European Commission

EU
ENERGY POVERTY
Observatory

The multiple impacts of energy poverty, and the multiple benefits of addressing it

Handbook and guide

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NEA
Action for Warm Homes

Energy

Overview

This resource is a guide for identifying, understanding, and documenting the different social and economic benefits of addressing energy poverty. Adequate warmth, cooling, lighting, and the energy to power appliances are essential services needed to guarantee a decent standard of living and citizens' health. Energy poverty occurs when a household suffers from a lack of adequate access to energy services in the home.

Energy poverty is a distinct form of poverty associated with a range of adverse consequences for people's health and wellbeing. Low indoor temperatures are linked with the exacerbation of respiratory and cardiovascular illnesses, while overheating and the lack of access to adequate cooling is linked to heat stroke, stress, and excess deaths. In fact, energy poverty has an indirect impact on many policy areas - including health and social care, education, economic growth, and reducing carbon emissions. Addressing energy poverty has the potential to bring multiple benefits, including less money spent by governments on health, higher levels of educational attainment, better comfort and wellbeing, economic development, and reducing carbon emissions (see Figure One below).

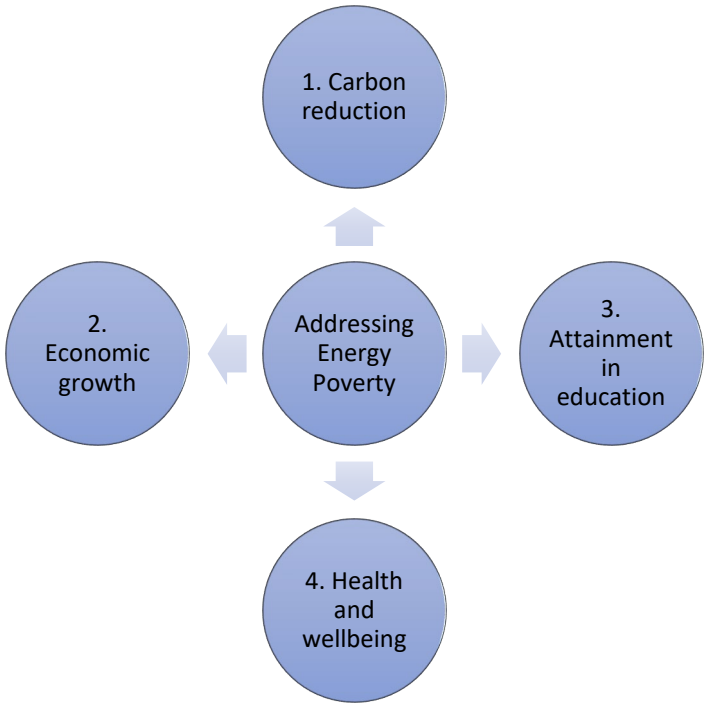

Figure One: The multiple benefits of addressing energy poverty

This resource aims to help EU organisations and Member States to identify, understand and document these multiple benefits. It explains the impacts that energy poverty has on four different areas: carbon emissions, economic development, educational attainment, and health and wellbeing. It also sets out the benefits to these areas of addressing energy poverty.

The resource is structured by policy area, and features case studies of good and innovative practice drawn from different member states to illustrate the benefits of addressing energy poverty.

1. Carbon emissions and energy poverty

Reducing carbon emissions is a critical priority for the EU. In 2016, the European Commission noted that around half of the European Union's final energy consumption was for heating and cooling, 45% of which was attributed to the residential sector. EU statistics show that the greenhouse gas emissions from private households is approximately 900,000,000 tonnes per annum (see Figure Two below), and in 2012 75% of the energy consumed for heating and cooling were produced by gas, coal, oil, or other fossil fuel based sources.

