €86,073,704 (43%) was added because of allowances transferred from Article 10c to the Modernisation Fund which, out of the ten eligible Member States, only three (Bulgaria, Hungary and Romania) decided to include a free allocation under Article 10c of the ETS Directive in phase 4, albeit it a relatively small amount for Romania of €5,600,000 or 6.1%.[67] As of 2025, additional allowances may be added to the fund, depending on how much is needed for the free allocation to the industry. Some funds will be allocated to support district heating renovations, while local, central, and EU funds will in large part remain focused on the transition to gas. The ban of gas boilers would be a policy difficult to implement, particularly if district heating systems fall apart and households in multi-family apartment buildings have no alternative but to use them.

Solidarity provision from ETS1

[66] https://ec.europa.eu/clima/eu-action/funding-climate-action/modernisation-fund_en
[67] https://ec.europa.eu/clima/eu-action/eu-emissions-trading-system-eu-ets/free-allocation/free-allocation-modernisation-energy-sector_en

Through the Solidarity provision, an estimated number of additional allowances can be calculated at 124,240,000 using a 53% increase of allowances to be auctioned through Annex II(a) of the directive in combination with the verified emissions under the EU ETS for 2005 or the average of the period from 2005 to 2007.

This figure can be used to calculate the estimated value of these allowances over phase 4 using a limited price range for the current spot price (at €20/EUA) and the highest expected price level (at €35/EUA) resulting in ~€2.5 billion and ~€3.7 billion respectively[68].

Just transition fund

Using the method for calculating the fair, balanced and effective distribution of the Just Transition Funds resources, Romania has allocated €757.1M or a share of 10.1% of the total available funding (€7.5 billion). This results in a total estimated expected investments to be mobilized under pillar 1, 2, and 3 for Romania at ~€10.1 billion, of which the total estimated funding under pillar 1 is €2.1 billion.

The priority investment areas and framework conditions set for the delivery of the Just Transition Fund are outlined by the commission and work towards an effective delivery of the fund investments in Romania. These areas and conditions were derived from the broader analysis of territories that face serious socio-economic challenges detailed in the 2019 Country Report for Romania.

Romania's counties of Hunedoara and Gorj employ 90% of the country's mining work force, with 18,600 and 10,000 jobs directly and indirectly depending on coal extraction or energy production, respectively. They cumulatively account for 90% of GHG emissions related to the country's coal fired power plants and 30% of all Romanian GHG emissions resulting from mining and manufacturing. Moving away from fossil fuel extraction and use will likely put these jobs at risk, especially since both counties make use of several carbon intensive industrial facilities which are expected to undergo restructuring before 2030, thus negatively influencing employment. Within the counties of Dolj, Galați, Prahova and Mureș, a significant number of the workforce works with fossil fuel power and heat generation or energy intensive manufacturing and heavy industries such as chemicals, metal processing, cement, and fertilisers, representing 35% of Romanian's GHG emission stemming from mining and manufacturing, all of which would be affected by the energy transition. [69]

As such, the Just Transition Fund can tackle the related transition challenges by:

- investing in regeneration and decontamination of sites, land restoration and repurposing projects;
- investing in the deployment of technology and infrastructures for affordable clean energy, greenhouse gas emission reduction, energy efficiency and renewable energy;
- productive investments in SMEs, start-ups, firms and consulting services leading to economic diversification and reconversion;
- investing in research and innovation activities and fostering transfer of advanced technologies

[68] https://www.ceep.be/www/wp-content/uploads/2018/10/Funding-Mechanisms-in-the-fourth-phase-of-the-EU-ETS.pdf
[69] Page 44: https://ec.europa.eu/commission/presscorner/detail/en/qanda_20_66

- enhancing the circular economy through waste prevention, reduction, and resource efficiency, reuse repair and recycling
- upskilling and reskilling workers, especially in the fields of renovation and heat pumps, which require specialised skills, while providing job-search assistance to jobseekers; and
- offering technical assistance.

Recovery and Resilience Facility

Romania's National Recovery and Resilience Facility will benefit from €14.2 billion in grants and €14.9 billion in loans, for a combined €29.9 billion to support its Recovery and Resilience Plan (RRP). Of the plan's total allocation, 41% will be given to measures that support the green transition, including the phase out of coal and lignite power production by 2032. In addition, Romania has been approved for the disbursement of €3.8 billion in pre-financing, representing 13% of the total allocated amount for the country.

For the gradual increase in annual renovation rates from 0.69% to 1.56% between 2021-2030, 3.79% between 2031-2040, and 4.33%, which would lead to a reduction of 0.83 Mtoe in the final consumption in 2030 compared to the baseline scenario, a reduction in CO_2 emissions of 2.34 million tonnes compared to the baseline scenario, and an estimated value of 7.50 million tonnes of CO_2 emissions generated by the stock of buildings in Romania in 2030, the country's LTRS estimates a commitment of €12.8 billion for necessary investments.[70] Moreover, an estimated amount of €1 billion should be committed to cover the technical assistance costs. The recommendations regarding the sources of the abovementioned investments are the following:

- €3 billion should come from non-reimbursable funds from the State budget or from funds offered by the EU;
- €6 to €9 billion should be allocated as funds through reimbursable financial mechanisms, including reimbursable grants;
- €1.8 billion should be provided by the owners of the buildings to be renovated under a co-financing regime.

Within the Operational Programme for Smart Growth and Digitalisation, funds for financial instruments dedicated to energy efficiency amount to €71.43 billion, of which €50 million originate from the ERDF, while €21.43 million come from the State's budget[71]. Additionally, within the Regional Operational Programme "A greener Europe", funds allotted for energy efficiency of buildings in the urban localities using solid fuel amount to €857.13 million (€600 million from the ERDF).

However, it must be noted that the focus of Romania's NRRP and renovation strategy continues to be on "low-hanging fruits" such as multi-family apartment buildings, with no clear measure for single family buildings, which make up the bulk of rural and poor areas.

[70] https://ec.europa.eu/energy/sites/ener/files/documents/ro_final_necp_main_en.pdf
[71] https://www.sazp.sk/fondy-eu/operacny-program-kvalita-zivotneho-prostredia/op-kzp.html

Costs from introduction of scenarios

The costs that need to be financed by the various funding streams and the specific policy instruments to do that (see below) consist of investment costs (technology and installation costs for boilers and energy refurbishments) and costs to consumers from the increased energy prices.

The investment costs should normally be financed through various policies and subsidy schemes from the state budget, and they should reach a very high or maximum financing rate (over 95% up to 100%) as the category of population we refer to are low-income groups (first quintile or decile of the income categories). These groups cannot use their own financing means for such investments as they are often locked-in to using fossil fuel technologies, live in low insulated buildings and cannot carry out changes due to the split incentive problem (as their landlords might object in undertaking investments), and other known barriers (see WS1 report). The investment costs required from the five scenarios are presented below.

Table 53a Investment costs for different scenarios

Scenario 2	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**Total investment costs (m EUR)**
	Heat pumps	0	0	52	0	2368	0	**2,420**
Scenario 3	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Building envelope	0	4,222	4,222	4,222	0	0	**12,666**
Scenario 4	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Heat pumps	0	0	51	0	2,569	0	**15,286**
	Building envelope	0	4,222	4,222	4,222	0	0	
	Total	0	4,222	4,273	4,222	2,569	0	
Scenario 5	**Investments (m EUR)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Heat pumps	0	0	24	0	2,229	0	**14,919**
	Building envelope	0	4,222	4,222	4,222	0	0	
	Total	0	4,222	4,246	4,222	2,229	0	

The highest costs are presented since they require technological change when the banning of fossil fuel boilers is combined with the Minimum Energy Performance Standards (Scenario 4) and when the latter are combined with the ETS 2 on heating fuels (Scenario 5). The respective policies (see below) should also aim for the largest financing gap in the 2030-2040 period, where the majority of funds must be delivered. For instance, the Social Climate Fund will have a duration up to 2032 (with €6.7 billion) and thus the other funds will need to cover the gap for these investment costs. However, it should be noted that heat pumps are not on the Romanian Authorities' radar, as public policies are still targeted at extending gas networks to rural areas. Local experts advise that heat pumps are recognized as "green" in the EU taxonomy only in the case that the electricity consumed to run them is itself "green". In order to cover the energy needs of lower income groups, electricity production should originate from a mix of energy sources that are dependent on local available resources. Nevertheless, it is important to consider that in case the costs of heat pumps remain high up to 2030, thus hindering the full effects of the economies

of scale, and also the costs of the insulation materials remain high, then the investment costs in all scenarios would be substantially higher and existing funds would not be able to cover the required financing gaps (see Table below).

Table 51b Investment costs for different scenarios with higher costs

Investments (million €)	2025	2030	2035	2040	2045	2050	Total	Increase
Scenario 2	0	0	98	0	4440	0	4538	88%
Scenario 3	0	6333	6333	6333	0	0	18999	50%
Scenario 4	0	6333	6429	6333	4817	0	23912	56%
Scenario 5	0	6333	6378	6333	4179	0	23223	56%

In terms of costs from energy price increases, if Romania implements a social support policy framework (such as on-bill financing or cost coverage to low-income groups from the higher energy costs), then the total energy costs passed on to consumers on a yearly basis and cumulatively (upon which a support scheme could be based) are presented below.

Table 54 Energy costs

Total energy costs (M €)	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**Cumulative costs (m EUR)**
Baseline	335	357	381	396	402	408	**2,279**
Scenario 1	335	357	400	425	449	472	**2,438**
Scenario 2	335	357	391	405	316	319	**2,123**
Scenario 3	335	335	335	332	338	343	**2,018**
Scenario 4	335	335	327	326	251	254	**1,828**
Scenario 5	335	339	335	337	226	228	**1,800**

In all scenarios, except the fossil fuel boilers phase out, low-income groups will reduce their energy costs cumulatively in the long run. For ETS2 (Scenario 1), there will be a requirement to support low-income households due to the increase in energy costs for such years (calculated as the difference of the energy costs in the scenario with the baseline costs) as shown in Table 5.

Table 55 Cost difference from baseline

Energy costs difference from baseline (m EUR)	**2030**	**2035**	**2040**	**2045**	**2050**
Scenario 1	0	9	29	47	64
Scenario 2	0	10	9	-86	-89

More specifically, in the period 2030-2040 an extra support of €38 million (€9 + €29) will be required to cover the increased bills of households (scenario 1: ETS2) and €140M for the period 2040-2050 alone. For scenario 2, the phasing out of fossil fuel boilers are expected to have costs increases by €19 million at first in the period 2030-2040, but become net-positive in the long term with €175 million saved in the period 2045-2050.

Adverse impacts of policy introduction on low-income groups

Based on the methodology described in the introductory part of this report, we calculate the compensating variation of the household or the rise in income that the household would need to cover the expenses introduced. The expenditure side of the calculation includes both energy expenditure and the expenditure for investments for the specific scenario introduced in comparison to the baseline scenario. The income remains the same as in the baseline scenario, forecasted from the available income data.

Table 56 Increase in income needed to cover additional expenditure

Rise in income needed to cover both variation in energy price and the cost of scenario (EUR)								AVG (EUR)	Share in income (%)
Year	2019	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**		
Scenario 1			0.00	16.88	25.76	41.75	56.85	28.25	0.95
Scenario 2			0.00	18.12	7.99	344.28	-79.05	58.27	1.96
Scenario 3			730.48	709.16	693.17	-56.85	-57.73	403.65	13.56
Scenario 4			730.48	711.11	687.84	322.25	-136.79	462.98	15.55
Scenario 5			734.03	713.42	697.61	239.64	-159.88	444.97	14.95

To be able to cover expenses of energy expenditure change and share of costs for covering implementation of policies, without the measures/instruments introduced, low-income households in Romania need a rise in income of around 1-2% for first two scenarios and 14-15% in scenarios 3,4 and 5. This means that the average yearly household income would have to rise by €28 in Scenario 1, €58 in Scenario 2, but around €400-460 for Scenarios 3,4,5 of the €4,428 average projected income for low-income groups to 2050. Taking into consideration that the disposable income is the most important primary indicator of energy poverty, this result would move additional number of citizens into vulnerable groups. Therefore, it is of highest importance to use the available funding to create measures which avoid adverse effects on households, as low-income households react to lower disposable income with negative impacts on arears, comfortability and causally with worsening of their social life and health, as described in the methodology.

Policy instruments

Measure	Heating aid during winter (Ajutoare pentru încălzirea locuinței) and subsequent support for vulnerable consumers
Description	Provides financial assistance to households to pay their heating bills during winter (November 1 - March 31). The main goal of the measure is to gradually reduce the amount of subsidies from the budget for heating generation, in line with commitments to the EU, and replace them over time with a form of targeted income support for vulnerable groups. Apart from providing monthly financial support to cover a part of the expenses related

	to heating the house during the cold season, the measure also aimed to implement new methods for billing and payment of heating.
Proposal of changes	Eligible beneficiaries should either receive additional funding needed; or be required to partake in the measures outlined by scenario's 2 & 3 of this report. In this way the one-off support is steered toward consistent energy savings long term by retrofitting low-income residences and/or by phasing out fossil fuel boilers used for heating.
Evolution of measure	Depending on the developments and uptake, the size and scope of income groups can be increased; targeting the lowest income groups with (near to) full compensation for implemented measures and making the support income-dependent.
Additional funding	Social Climate Fund (SCF); Recovery and Resilience Plan (RRP) (OP 2021-2027).
Start year and duration	2022-2032 (10 years)

Measure	Legislation on vulnerable consumers
Description	The proper identification of vulnerable consumers remains a challenge in Romania, and, in practice, "vulnerable consumers" remain those that can be identified by the Ministry of Labor for the Heating support in Ordinance 70 (also measure above). In the absence of a clear action plan, there is a lack of non-financial support available due to unclear definitions. The Law 226/2021 was meant to finally introduce an effective concept of the vulnerable consumer, however, while the law copies the correct EU definition of vulnerable consumers, the actual beneficiaries of support remain largely those identified since 2011 for the targeted income heating support measure (above). Currently, the support is provided in Ordinance 118/2021, which is now revised in Parliament and will most likely be adopted in a final form by the end of October. The current applicable law provides electricity and gas bill support by levels of energy consumption (as proxies for current vulnerability), as fixed sum per kWh or proportion of the bill. The amendments in Parliament include various price caps such as VAT reduction from 19% to 5%, delays in payment for vulnerable consumers, exemption from cogeneration tax and green certificates contributions for consumption up to a certain threshold. The number of beneficiaries (consumption threshold to be eligible for support) has also been increased.
Proposal of changes	The whole support scheme is designed to be financed through a "windfall tax" on energy producers. To this end, the provisions of the law are not well designed and do not cover district heating, affect cogeneration in district

	heating by excessive taxation through the "windfall tax" and apply the "windfall tax" twice on gas producers. These should all be revised.
Evolution of measure	The definition and scope of 'vulnerable consumers' groups included in the legislation should be adapted to better target energy poor households and avoid unjust and excessive taxation. In addition, the funding from taxes should be replaced with available funding coming from the EU .
Additional funding	Social Climate Fund (SCF) + National budget and local budget top-up
Start year and duration	Direct – 2032 (and beyond)

The analysis of impacts of the proposed measures

Measures 1 & 2: Heating aid during winter & Legislation on vulnerable consumers

Environmental impacts of the introduced measure:

Climate change and Air quality: There will be no affects on climate change or air quality without additional steps towards retrofitting or replacement of boilers, or the inclusion of non-financial aid such as advice on energy efficiency, energy use, energy conservation amongst others.

Social impacts of the introduced measure:

Health & wellbeing: The financial aid provided to households struggling through the winter-months will have a positive effect on mental health and overall wellbeing of the population and will reduce energy bill arrears and overall financial stress.

Improved social inclusion: Through the proposed revisions of the legislation towards vulnerable consumer groups social groups are better heard and included in adequate and effective policy measures leading to improved confidence in funding distribution, legislation and with is social inclusion.

Economic impacts of the introduced measure:

Education, jobs and productivity: Only if the measures are adopted and extended with the roll-out of a long-term plan for the overall reduction of the energy bill, so apart from the provision of direct financial aid to vulnerable consumers, then the measure will lead to higher education, and jobs through the increased (local) need for skilled personnel implementing the solutions.

Impact analysis

Environmental	Positive/Neutral
Social	Positive
Economic	Positive

It can be argued that the environmental impact of providing direct financial aid to vulnerable consumers can be neutral/negative as long as no effort is made to make consistent improvements to the residential energy efficiency. Hence the measure proposed should adhere to and include the proposed longer term EE improvements as described in scenario 2 & 3 of the report.

Links and co-benefits between the measures

Both measures are strongly interlinked and require careful reconsideration before (re)introduction, especially concerning the inclusion of long-term consistent energy efficiency improvements, non-financial benefits such as advice and trainings on energy saving as well as the revision of the untargeted "windfall taxes" potentially replacing these with other sources of funding.

Recommendations for procedural dimension

The distributional dimension of vulnerability includes, inter alia, energy affordability and energy efficiency, assessed in *Workstream 2*, while procedural elements include the recognition of energy poverty as a clear problem in policy documents, the presence of an official definition of energy poverty, and the development of clear indicators to measure the problem.

- Compared to the EU average, Romania is lagging behind in the introduction of effective policy measures that focus on combatting energy poverty in low-income households and the protection of vulnerable household groups. Although new policy objectives are being set and laws planned, Romanian legislation still only partially integrates and supports existing policy measures and leaves little room for the introduction of effective new policy measures supporting vulnerable households.
- The discussion on a proper definition and actual protection of the vulnerable energy consumers has been long-winded. The energy law 123/2012 (amended)[72] initially introduced the concept of vulnerable consumer, defined as persons with low income and/or with health conditions. In time, specific provisions for vulnerable energy consumers were meant to completely replace Ordinance 70/2011 and introduce support for energy beyond heating in the winter season. For such consumers, Ministries (mostly energy and labor and social protection) and ANRE were supposed to prepare an action plan, implement measures and monitor the implementation, respectively. Vulnerable consumers had certain rights (e.g., not to be disconnected; ensured access to networks and energy; targeted income support etc.). However, though on paper, such rights were mostly inoperable because the action plan was never subsequently prepared. The proper identification of vulnerable consumers remains a challenge and, in practice, "vulnerable consumers" remain those that can be identified by the Ministry of Labor for the Heating support in Ordinance 70. 126 Law 226/2021 was meant to finally introduce an effective concept of vulnerable consumer (in the EU meaning, which includes not only poor households but other forms of vulnerability as well, although if there were an EU average, the bottom half of Romanian households would fall under the poverty line). In effect, however, while the law copies the correct EU definition of vulnerable consumers, the actual beneficiaries of support remain largely those identified since 2011 for the targeted income heating support – households below certain thresholds of income or energy

[72] http://www.anre.ro/en/1385652740/primary-legislation1387198683

consumption, who submit requests to the local administration. The law allows in principle other forms of non-financial support (e.g. targeted programs of the Ministry of Development for energy efficiency in buildings etc.) but these would be prepared subsequently. One improvement compared to the heating support is also the fact that support is extended to other forms of energy (e.g. gas for cooking, electricity for lighting etc.) apart from heating to the same beneficiaries. Evidently, improvements in Romania's energy poverty alleviation should begin with the proper definition, acceptance of the meaning, and subsequent action to address the true causes for the issue amongst the correct target groups. In practice, heating support represents only 0.4% of the Ministry of Labor's budget, since heating support is generally viewed as a social expenditure for extremely poor people. As such, heating support has declined and lower income groups are not targeted with support other than financial aid for utility bills.