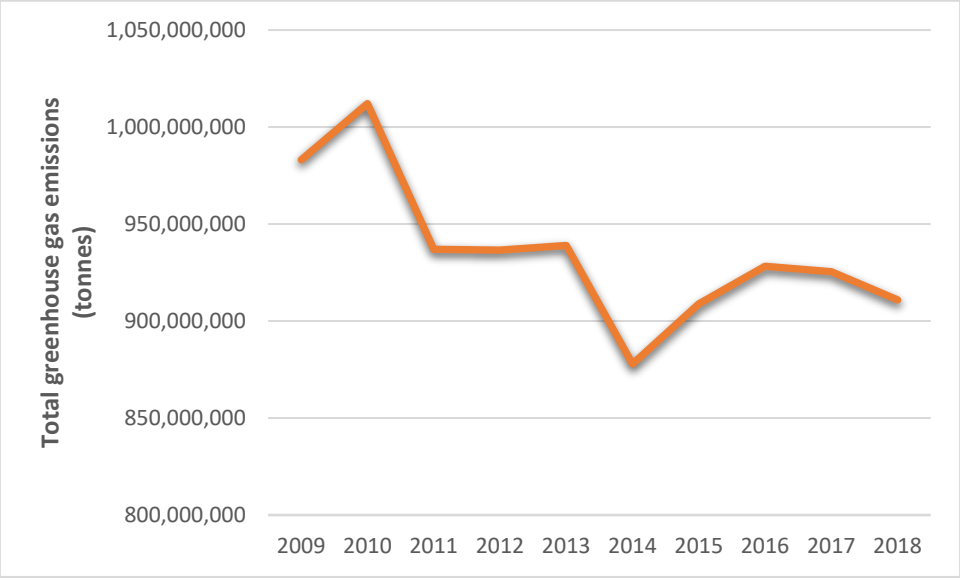

Figure Two: Direct greenhouse gas emissions (tonnes) by private households in the EU between 2009 and 2018.[1]

Energy poverty impacts on carbon emissions reduction because they have a common cause: energy inefficiency in dwellings. Figure Three below shows the relationship between energy efficiency, energy poverty, and carbon emissions. Homes that are energy inefficient, with poor insulation and inefficient heating or cooling systems require more energy to achieve an adequate and comfortable level of warmth or to stay cool in hot weather. Across the EU, this energy demand is still primarily satisfied by fuels that emit carbon. Simultaneously, households with low incomes living in energy inefficient buildings are at a higher risk of living in energy poverty because the energy they require to stay comfortably warm or cool is unaffordable. Addressing energy poverty and addressing carbon emissions can therefore often be achieved in the same way – through improving the energy efficiency of dwellings. This can be achieved through the installation of insulation, efficient glazing and doors, and through the installation of low-carbon, primarily non-gas heating systems such as heat pumps or heat networks (see Figure Three).