- The Romanian government has not yet used specific indicators to evaluate whom energy poverty measures should be targeting.
- There are a mix of solutions which could help reduce energy poverty in Romania include taxation of gas boilers and promotion of off-grid solutions such as solar rooftops.
- There is little incentive for ESCOs, particularly if the Government really considers regulating prices (although there is now a discussion on this, in the context of recent price increases). There is no clear legislation for ESCOs for residential consumers as uncertainties on prices make ESCOs a risky business. However, in normal conditions, ESCOs could be feasible even with poorer households as studies show that people are willing to pay energy bills before other expenditure. If this were to be put in practice, public support would be needed to extend the recovery period, sharing of risks between owners and the state should become common practice, and bankability for poorer homeowners should be supported as well.
- Romania's policies are very fragmented and there is little complementarity between national, local, EU funds. The preparation of OPs, Modernization Fund, JTF have different timelines and different responsible decision-makers with no coordination. However, local energy strategies and local measures for energy efficiency and sustainable heating could be implemented as there have been a few success cases where local authorities have apply their knowledge on the local conditions to alleviate poverty issues.
- There is a need for home renovation one-stop-shops where, at the city hall, applicants can have access to solutions for energy efficiency, including availability of funding and various support programs.
- Law 226 introduces a good concept for minimum heating needs, although it would be difficult to operationalize. In its stead, energy performance certificates for buildings could provide solutions for the definition of energy poverty in the country.
- There is a new law concerning informal housing which would encourage local authorities to "legalize" informal housing and facilitate access to utilities and other forms of support. This would benefit vulnerable people as these are the ones that tend to live in such informal housing settings, although this is not well reflected in the household budget survey.

Conclusions

To conclude, although there have been some developments made towards the introduction of measures targeting vulnerable consumers both through policy measures and national legislation,

by current standings these have been ineffective, inefficient, and unsustainable. The provision of direct financial aid to vulnerable consumers can be beneficial in the short term; specifically generating social- and economic impact, but without consistent improvement of the overall energy efficiency; through the introduction of effective energy efficiency measures such as the retrofitting of residential housing and replacement of fossil fuel boilers used for heating, no long-term improvement of the overall energy efficiency is expected.

Combining this with an inadequate and unclear definition of vulnerable consumer groups, which is at the foundation of effective measure introduction; as well as a subsequent lack of communication on newly introduced measures which could provide non-financial benefits that are an important element for achieving long term reductions in energy use, it becomes essential to find new ways to communicate from government bodies to clearly defined vulnerable consumers or low-income households about current and upcoming support measures that go beyond the short term alleviation of financial concern and provide a more robust basis for consistent energy use reductions through proper communication of support measures, raising general awareness on their availability.

10.9 Slovakia

Social Climate Fund

The objectives of the EU Social Fund (€72 billion) are to a) finance temporary direct income support for vulnerable households and b) support measures and investments that reduce emissions in road transport and buildings sectors and as a result reduce costs for vulnerable households, micro-enterprises and transport users. The amount allocated to Slovakia incudes in total 2.36% of allocation, €1.7 billion (€500 million until 2027 and the rest until 2032). As visible from the description of the Fund, it could cover multiple types of measures, including building renovations, electrification and financial aid. The final application will depend on the national Social Climate Plan, but the possible financing of the combination of measures supports the idea of scenarios where all policies are combined and co-financed.

Revenues from auctions of national allocations of ETS2

Based on the allocation of auctions between the countries, total revenues from ETS2 in Slovakia are modelled as shown in Table 57. These numbers are not exact as the only values available are calculations from ETS2 forecast from Vivid Economics. The estimated revenues for Slovakia (net from the national contributions to the Innovation Fund and the Social Climate Fund) are estimated at €3.13 billion, where the majority of funding is expected in the period 2025-2030 (€1.7 billion). This amount can partially cover the initial requirements for funding the costs for low-income groups.

Table 57 Revenues from national allocations

Year	Central_MSR1	Revenues
2026	9.8	543.87
2027	6.7	374.65
2028	5.1	284.21
2029	4.3	241.11
2030	4.4	245.76
2031	4.8	265.92
2032	4.3	238.74
2033	3.8	211.56
2034	3.3	184.38
2035	2.8	157.19
2036	2.3	130.01
2037	1.8	102.83
2038	1.4	75.65
2039	0.9	48.47
2040	0.4	21.29
		3,125.62

However, revenues could be spent based on priorities of the country and are not dedicated only to low-income households, but to low-carbon measures in general. One of the priorities could be covering of phase-out expenses or MEPS implementation which is only in case when ETS2 is combined with one of those measures.

Modernisation fund

Slovakia is eligible for funding from the Modernisation fund. The funds currently allocated to Slovakia are those from the total initial size of the Modernisation Fund, meaning 2% of the ETS cap and the changes allocated based on the ETS revision.

Table 58 Current eligible funding from Modernisation Fund for Slovakia[73]

Member States	Share as per Annex IIb of ETS Directive	Share of additional funding
Slovakia	6.13%	4.9%

According to the ETS Directive, Slovakia will transfer 30% from its total share of allowance auctions to the Modernisation Fund. Based on the available information, Slovakia did not plan to spend current available funding on direct support to the Just Transition or low-income households.[74]

Just transition fund

Using the method to calculate the fair, balanced and effective distribution of the Just Transition Funds resources, Slovakia has allocated €162.4 million or a share of 2.2% of the total available funding (€7.5 billion). This results in a total estimated expected investments to be mobilized under pillar 1, 2, and 3 for Slovakia at ~€2.2 billion, of which the total estimated funding under Pillar 1 is €0.6 billion. The priority investment areas and framework conditions set for the delivery of the Just Transition Fund are outlined by the Commission and work towards an effective delivery of the fund investments in Slovakia. These areas and conditions were derived from the broader analysis of territories that face serious socio-economic challenges detailed in the 2019 Country Report for Slovakia. In order to tackle the transition challenges of the Trenčín and Košice regions, whose economies rely heavily on coal mining activities (with 4000 people involved directly and 1000 involved indirectly in mining-related jobs), cement production and steel production (resulting in the largest CO_2 emissions in Slovakia), a list of priorities to be targeted by the Just Transition Fund is detailed below[75]:

- Investments in regeneration and decontamination of sites, land restoration and repurposing projects;
- Investments in research and innovation activities and fostering the transfer of advanced technologies;
- Upskilling and reskilling of workers;

[73] https://ec.europa.eu/info/sites/default/files/revision-eu-ets_with-annex_en_0.pdf
[74] https://minzp.sk/klima/modernizacny-fond/modernisation-fund/
[75] https://ec.europa.eu/info/sites/default/files/annex_d_crs_2020_en.pdf

- Investments in the deployment of technology and infrastructures for affordable clean energy, in greenhouse gas emission reduction, energy efficiency and renewable energy;
- Technical assistance;
- Digitalisation and digital connectivity;
- Investments in the creation of new firms, including through business incubators and consulting services; and
- Investments in enhancing the circular economy, including through waste prevention, reduction, resource efficiency, reuse, repair and recycling.

The Trenčín and Košice regions are expected to suffer from substantial job losses that may not be offset by the creation of SMEs, and as such, support for productive investments in large enterprises should be considered.

Other sources of funding

Slovakia's Recovery and Resilience Plan will be supported by €6.3 billion in grants, 43% of which will be attributed to attaining climate objectives until December 2026.[76] The plan assists in furthering the green transition through an investment of €528 million to make at least 30,000 family houses more energy-efficient with an average primary energy savings of at least 30%**.** In addition, around €368 million will be invested into the decarbonisation of the industry to encourage energy efficiency improvements and deployment of innovative technologies.

The country's Operational Programme Environment (OP ENV)[77] or *"Operačný program Životné prostredie (OP ŽP)"* is aimed at improving the state of the environment and rational use of resources through the completion and improvement of environmental infrastructure in accordance with EU and Slovak regulations. The OP ENV contributes to ensuring that economic and social development is carried out in a way that enables the quality of the environment to be preserved for future generations and is thus sustainable. Since its approval by the EC in 2007, the OP ENV has been managed by the Ministry of the Environment of the Slovak Republic and financed by the Cohesion Fund (CF) and the European Regional Development Fund (ERDF), both of which are co-financed by the State Budget of the Slovak Republic. It is implemented through 7 priority axes, thematically focused on individual environmental components and technical assistance, one of which is 'protection of air and minimisation of the adverse effects of climate change' which is financed by the ERDF. A total of €250,756,935 has been allocated from the ERDF, while €1,569,243,065 and €278,133,265 were given by the CF and the state budget and own public resources respectively, for a total of €2,141,176,471 for each of the axes.

Slovakia's Operational Programme Environmental Quality (OP EQ)[78] or *"Operačný program Kvalita životného prostredia (OP KŽP)"* was approved by the European Commission in October 2014 to support the achievement of the Europe 2020 strategy objectives for smart, sustainable and inclusive growth in all regions of Slovakia. Its main objective is to promote sustainable and efficient use of natural resources, ensure environmental protection, actively adapt to climate change as well as to promote energy efficiency and a low-carbon economy. The total allocation of EU resources for this programme amounts to €3,137,900,110 which is managed by the Ministry

[76] https://ec.europa.eu/info/business-economy-euro/recovery-coronavirus/recovery-and-resilience-facility/slovakias-recovery-and-resilience-plan_en
[77] https://www.sazp.sk/fondy-eu/operacny-program-zivotne-prostredie/opzp.html
[78] https://www.sazp.sk/fondy-eu/operacny-program-kvalita-zivotneho-prostredia/op-kzp.html

of Environment of the Slovak Republic, while the priority axes are implemented by three intermediate bodies according to their thematic focus, namely SAŽP, the Ministry of the Interior of the Slovak Republic and the Slovak Innovation and Energy Agency (SIA). Within Priority Axis 1: Sustainable use of natural resources through the development of environmental infrastructure, Specific objective 1.4.1 is relevant as it aims to 'reduce air pollution and improve air quality'.

Costs of introduction of scenarios

The costs that need to be financed by the various funding streams and the specific policy instruments to do that (see below) consist of investment costs (technology and installation costs for boilers and energy refurbishments) and costs to consumers from the increased energy prices. The investment costs should normally be financed through various policies and subsidy schemes from the state budget, and they should reach a very high or maximum financing rate (over 95% up to 100%) as the category of population we refer to are low-income groups (first quintile or decile of the income categories). These groups cannot use own financing means for such investments and they are the ones locked-in fossil fuel technologies, low insulated buildings and they cannot carry out changes due to the higher split incentive problem (as their landlords might object in undertaking investment costs) and other known barriers (see WS1 report). The investment costs required from the five scenarios are presented below.