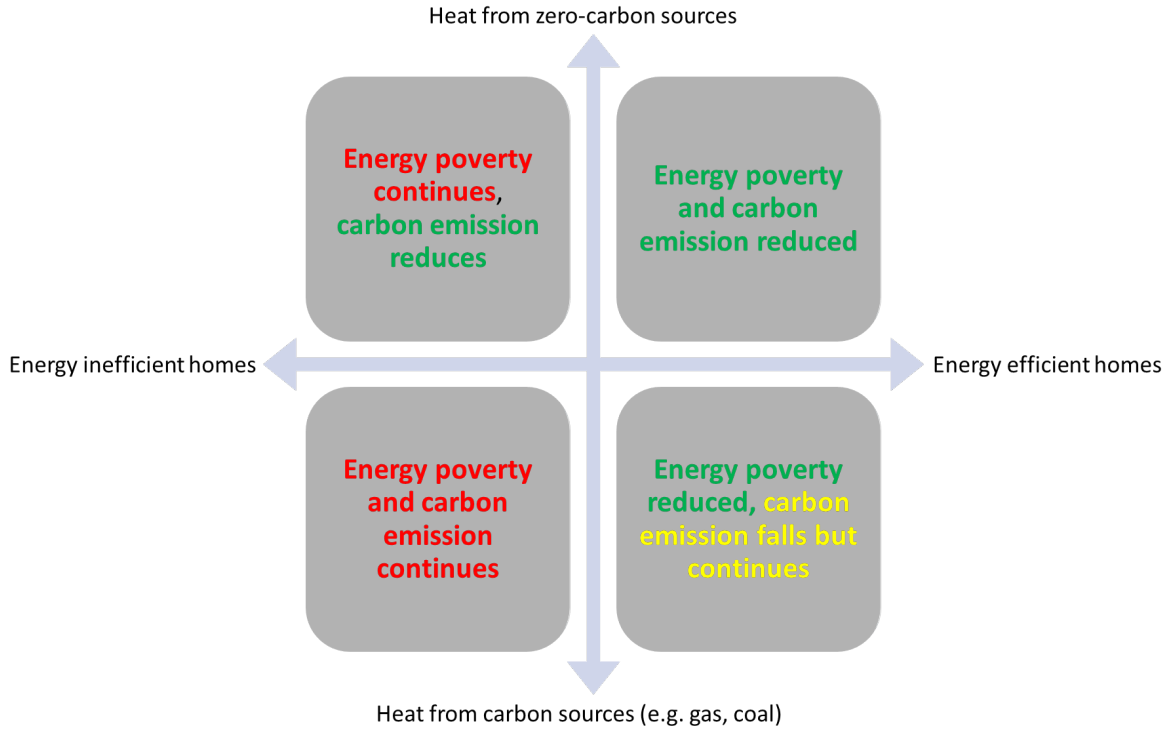

Figure Three: A matrix showing the combined impacts of energy (in)efficiency and heating type on energy poverty and carbon emissions.

At the same time, energy poverty and carbon emissions can also be addressed through advisory programmes that help households transform energy inefficient behaviours and practices. In other words, what people do in their homes can contribute to carbon emissions while being caused by energy poverty. For example, households may have old, inefficient heating systems that are difficult to operate, resulting in the household using more energy than they would otherwise need, and in turn higher energy costs and carbon emissions. Households at risk of energy poverty may also not have the knowledge, confidence, or capabilities to better engage with the energy market (where there is a competitive energy market) – for example though switching their supplier or energy tariff. This can increase the risk of customers using expensive tariffs, or less competitive standard tariffs. Programmes that provide advice-based services can therefore help households at risk of energy poverty to be more energy efficient at home, resulting in reduced energy costs and reduced carbon emissions from their dwelling.

Finally, innovative planning programmes can tackle energy poverty and carbon emissions simultaneously by controlling the degree to which external walls and windows are exposed to direct sunlight. For example, well-designed placement of trees and vegetation in residential areas can block or reduce the amount of heat reaching external walls, thereby removing or reducing the need for the use of cooling systems. Research has also demonstrated the links between green space and improved mental and physical wellbeing in residential areas, which may improve more general feelings of contentedness, happiness, and comfort for residents.[2]

Case Study: Reducing carbon emissions with low-carbon heat and energy efficiency measures in Croatia

In 2014, Croatia established a national programme focused on a specific type of housing stock – family homes.[3] In Croatia, family homes make up approximately 65% of the total housing and are responsible for approximately 40% of total energy consumption at the national level. The majority of family houses in Croatia were built before 1987 and have a poor standard of thermal insulation. These houses therefore consume approximately 70% of their energy in the service of heating, cooling, and domestic hot water use, and are a significant example of dwellings that are characterised by acute energy inefficiency as well as energy poverty.

A promotional video produced by the Croatian government to illustrate the Programme for the Energy Renovation of Family Homes, visually showing the different measures available.

To tackle the energy inefficiency of these homes, the Croatian government established the Programme for the Energy Renovation of Family Homes, which initially ran between 2014 and 2020 (see video above, in Croatian). Its aim was to increase the energy efficiency of family homes, reduce overall energy consumption and therefore CO2 emissions, while simultaneously reducing the energy costs of participating households. The programme operated by providing grants to improve the energy efficiency of the building fabric, particularly outer wall, ceiling, floor, and roof insulation; waterproofing; and finally the installation of renewable heat technologies such as wood chip and wood pellet systems; solar heat systems; and air source and ground source heat pumps (see Table One below).

Measures available	Maximum unit price in Croatian Kuna (kn) per m^2		Maximum measure cost (kn)	Amount co-financed (%)	Maximum amount co-financed per public call (kn)
External insulation	External wall	350,00	100,000.00	60%	60,000.00
	Flat roof	500,00			
	Ceiling	140,00			
	Sloping roof	500,00			
	Floor	500,00			
External door/panel replacement	2,500.00		100,000.00	60%	60,000.00
Solar thermal system	/		36,250.00	60% (in combination with a minimum of one external insulation measure)	21,750.00
Wood/pellet chip system	/		36,250.00		21,750.00
Heat pump	/		48,750.00		29,250.00
Photovoltaic system	/		91,250.00		54,750.00

Table One: Measures available through the Programme for the Energy Renovation of Family Homes, as well as the contributions offered by the Croatian government in Kuna.

As shown in Table One, the Programme provided a maximum of 60% of the total cost of measures to households, meaning that many households in energy poverty would be at risk of missing out due to not being able to afford their 40% contribution. Recognising this, of the 203 million Kuna allocated to the fund, 32 million Kuna was ring-fenced for households at risk of energy poverty. Social centres and community organisations were tasked with helping energy poor and vulnerable households to apply, and for households that met the eligibility criteria the programme financed 100% of their measures. As a consequence, the programme attempted to maximise the number of households at risk of energy poverty that could benefit from the scheme.

From the programme as a whole, the yearly energy savings were estimated to be approximately 13.5 GWh, and the yearly avoided CO2 emissions were estimated to be approximately 3,777 tonnes. The Croatian example is important because it demonstrates that energy efficiency and low-carbon heating programmes can target those at risk of energy poverty and simultaneously reduce energy consumption and carbon emissions.

2. Economic development and energy poverty

The impacts of energy poverty on economic development are best discussed in terms of the economic opportunities that are missed if energy poverty is left unaddressed. Addressing energy poverty by investing in domestic energy efficiency can simultaneously have positive economic impacts by creating jobs and clean growth for local, regional, and national economies and supply chains. In 2015, the International Energy Agency identified three broad economic areas that can be positively impacted by addressing energy poverty through investments in energy efficiency.[4]

Macroeconomic development	•Improvements in energy efficiency can have direct and indrect impacts on economic activity, employment, trade balance, and energy prices •Analysis of GDP changes due to large-scale energy efficiency policies has shown that they generate positive impacts on economic growth, ranging from 0.25% to 1.1% per year in GDP
Public budgets	•When energy efficiency schemes lead to job creation, one of the greatest overall impacts in economic terms is the reduced budget for unemployment and welfare payments •Energy efficiency improvements can generate increased tax revenues through greater economic activity, as well as reducing governmental expenditure on energy
Industrial productivity	•Industrial energy efficiency measures can deliver substantial benefits, such as enhancing competitiveness, profitability, production, and product quality, as well as reducing operational costs and costs associated with environmental compliance. •Energy efficiency measures can also lead to economic benefits for utilities, including lower transmission, generation, and distribution costs and lower or deferred costs for network reinforcement activites

Energy poverty also has an adverse impact on household spending power. Households living in energy poverty typically spend a higher proportion of their income on their energy bills and households that have higher than average energy bills due to poor dwelling efficiency tend to be at most risk of living in a cold home. Improving the energy efficiency of dwellings by installing insulation, more efficient heating and cooling systems and more efficient building fabrics, including glazing, can decrease energy costs and enable higher levels of disposable income (though among some, some savings may be taken in comfort). In other words, energy poverty places a restriction on the extent to which citizens can fully participate in and benefit from market economies.