Table 59a Cost of different policy Scenarios

Scenario 2	**Investments (million €)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**Total investment costs (m EUR)**
	Heat pumps	0	0	27	0	1087	0	**1,114**
Scenario 3	**Investments (million €)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Building envelope	0	1,421	1,421	1,421	0	0	**4,263**
Scenario 4	**Investments (million €)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Heat pumps	0	0	27	0	1,142	0	**5,432**
	Building envelope	0	1421	1421	1421	0	0	
	Total	0	1,421	1,448	1,421	1,142	0	
Scenario 5	**Investments (million €)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Heat pumps	0	0	21	0	1,011	0	**5,296**
	Building envelope	0	1,421	1,421	1,421	0	0	
	Total	0	1,421	1,443	1,421	1,011	0	

The highest costs are presented, as expected since they require technological change, when the banning of fossil fuel boilers is combined with the Minimum Energy Performance Standards (Scenario 4) and when the latter is combined with the ETS 2 on heating fuels (Scenario 5). The respective policies (see below) should also aim at the largest financing gap in the 2030-2040 period, where the majority of funds must be delivered. For instance, the Social Climate Fund will

have a duration up to 2032 (with €1.7 billion while €3.6 billion are required till 2045 in the Scenario 5) and thus the other funds will need to cover the gap for these investment costs.

Nevertheless, it is important to consider that in case the costs of the heat pumps remain high up to 2030, thus hindering the full effects of the economies of scale, and also the costs of the insulation materials remain high, then the investment costs in all scenarios would be substantially higher and the existing funds would not be able to cover the required financing gaps (see Table below).

Table 57b Investment costs for different scenarios with higher costs

Investments (million €)	2025	2030	2035	2040	2045	2050	Total	Increase
Scenario 2	0	0	51	0	2038	0	2089	88%
Scenario 3	0	2132	2132	2132	0	0	6395	50%
Scenario 4	0	2132	2182	2132	2141	0	8586	58%
Scenario 5	0	2132	2171	2132	1896	0	8330	57%

In terms of costs from energy price increases, if Slovakia implements a social support policy framework (such as an on-bill financing or cost coverage to low-income groups from the higher energy costs), then the total energy costs passed on to consumers on a yearly basis and cumulative (upon which a support scheme could be based) are presented below.

Table 60 Total energy cost for different Scenarios

Total energy costs (m €)	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**Cumulative costs (m EUR)**
Baseline	237	245	252	259	262	265	**1,520**
Scenario 1	237	243	255	266	277	288	**1,566**
Scenario 2	237	245	252	260	215	216	**1,425**
Scenario 3	237	222	209	202	204	206	**1,280**
Scenario 4	237	222	191	186	157	157	**1,150**
Scenario 5	237	224	193	189	146	147	**1,136**

In all scenarios, except on fossil fuel boilers phase out, low-income groups will reduce their energy costs cumulatively in the long run. For ETS2 (Scenario 1) and phasing out of fossil fuel boilers (Scenario 2), there will be a requirement to support low-income households due to the increase in energy costs for such years (calculated as the difference of the energy costs in the scenario with the baseline costs) as shown in Table 59.

Table 61 Energy costs difference from baseline

Energy costs difference from baseline (m €)	**2030**	**2035**	**2040**	**2045**	**2050**
Scenario 1	-2	3	7	15	-23
Scenario 2	0	0	1	-47	0

Adverse impacts of policy introduction on low-income groups

Based on the methodology described in the introductory part of this report, we calculated the compensating variation of the household, the rise in income that the household would need to cover the expenses introduced. The expenditure side of the calculation includes both energy expenditure and the expenditure for investments for the specific scenario introduced in comparison to the baseline scenario. The income remains the same as in the baseline scenario, forecasted from the available income data.

Table 62 Increase in income needed to cover additional expenditure

Increase in income needed to cover both variation in energy price and the cost of scenario							AVG (EUR)	Share in income (%)
Year			2030	2035	2040	2045	2050		
Scenario 1			-5.28	7.91	18.47	39.57	60.68	24.27	0.49
Scenario 2			0.00	14.25	2.64	449.53	-129.27	67.43	1.37
Scenario 3			689.07	636.31	599.38	-153.01	-155.65	323.22	6.56
Scenario 4			689.07	603.07	557.17	325.54	-284.92	377.99	7.67
Scenario 5			694.35	605.71	565.08	227.40	-311.30	356.25	7.23

To be able to cover expenses of energy expenditure change and share of costs for covering implementation of policies, without the measures introduced, low-income households in Slovakia need a rise in income of around 1% for first two scenarios and close to 7% in scenarios 3,4 and 5. This would mean that the average yearly household income would have to rise by €24 in Scenario 1, €67 in Scenario 2, but between €320-€375 for Scenarios 3,4,5 of the €6,218 average projected income for low- income groups to 2050. Taking into consideration that the disposable income is the most important primary indicator of energy poverty, this result would move an additional number of citizens into vulnerable groups. Therefore, it is of highest importance to use the available funding to create measures to avoid adverse effects on households, as low-income households react to lower disposable income with negative impacts on arears, comfortability and causally by worsening their social life and health, as described in the methodology.

Policy instruments

Measure	**Green for Households II (Zelená domácnostiam II)**[79]
Description	The national project Green Households II aims to promote an energy-efficient, low-carbon economy in all sectors. Green Households II is the second phase of support aimed at the use of small-scale renewable energy sources in family and apartment buildings, with a budget of €48 million, on top of its predecessor's €45 million availability. The following subsidies are made available under this measure: • **Subsidy for a heat pump for a family house** where a grant of up to €3,400 can be obtained for all types of heat pumps whose manufacturer has registered in the Green Households programme.

[79] https://zelenadomacnostiam.sk/sk/domacnosti/

	• **Subsidy for solar installations for family houses** where support is available to all owners of family houses if they are not running a business at the address where the photovoltaic panels or solar collectors will be installed. • **Subsidy for a biomass boiler in a family house.** Although coal heating is no longer as widespread as it once was, there are still tens of thousands of households in Slovakia which burn coal. For those with no alternative, it is possible to replace old inefficient coal boilers with biomass boilers. • **Subsidy for a biomass boiler in a residential building where r**esidential buildings can also get a subsidy if they want to use a biomass boiler that burns some form of wood. • **Subsidy for solar collectors for a residential building** where the grant for the installation of solar collectors for hot water heating can be used by apartment buildings that are already insulated.
Proposal of changes	The highest and most plentiful subsidies should be allotted to vulnerable or low-income households which would benefit from these funds more than their higher income counterparts. As such, the subsidies should be separated into brackets, with the replacement of systems for vulnerable groups earning below a preestablished income to be fully funded, while those earning more would receive fewer subsidies, in line with their income.
Evolution of measure	The measure should, in later stages, take into consideration the sustainability of production of biomass and the growth deriving from the fossil – fuel boilers ban.
Additional funding	The Social Climate Fund plus possible funding could be provided from RRF since the measure offers energy efficiency and energy savings programs.
Start year and duration	2015-2018 for I and 2019-2023 for II

Measure	**Live Frugally (Bývajte úsporne)**[80][81]
Description	The Live Frugally measure is divided into two parts, namely the support for "Insulation of older family houses" and "New homes with almost zero energy demand". The allowance for the insulation of the family house is granted for building alterations that intervene in the building envelope to improve the energy performance of a property and covers part of the costs incurred for the insulation of the family house which includes expenditure on materials and insulation works, including VAT after December 2014. The total amount of contribution may reach up to €8,800 for roof insulation, insulation of internal partitioning between heated and unheated spaces, and replacement of the original opening structures of a house. In order to increase the construction of near-zero energy houses, a

[80] https://byvajteusporne.sk/zateplovanie/
[81] https://byvajteusporne.sk/novostavby/

	new allowance of €8,000 was introduced in May of 2019. In order to qualify, the following conditions must be met: • Property located on the territory of the Slovak Republic • It is used exclusively for housing • The final building permit for the family house was issued no earlier than in the second calendar year preceding the year in which the application for the contribution was submitted • The family house, including its technical system, has not received financial support in the past • It is a building with almost zero energy demand with its primary energy being in energy class A0 • The total floor area does not exceed 200 m^2 • The building envelope shall comply with the conditions for near-zero energy buildings
Proposal of changes	The program can be expanded to ensure that it aids families who have received financial support in the past as well, seeing as these families are likely to be classified as vulnerable and would benefit the most from subsidies to reduce energy waste, due to both financial and thermal comfort reasons.
Evolution of measure	The measure should be aligned with the Minimum Energy Performance Standard. It is commented in the national workshop that the program is currently inactive so it should be re-evaluated and restarted.
Additional funding	The part of the measure dealing with achieving MEPS in low-income households could be financed from SCF.
Start year and duration	2015-

Measure	**Aid in material need - Housing allowance (Pomoc v hmotnej núdzi)**[82]
Description	This measure is in place to provide aid to those dealing with material hardship where the income of the household does not reach the minimum subsistence level and where the household members are unable or unlikely to increase their income via their own labour, by exercising the right of ownership or other right over property, or by exercising claims. Aid is provided via a subsistence minimum, which is the socially recognised minimum income threshold below which a state of material deprivation arises. The amounts of the minimum subsistence level is adjusted each July on the basis of the coefficient of growth of net monetary income per person or the coefficient of growth of the cost of living of low-income households. Financial aid to vulnerable groups can also be given via the housing allowance, which is intended to partially cover housing costs. A household with one household member can receive €59.40 per month while households with several members or tenants receive €94.80 per month.

[82] https://www.employment.gov.sk/sk/rodina-socialna-pomoc/hmotna-nudza/

Proposal of changes	The program should be expanded to include higher grants for low-income households, especially in the case of multi-tenant occupancy within a single household. In this case, living within one home with a large number of people can be a result of limited funds amongst the group and is a practice carried out in order to save money on living expenses. As such, offering less than double the living allowance in comparison to the single household member is not proportionate to the needs of the multiple tenants for basic living expenses. Increasing the allowance per member seems more just. National stakeholders commented as ineffective for the inhabitants in real social needs. Its conditions are very strict and therefore not helping people who really need it, there is a need to adjust the program.
Evolution of measure	In addition, allocating a certain threshold of the allowance for energy efficiency is indicated to encourage families to invest in technologies which would help lift them out of poverty (and energy poverty) in the long run. This would entail raising the allowance to ensure that basic living needs are still addressed, with additional funds going towards energy efficiency improvements in the home.
Additional funding	Social Climate Fund
Start year and duration	2014-

The analysis of impacts of the proposed measures

Policy measure 1: [Green for Households II (Zelená domácnostiam II)]

Environmental impacts of the introduced measure

Climate change: The Green for Households II program supports the adoption of a range of energy efficient and renewable energy interventions which, if installed in the place of older and more traditional technologies, will result in a reduced level of GHG emissions related to household heating and cooling. The environmental impact of replacing gas boilers with heat pumps will be positive as the latter produces less emissions and thus contributes less to environmental degradation.

Air quality: Included in the Green for Households II program is the replacement of inefficient boilers and the promotion and uptake of renewable energy resources to ease the population's dependence on fossil energy sources used for heating. Replacing old and polluting boilers provides better air quality as it reduces polluting emissions, therefore improving the quality of life for citizens. Overall, energy efficiency and renewable resources as sources of power result in a higher air quality by reducing air pollutants which would have been released by outdated technologies.

Social impacts of energy efficiency measures

Health & wellbeing: The measure aims to improve the overall health and wellbeing of its residents by replacing old heating technologies with more efficient and carbon-neutral ones. These

replacements can have a positive effect on physical health due to increased warmth of a property in winter months and therefore comfort while in the home, as well as mental health as more efficient technologies such as heat pumps consume less energy resulting in lower energy bills and thus lower chances of arrears on energy bills. [83]

Improved social inclusion: The energy-bill cost reductions introduced through the Green for Households II measure can lead to higher disposable income and therefore buying power of its beneficiaries.[84] This takes place when energy savings result in lower energy bills and enhance social inclusion by allowing households to spend their income on items or experiences that elevate their social status to match those around them.

Economic impacts of energy efficiency measures

Increased economic activity: Through the increased demand for energy system replacement activities, many new job opportunities will be created within the market, including those for contractors, energy service providers responsible for installing new PV RES, policy makers, and regulators, which will boost the economic activity within the country. According to the European Commission, increasing focus and investments on energy efficiency can result in a 0.1-2% increase in GDP.[11]

Education, jobs, and productivity: With the COVID-19 pandemic, many of the world's working professionals have moved their working space form the traditional office to a home office. This has created demand for increased energy efficiency and energy performance as many employees have been faced with the difficulty of maintaining a comfortable temperature in the home while working. Due to this measure, household heating systems can be upgraded, resulting in an increase of thermal comfort and therefore a rise in productivity during working hours.[85] In addition, the energy transition has been associated with job creation, thus switching over to new systems helps to promote jobs in renewable energy and energy efficiency.[86] These energy efficiency improvements can boost economic activity that can turn into higher employment rates among energy service companies and energy utilities, which employ more than 1 million people globally[87].

Impact analysis

Environmental	Positive
Social	Positive
Economic	Positive

Policy measure 2: [Live Frugally (Bývajte úsporne)]

Environmental impacts of the introduced measure

Climate change: The Live Frugally program, which focuses on increasing insulation in homes and increasing the availability of net-zero buildings encourages cleaner living practices and thus has

[83] https://doi.org/10.1177/1420326X211039883
[84] https://www.tandfonline.com/doi/full/10.1080/13549839.2015.1075480
[85] https://doi.org/10.3390/buildings11060244
[86] https://ec.europa.eu/energy/sites/ener/files/documents/CE_EE_Jobs_main%2018Nov2015.pdf
[87]https://ec.europa.eu/energy/sites/ener/files/documents/eia_ii_-_status_report_2016_rev20170314.pdf

an effect on the number of emissions which are released in order to keep well insulated or net zero homes functioning at the same level at which they would have been in less-efficient conditions. By decreasing the demand for energy, this measure results in the production of less heat production-related emissions, thus decreasing environmental degradation in comparison to the baseline. As stated by the EEA, improvements in buildings for insulation and better heating or cooling systems can reduce emissions from the direct use of fossil fuel energy, however the most effective way of reducing emissions rather than causing a shift in them to the electricity and heating sector would be to reduce demand while avoiding the rebound effect and replacing fuel-based energy supplies with renewable or decarbonised energy. [88]

Air quality: Similar to the positive effects that reduced emissions spurring from decreased energy demand have on climate change, the same can be said for air quality. With lower energy production needs come lower air pollutants being released into the environment.

Social impacts of energy efficiency measures

Health & wellbeing: The measure aims to improve the overall health and wellbeing of Slovakian residents through interventions in the form of grants for improved thermal insulation and grants for net-zero buildings. These interventions should result in occupants experiencing an increased level of comfort in comparison to the conditions they may have been experiencing in the absence of these grants. The reduction on the investment related to cost of living, reflected in reduced energy bills, also benefits wellbeing as earnings can be spent in something that positively impacts the mental health of the household inhabitants.

Improved social inclusion: Energy savings generated through decreases in the loss of heat due to building insulation result in lower energy bills, thus enhancing social inclusion as residents are able to use savings from this additional disposable income towards performing activities which reduce their feelings of social isolation.[84]

Economic impacts of energy efficiency measures

Education, jobs, and productivity: As mentioned earlier, the retrofitting of buildings, specifically residential structures thermal insulation, and the funding of energy efficient builds result in a higher living comfort, thus positively affecting productivity for those working from home. With increased productivity comes higher income. Higher income proportionally correlates to increased economic activity and economic growth.[89] In addition, due to new tasks associated with the green energy transition, new sustainable jobs can be created.[90]

Increased economic activity: In economics, productivity is defined as the quantity of output produced by one unit of input within one unit of time, where the standard calculation results in output per unit of time. An increase in productivity causes a corresponding increase in the value

[88]https://www.eea.europa.eu/data-and-maps/indicators/greenhouse-gas-emissions-from-energy/assessment
[89] https://www.enterprise-development.org/what-works-and-why/evidence-framework/increased-productivity-creates-economic-growth/#:~:text=Increases%20in%20productivity%20allow%20firms,generate%20higher%20Gross%20Domestic%20Product.
[90] https://www.adeccogroup.com/future-of-work/latest-insights/how-green-transition-plans-could-lead-to-sustainable-jobs/

of an employee, hence raising wages, GDP and thus disposable income which can later be reinvested into the economy. [91]

Impact analysis

Environmental	Positive
Social	Positive
Economic	Positive

Policy measure 3: [Aid in material need - Housing allowance (Pomoc v hmotnej núdzi)]

Environmental impacts of the introduced measure

Climate change: The Aid in Material Need measure seemingly has no effect on climate change as this measure is mean to help households sustain a minimum standard of living, leaving little room for investments in energy efficiency technologies.

Air quality: Similar to its effects on climate change, the Aid in Material Need measure does not yield any changes in relation to air quality in Slovakia.

Social impacts of energy efficiency measures

Health & wellbeing: The sole purpose of the measure is to improve the overall wellbeing of its residents by allotting funds to them so as to keep them from becoming evicted from their residences or utilities services. The physical and mental strain that is avoided due to this type of aid are significant in some studies, where the primary health outcomes of homelessness avoidance reported were general physical and mental health, well-being, and quality of life, especially with those with human immunodeficiency virus, anxiety and depression.[92]

Improved social inclusion: Socially excluded people are those who experience an accumulation of disadvantages in society. These range from structural-economic exclusion which refers to a distributional dimension and includes material (income and goods) and non-material (social rights) aspects, as well as socio-cultural exclusion, referring to a relational dimension that includes social integration involving social relations and networks and cultural integration which concerns values and norms, or the lack thereof.[93] Both types of exclusion can be avoided by those who take advantage of the Aid in Material Need measure.

Economic impacts of energy efficiency measures

Increased economic activity: For those who do not possess a safety net of social and financial resources, any unexpected financial shock can be the first step in a downward spiral toward homelessness. Evans *et al.* found that government aid greatly reduces the likelihood of homelessness in vulnerable populations, where the estimated economic benefits exceeds the estimated costs, with immeasurable psychic and physical benefits.[94]

[91] https://www.investopedia.com/ask/answers/040615/why-productivity-important-concept-economics.asp
[92] 10.1111/hsc.13486
[93] https://pure.hva.nl/ws/portalfiles/portal/5513844/10.1007_s11205_016_1486_z.pdf
[94] 10.1126/science.aag0833

Education, jobs, and productivity: In the absence of this measure, beneficiaries who would lose their housing would most likely face the cascading risk of also losing their job[95], which would result in emotional strain for them.

Impact analysis

Environmental	Neutral
Social	Positive
Economic	Positive

Links and co-benefits between the measures

These measures complement each other as they are all centred around energy efficiency, providing specific and adaptive measures for vulnerable households and offering financial assistance to provide cleaner and efficient energy in their homes.

Recommendations for procedural dimension

The distributional dimension of vulnerability includes, inter alia, energy affordability and energy efficiency, assessed in *Workstream 2*, while procedural elements include the recognition of energy poverty as a clear problem in policy documents, the presence of an official definition of energy poverty, and the development of clear indicators to measure the problem.

- The assessment of the NECP from the European Commission states that Slovakia does not report the number of households affected, only the number of households considered at risk of poverty. Slovakia did not include any policies or measures targeted specifically at fighting energy poverty in the plan, thus this must change.[96]

- The Slovakian government has not yet officially developed its own definition for energy poverty or adopted a definition from other countries.[97] From the perspective of procedural elements recognised in *Workstream 1*, to support the policies suggested above, Slovakia should provide a clearer definition of energy poverty and the vulnerable groups based on the income and other indicators which have yet to be developed at a national level.

Conclusions

The discussions from national workshop shows that it is important to share good practices from other EU countries (for example Lithuanian 100% subsides or Italian 110% investment support). The current obstacles include a lack of support schemes specifically targeting low-income groups – these should be supported with more specifically designed tools and the co-financing rate of 50% for the Social Climate Fund. There is lack of policies that tackle energy poverty and energy efficiency measures. There is also room for finding new ways to communicate from government bodies to low-income groups and how to reach them and provide more adaptive and informational approaches without focusing only on the general national climate targets, but their personal comfort.

[95] https://doi.org/10.1177/1359105307080581
[96] https://ec.europa.eu/energy/sites/ener/files/documents/staff_working_document_assessment_necp_slovakia.pdf
[97] 10.2139/ssrn.2546758

10.10 Spain

Social Climate Fund

The objectives of the EU Social Fund (€72 billion) are to a) finance temporary direct income support for vulnerable households and b) support measures and investments that reduce emissions in road transport and buildings sectors and as a result reduce costs for vulnerable households, micro-enterprises and transport users. The spending should be frontloaded to precede and accompany a smooth introduction of the new ETS, but does not cover scenarios without the ETS2 introduction. The amount of €48.5 billion for the period 2028-2032 is subject to the availability of the funds under the annual ceilings of the applicable multiannual financial framework. The Fund will be operational as of 2025 and Spain must finance at least 50% of the total costs of the Social Climate Plans. The amount attributed to Spain is shown in the table below.

Table 63 Allocation of SCF to Spain [98]

Member State	Share as % of total	TOTAL 2025-2032 (in EUR, current prices)	Amount for 2025-2027 (in EUR, current prices)	Amount for 2028-2032 (in EUR, current prices)
Spain	10.53	7,599,982,898.00	2,494,731,228.00	5,105,251,670.00

The fund could cover multiple types of measures, including building renovations, electrification and financial aid. The final application will depend on the national Social Climate Plan, but the possible financing of combination of measures supports the idea of scenarios where all policies are combined and co-financed.

Recovery and Resilience Funding

Spain's plan finds that it devotes 10.53% of its total allocation to measures that support climate objectives. Investments coming from the RRF will amount to €69.5 billion and are complemented by a coherent package of reforms, including tax incentives and renovation one-stop-shops to facilitate home retrofits.[99] The measures that could be financed are described in the plan description, but MEPS-related measures and general energy efficiency in buildings are major components of the RRF.

Revenues from auctions of national allocations

Based on the allocation of auctions between the countries, total revenues from ETS2 in Spain are modelled as is shown in Table 62. These numbers are not exact as the only values available are

[98] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0568
[99] https://ec.europa.eu/info/business-economy-euro/recovery-coronavirus/recovery-and-resilience-facility/spains-recovery-and-resilience-plan_en#:~:text=Spain's%20recovery%20and%20resilience%20plan%20supports%20more%20than%20half%20a,in%20residential%20buildings%20by%202026.&text=The%20investments%20amount%20to%20%E2%82%AC,shops%E2%80%9D)%20to%20facilitate%20renovations.

own calculations from ETS2 forecast of Vivid Economics. Of that, 25% should be allocated to Social Climate Fund.

Table 64 Revenues from national allocations

Year	Spain	Central_MSR1	Revenues	Revenues without SCF
2026	97.4	74.2	7,223.8	5,575.63
2027	67	85.1	5,701.2	3,840.84
2028	50.7	111.9	5,678.1	2,913.63
2029	43	106	4,556.6	2,471.80
2030	43.8	140.2	6,144.1	2,519.47
2031	47.5	152.2	7,222.4	2,726.18
2032	42.6	180.1	7,668.8	2,447.52
2033	37.7	199.9	7,534.3	2,168.86
2034	32.8	224.7	7,370.1	1,890.19
2035	27.9	254.3	7,101.3	1,611.53
2036	23	278.2	6,409.3	1,332.87
2037	18.2	305.9	5,551.9	1,054.20
2038	13.3	337.3	4,474	775.54
2039	8.4	372.4	3,121.2	496.88
2040	3.5	344.3	1,203.5	218.21
			86,960.5	32,043.35

These revenues could be spent based on Spain's priorities and are not dedicated solely to low-income households, but to the low-carbon measures in general. Some of the priorities could be covering of phase-out expenses or MEPS implementation in case where ETS2 is combined with these measures.

Modernisation fund

The modernisation fund is designed to support the 10 lower-income EU MS. Spain is not part of the group.

Solidarity provision from ETS1

Through the Solidarity provision, an estimated number of additional allowances Spain receives can be calculated at €80,390,000. This was calculated using a 13% increase of allowances to be auctioned, taken from Annex II(a) of the Directive and is derived from either the verified emissions under the EU ETS for 2005, or the average of the period 2005 to 2007. This figure can be used to calculate the estimated value of these allowances over phase 4 using a limited price range for the current spot price (at €20/EUA) and the highest expected price level (at 35 Euro/EUA) resulting in ~ €1.6 billion and €2.4 billion respectively[100].

[100] https://www.ceep.be/www/wp-content/uploads/2018/10/Funding-Mechanisms-in-the-fourth-phase-of-the-EU-ETS.pdf

Just transition fund

Using the method for calculating the fair, balanced and effective distribution of the Just Transition Mechanism resources, Spain was allocated €307.4 million, a share of 4.1% of the total available funding (€7.5 billion). This results in a total estimated expected investments to be mobilized under pillar 1, 2, and 3 for Spain at ~ €4.5 billion, of which the total estimated funding under pillar 1 (Just Transition Fund) is €1.4 billion. The priority investment areas and framework conditions set for the delivery of the Just Transition Fund are outlined by the EU Commission and work towards an effective delivery of the fund investments in Spain. These areas and conditions were derived from the broader analysis of territories that face serious socio-economic challenges detailed in the 2019 Country Report for Spain.

In its transition away from coal-fired powerplants and coalmines, Spain has engaged in an ambitious decarbonisation strategy of its energy production, resulting in a series of social and economic consequences as well as a temporary increase of the country's energy dependency. Since 2008, the coal-mining sector has lost over 8,000 jobs mostly within Asturias, Teruel, and León and Palencia, leaving 3,300 people working in plants and 10,000 people working indirectly related jobs in 2018, who would be at risk of becoming unemployed with the energy transition[101]. The majority of these areas face challenges of depopulation and limited economic activities, which further amplify the negative consequences of the decarbonisation process. In order to combat these difficulties, investment needs were identified to diversify, modernise, and increase the competitiveness of the regional economy. As such, the Just Transition Fund should complement the efforts of the national just transition strategy via:

- investment in the creation of new firms, including through business incubators and consulting services as well as productive investments in SMEs, comprising start-ups;
- investment in deployment of technology and infrastructures for affordable clean energy, in greenhouse gas emission reduction, energy efficiency and renewable energy;
- investment in circular economy;
- investment in research and innovation activities and fostering the transfer of advanced technologies;
- investment in the regeneration and decontamination of sites, land restoration and repurposing projects;
- upskilling and reskilling of workers while providing job-search assistance to jobseekers; and,
- active inclusion of jobseekers.

Other sources of funding

Spain created a strategic framework for Energy and Climate planning based on five documents and with high attention to energy poverty. The National Energy and Climate Plan (NECP)[102] is accompanied by the Climate Change and Energy Transition Bill[103] - which sets minimum targets for emissions reductions for 2030 and 2050, providing predictability and a sense of direction - and by the Just Transition Strategy[104] which, based on solidarity, is designed to anticipate and manage the consequences on those regions and people directly linked to technologies that will be

[101] https://ec.europa.eu/info/sites/default/files/annex_d_crs_2020_en.pdf
[102] https://ec.europa.eu/energy/sites/default/files/documents/es_final_necp_main_en.pdf
[103] https://www.boe.es/boe/dias/2021/05/21/pdfs/BOE-A-2021-8447.pdf
[104] https://www.lamoncloa.gob.es/temas/fondos-recuperacion/Documents/16062021-Componente10.pdf

progressively displaced as a result of the energy transition promoted by the NECP. The JTS is also part of the national Recovery and Resilience Plan[105]. In addition, Spain adopted the National Strategy against Energy Poverty[106]. The measures foreseen by the NECP will mobilise €241 billion of investment in Spain between 2021 and 2030, which will generate a significant expansionary effect on the economy. The exact share of money directed towards the alleviation of Energy Poverty is not clearly stated. However, the document reports that "The NECP will favour lower income households and vulnerable groups, which will see their income and consumption increase by a greater proportion than other households".

The Spanish NRRP foresees expenses for €140 billion between grants and loans[107]. The plan is developed around four axes: green transition, digital transition, social and territorial cohesion and gender equality. These four axes guide the 10 levers on which the NRRP is based: from the urban agenda, the fight against depopulation and the development of agriculture to the modernization and reinforcement of the fiscal and pension systems, passing through the resilience of infrastructures and ecosystems, the energy transition, the modernization of the administration, the industrial fabric and SMEs and the recovery of tourism, the commitment to science and the reinforcement of the National Health System, the promotion of education and continuous professional training, the development of the new care economy, the new public policies of the labour market or the promotion of the culture and sports industry. Specifically, the plan has 30 components. The most relevant for low-income groups and their relative budget are listed in the table below.

COMPONENT	INVESTMENT (million EUR)
2) Plan for housing rehabilitation and urban regeneration (including rehabilitation programs for economic and social recovery in residential environments and program for the construction of social rental housing in energy efficient buildings)	6.82
10) Just Transition Strategy (see paragraph below)	300
22) Shock plan for the welfare economy and reinforcement of inclusion policies	3.5
23) Public measures for a flexible and inclusive job market	2/.36

The Spanish JTS includes four lines of actions, listed below with the relative planned investment. Lines C and D are of interest for vulnerable inhabitants of the targeted regions.

	LINE OF ACTION	PLANNED INVESTMENT (2021-2023)
a)	Environmental restoration plan for closed or abandoned mining operations and deteriorated land next to thermal or nuclear power plants (areas of intervention: natural capital, physical infrastructures and restoration of natural environment)	150 million EUR

[105] https://ec.europa.eu/info/sites/default/files/spain_recovery_and_resilience_plan_es.zip

[106] https://www.miteco.gob.es/es/prensa/estrategianacionalcontralapobrezaenergetica2019-2024_tcm30-496282.pdf

[107] They will be supported by **€69.5 billion in grants. 40%** of the plan will support **climate objectives** and **28%** of the plan will foster the **digital transition**. https://ec.europa.eu/info/business-economy-euro/recovery-coronavirus/recovery-and-resilience-facility/spains-recovery-and-resilience-plan_en

b)	Environmental, digital and social infrastructure plan in municipalities and territories in transition (areas of intervention: investments in technological assets, physical infrastructures (rehabilitation works on public domain or property), and technical assistance.	100 million EUR
c)	R&D projects in energy storage and energy efficiency (areas of intervention: technological assets, physical infrastructure, intangible assets (R&D and software) and human assets (trainings)).	30 million EUR
d)	Support plan for the professional retraining and employment of workers and population affected by the energy transition (areas of intervention: investments in human assets (trainings)).	20 million EUR

Costs from introduction of scenarios

The costs that need to be financed by the various funding streams and the specific policy instruments to do that (see below) consist of investment costs (technology and installation costs for boilers and energy refurbishments) and costs to consumers from the increased energy prices. The investment costs should normally be financed through various policies and subsidy schemes from the state budget, and should reach a very high or maximum financing rate (over 95% up to 100%) as the category of population we refer to are low-income groups (first quintile or decile of the income categories). These groups cannot use their own financing means for such investments as they are often locked-in to using fossil fuel technologies, live in low insulated buildings and cannot carry out changes due to the split incentive problem (as their landlords might object in undertaking investments), and other known barriers (see WS1 report). The investment costs required from the five scenarios are presented below.

Table 65a Investment costs of different scenarios

Scenario 2	**Investments (million €)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**Total investment costs (mln** EUR)
	Heat pumps	0	0	3554	0	2391	0	**5,945**
Scenario 3	**Investments (million €)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Building envelope	0	7,013	7,013	7,013	0	0	**21,039**
Scenario 4	**Investments (million €)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Heat pumps	0	0	3,554	0	2,433	0	**27,027**
	Building envelope	0	7,013	7,013	7,013	0	0	
	Total	0	7,013	10,568	7,013	2,433	0	
Scenario 5	**Investments (million €)**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	
	Heat pumps	0	0	3,355	0	2,031	0	**26,426**
	Building envelope	0	7,013	7,013	7,013	0	0	
	Total	0	7,013	10,369	7,013	2,031	0	

As expected, highest cost derives from the introduction of Minimum Energy Performance Standards. Costs become higher when MEPS are coupled with the banning of fossil fuel boilers (Scenario 4) and when the latter are combined with the ETS 2 on heating fuels (Scenario 5). Introduced policies and measures should aim at compensating the largest financing gap in the

2030-2040 period (see below), where the majority of funds must be delivered. For instance, the Social Climate Fund will have a duration up to 2032 (with €7.6 billion) and thus the other funds will need to cover the gap for these investment costs. Nevertheless, it is important to consider that in case the costs of heat pumps remain high up to 2030, thus hindering the full effects of the economies of scale, and also if the costs of insulation materials remain high, then the investment costs in all scenarios would be substantially higher and existing funds would not be able to cover the required financing gaps (see Table below).

Table 63b Investment costs for different scenarios with higher costs

Investments (million €)	2025	2030	2035	2040	2045	2050	Total	Increase
Scenario 2	0	0	6664	0	4483	0	11147	88%
Scenario 3	0	10520	10520	10520	0	0	31559	50%
Scenario 4	0	10520	17183	10520	4562	0	42784	58%
Scenario 5	0	10520	16810	10520	3808	0	41657	58%

In terms of costs from energy price increases the total energy costs passed on to consumers on a yearly basis and cumulative (upon which a support scheme could be based) are presented below.

Table 66 Energy costs

Total energy costs (m EUR)	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**Cumulative costs**
Baseline	595	596	598	601	606	611	3,012
Scenario 1	595	548	543	545	550	556	2,742
Scenario 2	595	596	615	614	568	569	2,962
Scenario 3	595	555	521	502	506	509	2,593
Scenario 4	595	555	558	538	537	538	2,726
Scenario 5	595	554	541	521	487	488	2,591

In all scenarios, except for fossil fuel boilers phase out, low-income groups will reduce their energy costs cumulatively in the long run. For the phasing out of fossil fuel boilers (Scenario 2) there will be a requirement to support low-income households due to the increase in energy costs for such years (calculated as the difference of the energy costs in the scenario with the baseline costs) as shown in the table below.

Table 67 Energy costs difference to baseline

Energy costs difference from baseline (m EUR)	**2030**		**2035**	**2040**	**2045**	**2050**
Scenario 2	0		17	13	-38	-15

More specifically, in the period 2030-2040 an extra support of €30 million will be required for the increased bills of households (in the case of phasing out of fossil fuel boilers). It should however be noted that possible investments in energy efficiency interventions are not taken into consideration for scenario 1 (ETS2).

Adverse impacts of policy introduction on low-income groups

Based on the methodology described in the introductory part of this report, we calculate the compensating variation of the household, the rise in income that the household would need to cover the expenses introduced. The expenditure side of the calculation includes both energy expenditure and the expenditure for investments for the specific scenario introduced in comparison to the baseline scenario. The income remains the same as in the baseline scenario, forecasted from the available income data.

Table 68 Increase in income needed to cover additional expenditure

Rise in income needed to cover both variation in energy price and the cost of scenario								AVG (EUR)	Share in income (%)
	2019	2025	2030	2035	2040	2045	2050		
Scenario 1			-25.67	-29.41	-29.94	-29.94	-29.41	-28.87	-0.37
Scenario 2			0.00	389.15	6.95	235.37	-22.46	121.80	1.57
Scenario 3			728.03	708.78	697.02	-53.47	-54.54	405.16	5.21
Scenario 4			728.03	1,108.73	716.27	223.29	-39.03	547.46	7.04
Scenario 5			727.50	1,078.36	707.18	153.56	-65.77	520.17	6.69

To be able to cover expenses of energy expenditure change and share of costs for covering implementation of policies, without the measures introduced, low-income households in Spain need a rise in income of around 1.6% for the second scenario (phasing out of fossil fuels boilers) and 5-7% in scenarios 3,4 and 5. This would mean that the average yearly household income would have to rise for €120 in Scenario 2, and around €400-500 for Scenarios 3,4,5 of the €9,200 average projected income for low-income groups to 2050. Taking into consideration that the disposable income is the most important primary indicator of energy poverty, this result would move an additional number of citizens into vulnerable groups. Therefore, it is of highest importance to use the available funding to create measures to avoid adverse effects on households, as low-income households react to lower disposable income with negative impacts on arears, comfortability and causally worsening their social life and health, as described in the methodology.

Policy instruments

Measure	**Bono social de Electricidad / Social bonus for electricity and Bono social Termico / Thermal social bonus**[108]
Description	The **electricity social bonus** is a discount on the bill amounting to: - 25% for vulnerable consumers who meet the eligibility conditions; - 40% for severe vulnerable consumers who meet the eligibility conditions;

[108] https://www.bonosocial.gob.es/#inicio and http://www.bonotermico.gob.es/#inicio

	For consumers at risk of social exclusion (cared for by the social services of an autonomous region or local administration who pays for at least half of the bill) the electric social bonus covers the whole amount. After the Covid-19 out, more categories other than vulnerable consumers can have access to the bonus: - those who are unemployed; - those who are affected by a "temporary file for the regularization of employment"; - those who are entrepreneurs and saw their income severely reduced. The **thermal social bonus** is automatically granted to the beneficiaries of the electric social bonus, without the need to introduce a request and varies between €25 and €123.94.
Proposal of changes	The electricity social bonus and thermal social bonus could be more accessible by enabling eligible consumers able to receive it automatically, without the need to actively apply for it.
Evolution of measure	The recently approved Royal Decree 897/2017 substituted the previous social tariff started in 2009 and set new eligibility criteria. The threshold for vulnerable consumers could be lowered as a result of raising energy prices and additional funds could be taken from the social climate fund.
Additional funding	SCF; ERDF; Own funds of Spanish national and regional governments
Start year and duration	Electricity social bonus: 2009 – Thermal social bonus: 2019 –
Organisations in charge of implementation	Spanish government (Ministry of the Ecological transition)
Target groups	Vulnerable and severely vulnerable households

Measure	**Disconnection protection Catalonia (Ley 24/2015, de 29 de julio, de medidas urgentes para afrontar la emergencia en el ámbito de la vivienda y la pobreza energética)**[109]
Description	This measure, detailed in Article 6 of the Law, prohibits the disconnection of electricity, gas and water supply for vulnerable households as certified by local social services. It also applies a precautionary principle according to which utility companies are obliged to check first with local services whether the consumer with arrears is vulnerable or not. In addition, arrangements with drinking water, gas and electricity supply companies will be made to ensure that they grant non-repayable aid to those at risk of residential exclusion or apply very significant discounts on the cost of minimum consumption.
Proposal of changes	It would be beneficial to expand the scope of this law to the whole national Spanish territory. Moreover, the significant discounts for water, gas, and

[109] BOE.es - BOE-A-2015-9725 Law 24/2015, of 29 July, on urgent measures to face the emergency in the field of housing and energy poverty.

	electricity were expanded to a larger group, past those at risk of residential exclusion, and to those with low household incomes as well. Conditions or additional discounts or grants could be given in the case that households invest in energy or water saving technologies within a set number of years to promote sustainable energy practices and decrease households' dependence on financial aid for utility payments in the long run.
Evolution of measure	
Additional funding	Social Climate Fund; ERDF; Own funds of Spanish national and other regional governments
Start year and duration	2015 –
Organisations in charge of implementation	Generalitat de Catalunya
Target groups	Low-income households and vulnerable households

Measure	**Housing renovation programme for vulnerable households (Ayudas del Programa de Rehabilitación de Viviendas para personas en situación de vulnerabilidad)**[110]
Description	This measure funds improvements for housing conditions of vulnerable homeowners, including targets to increase energy efficiency levels to protect households against energy poverty. Beneficiary households can be reimbursed 100% of the costs of retrofitting measures up to €20,000, with a minimum amount of €500.
Proposal of changes	The programme can be expanded to the whole Spanish territory. Moreover, the minimum cost of renovations and expanding the scope of the grants could be removed, in order to include the funding of low-cost energy savings products as well. These products are easier to make use of as they are less costly and don't interfere with household's abilities to function during installation, like other, deeper renovations would. In addition, the upper margin of grants can also be extended, provided that households provide compelling means for it. This can be done via the submission of supporting documentation such as a technical report detailing specifications of their system or renovation provided by authorized personnel as determined by the Barcelona City Council and the Barcelona Housing Consortium, an energy assessment, and/or an EPC for a building.
Evolution of measure	
Additional funding	Social Climate Fund; ERDF; Own funds of Spanish national and other regional governments
Start year and duration	2017 –

[110] Aid for the rehabilitation of housing interiors to incorporate | virtual office | Barcelona Town Hall

Organisations in charge of implementation	Barcelona City Council and the Barcelona Housing Consortium
Target groups	Low-income households and vulnerable households

The analysis of impacts of the proposed measures

Policy measures 1 Electricity and Thermal social bonus

Environmental impacts of the introduced measure

Climate change: The Electricity and Thermal social bonus seemingly have no effect on climate change as they are meant to help households sustain a minimum standard of living and afford their electricity and thermal bills.

Air quality: Similar to their effects on climate change, these measures do not yield any changes in relation to the baseline of air quality in Spain.

Social impacts of energy efficiency measures

Health & wellbeing: The purpose of the two measures is to make sure vulnerable consumers can have a decent quality of life, by supporting their energy expenses. The physical and mental strain that is avoided due to this type of aid have been found as significant in some studies, where the primary health outcomes of homelessness avoidance reported were improvements in general physical and mental health, well-being, and quality of life.[111]

Improved social inclusion: Beneficiaries of these measures are able to avoid structural-economic exclusion, which includes material (income and goods) and non-material (social rights) aspects, as well as socio-cultural exclusion that involves reduced social relations and cultural integration.[112]

Economic impacts of energy efficiency measures

Increased economic activity: For those who do not have access to emergency social or financial resources, unexpected financial costs can result in the inability to pay necessities such as utility bills or rent, thus causing health hazards in the home or homelessness. These types of governmental aid thus greatly reduce the likelihood of homelessness in vulnerable populations, where the estimated economic benefits of supplying grants to vulnerable households exceeds the estimated costs on society.[113]

Education, jobs, and productivity: In the absence of this measure, beneficiaries who would lose access to utilities or their housing would most likely face the cascading risk of also losing their job[114], which would result in emotional strain for them. In addition, many that are homeless or

[111] 10.1111/hsc.13486
[112] https://pure.hva.nl/ws/portalfiles/portal/5513844/10.1007_s11205_016_1486_z.pdf
[113] 10.1126/science.aag0833
[114] https://doi.org/10.1177/1359105307080581

close to being homeless struggle to find or maintain a job due to numerous individual and institutional barriers[115] and thus are unable to be a productive member of society.

Impact analysis

Environmental	Neutral
Social	Positive
Economic	Positive

Policy measures 2 Disconnection Protection Catalonia

Environmental impacts of the introduced measure

Climate change: The Disconnection Protection Catalonia and Emergency Financial Support measures seemingly have no effect on climate change as they are meant to help households sustain a minimum standard of living and not lose access to basic necessities such as water, power, and even housing, leaving little room for investments in energy efficiency or climate-positive technologies.

Air quality: Similar to their effects on climate change, these measures do not yield any changes in relation to the baseline of air quality in Spain.

Social impacts of energy efficiency measures

Health & wellbeing: The purpose of the two measures is to improve the overall wellbeing of residents by allotting funds so as to keep them from becoming evicted from their residences or utilities services. The physical and mental strain that is avoided due to this type of aid have been found as significant in some studies, where the primary health outcomes of homelessness avoidance reported were improvements in general physical and mental health, well-being, and quality of life.[111]

Improved social inclusion: Beneficiaries of these measures can avoid structural-economic exclusion, which includes material (income and goods) and non-material (social rights) aspects, as well as socio-cultural exclusion that involves reduced social relations and cultural integration.[112]

Economic impacts of energy efficiency measures

Increased economic activity: For those who do not have access to emergency social or financial resources, unexpected financial costs can result in the inability to pay necessities such as utility bills or rent, thus causing health hazards in the home or homelessness. These types of governmental aid thus greatly reduce the likelihood of homelessness in vulnerable populations, where the estimated economic benefits of supplying grants to vulnerable households exceeds the estimated costs on society.[113]

[115] https://socialinnovation.usc.edu/wp-content/uploads/2020/08/Homelessness-and-Employment.pdf

Education, jobs, and productivity: In the absence of this measure, beneficiaries who would lose access to utilities or their housing would most likely face the cascading risk of also losing their job[114], which would result in emotional strain for them. In addition, many that are homeless or close to being homeless struggle to find or maintain a job due to numerous individual and institutional barriers[116] and thus are unable to be a productive member of society.

Impact analysis

Environmental	Neutral
Social	Positive
Economic	Positive

Policy measure 3: Housing renovation programme for vulnerable households

Environmental impacts of the introduced measure

Climate change: The Housing Renovation Programme for Vulnerable Households supports the adoption of a range of energy efficient interventions which, if installed in the place of older and more traditional technologies, will result in a reduced level of GHG emissions related to household heating and cooling. The environmental impact of replacing gas boilers with heat pumps will be positive as the latter produces less emissions and thus contributes less to environmental degradation. In accordance with the COMBI tool[117], Spanish residents can have a significant impact on the number of GHG emissions avoided (in tCO_2eq) if switching to energy efficient appliances and renovating their homes to decrease energy demand and loss.

Air quality: Included in the measure is the replacement of energy inefficient technologies. Replacing old and polluting systems like gas boilers can result in better air quality as the use of newer and greener systems like heat pumps or solar systems reduce the number of polluting emissions put out in comparison to the baseline, therefore improving the quality of life for citizens.

Social impacts of energy efficiency measures

Health & wellbeing: The measure aims to improve the overall health and wellbeing of its residents by replacing old heating, cooling, and lighting technologies with more efficient ones, while funding other energy saving products like insulation or window replacement. These replacements can have a positive effect on physical health due to increased warmth of a property in winter months or decreased heat during summer months, and therefore comfort while in the home, as well as mental health as more efficient technologies consume less energy resulting in lower energy bills and thus lower chances of arrears on energy bills.[118]

Improved social inclusion: If installed, energy inefficient technologies should decrease energy bills and protect households from experiencing energy poverty. The energy-bill cost reductions introduced through the Housing Renovation Programme for Vulnerable Households should therefore lead to higher disposable income for its beneficiaries, allowing households to spend

[116] https://socialinnovation.usc.edu/wp-content/uploads/2020/08/Homelessness-and-Employment.pdf
[117] https://combi-project.eu/charts/
[118] https://doi.org/10.1177/1420326X211039883

their income on items or experiences that elevate their social status to match the status of those in their community.

Economic impacts of energy efficiency measures

Increased economic activity: Through the increased demand for energy-efficient energy systems, there arises a need for new jobs within the market, including those for contractors, energy service providers, policy makers, and regulators. The more households that sustainably renovate their homes with energy savings in mind, the more that economic activity will grow in Spain, which is in line with the billions in Euro that could be made according to the COMBI tool[54]. In accordance with the European Commission, increasing investments in energy efficiency can result in a 0.1-2% increase in GDP.[119]

Education, jobs, and productivity: With the COVID-19 pandemic, many of the world's working professionals have been confined to a home office for the last two years, and will most likely continue to work from home in some capacity. This has created demand for increased energy efficiency and energy performance as many employees have been faced with the difficulty of maintaining a comfortable temperature in the home while working. Due to this measure, household heating systems can be upgraded, resulting in an increase of thermal comfort and therefore a rise in productivity during working hours.[120] In accordance to the COMBI tool, this measure should result in workdays gained.[54] In addition, children studying from home will experience the same comfort-related boost in productivity as their working parents, allowing them to perform at higher levels in school.

Impact analysis

Environmental	Positive
Social	Positive
Economic	Positive

Links and co-benefits between the measures

These measures complement each other as they are all targeted towards vulnerable households, however they are not all centred around energy efficiency, and although they have a common denominator of financial aid, they differ in terms of overall scope (i.e. energy efficiency).

Recommendations for procedural dimension

The distributional dimension of vulnerability includes, inter alia, energy affordability and energy efficiency, assessed in Workstream 2, while procedural elements include the recognition of energy poverty as a clear problem in policy documents, the presence of an official definition of energy poverty, and the development of clear indicators to measure the problem.

The National Strategy Against Energy Poverty (ENPE), approved in 2019, is an instrument that addresses energy poverty with an integrated approach and a medium- and long-term vision. The Strategy provides a definition of energy poverty (Energy poverty is the situation in which a

[119]https://ec.europa.eu/energy/sites/ener/files/documents/the_macro-level_and_sectoral_impacts_of_energy_efficiency_policies.pdf
[120] https://doi.org/10.3390/buildings11060244

household cannot satisfy the basic needs of energy supplies, as a consequence of an insufficient level of income and that, where appropriate, may be aggravated by having an energy inefficient home) and, in relation to it, of a vulnerable consumer (A vulnerable consumer is a consumer of electrical energy or thermal energy who finds him/herself in a situation of energy poverty, and who is an eligible beneficiary of the measures of support established by the administrations). It has made an initial diagnosis and has characterized the problem by designing official measurement indicators in line with the 4 headline indicators (2M, M/2, inability to keep the home adequately warm and arrears on utility bills) by the Energy Poverty Advisory Hub (EPAH), which will allow comparison with other Member States while monitoring progress towards the ENPE goal of reducing energy poverty by 25% between 2019-2024.

Conclusions

To conclude, alleviation of energy poverty is gaining momentum in Spain, being central to the whole National Energy and Climate Planning. A specific strategy has been drafted by the Spanish government, which gave a definition of both energy poverty and vulnerable consumers, making Spain at the forefront of the fight against energy poverty in Europe. However, most objectives contained in the strategies have not been turned into practice yet. This means that Spain has still few measures and policies which specifically target vulnerable consumers. Of these, a special mention should be given to the electric and thermal social bonusses, national measures of energy poverty alleviation, which have been improved and expanded in scope in recent years, especially after the outbreak of Covid-19. It can be seen as a very positive sign that some autonomous regions (e.g. Government of Catalunia or the Basque Government) are better equipped than the central government in the fight against energy poverty.

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