Energy poverty and economic development rise and fall in tandem in times of economic crisis and recovery. The economic policies and priorities of the EU and individual member states are likely to be shaped for some time by Covid-19, which has resulted in increased teleworking across Member States. Research suggests that teleworking is associated with increased home energy use, especially for electricity, which can result in higher energy bills for households.[5] This may lead to an increase in energy poverty, as well as poorer living conditions at home and decreased levels of disposable income. Taking action to reduce energy poverty may therefore help to enable more productive teleworking by allowing more comfortable home working environments and maintaining or increasing households' levels of disposable income. Simultaneously, investing in insulation, heating and cooling systems, and ventilation can reduce levels of energy poverty for households that may have fallen into energy poverty due to the crisis, or whose energy poverty has grown more acute because of decreased incomes, increased energy usage at home, and/or the accumulation of energy debt.

Finally, energy poverty has a negative impact on the finances of national health services because of the cost to member states of avoidable hospital admissions and or use of non-primary health care services. As discussed at length in the section below on energy poverty and health, living in energy poverty increases the risk of acute respiratory, cardiovascular, and musculoskeletal problems which often result in lengthy hospital admissions, particularly in winter. For member states with publicly funded health services, such as Spain's National Health Service, this adds additional costs to budgets that are ultimately avoidable and preventable. In some cases, such as that of Spain explored in the Case Study below, the health savings to the state produced by energy efficiency programmes can equal and even exceed the cost of the programme itself.

Case Study: Evaluating the economic impacts and NHS savings of an energy poverty programme in Seville, Spain

One example of the economic benefits of addressing energy poverty is the cost savings this can produce for national health services. In Seville, a city that is the capital and largest city of the Spanish autonomous community of Andalusia, a project entitled POWERTY provided energy efficiency improvements to six multi-family residential buildings comprised of 71 social rented households.[6] The aim of the project was to reduce initial energy demand, reduce vulnerability to energy poverty, and improve the quality of life for each household that received measures. In addition, however, evaluation work undertaken by academics at the University of Seville aimed to quantify and model the economic savings of the project for Spain's National Health Service (NHS).

The interventions were focused on the second largest district in Seville, which represents 60% of its population and which has an average of 104 dwellings per square mile. In 2007, Seville's City Council put in place a retrofitting development plan to improve the energy efficiency of the housing stock, which was prematurely halted by the financial crisis in 2008 with only 10% of works completed. Later, in 2012, Seville City Council approved six residential buildings for retrofit. These buildings were built before the introduction of energy efficiency regulations in Spain and were therefore extremely energy inefficient and largely unmaintained, resulting in low health standards and inadequate indoor

temperatures for each individual household. The retrofitting work undertaken in each building consisted of improvements to cavity wall insulation, loft insulation, UPVC windows, and installing new solar-thermal heating systems.

To quantify the possible savings of the retrofit to Spain's NHS, the University of Seville academics established the initial estimated costs to the NHS based on the levels of vulnerability present in each household as defined by the Health-Related Quality-Life Cost (HRQLC). The HRQLC provides an economic analysis of a vulnerable household and is determined by giving a monetary value to the Quality-Adjusted Life Year (QALY). Put simply, households featuring occupants with multiple health conditions have a greater estimated cost to health services over their lifetimes, while the opposite is also true. They then calculated the impact of the retrofit by subtracting from this initial figure the calculated estimated cost of each household to the NHS after the energy efficiency measures were installed. Across each of the six buildings the costs to the NHS were reduced by between €51,480 and €178,290 (see Figure Four). Two years following the retrofit, it was calculated that the initial costs of the energy efficiency investment were almost completely recovered, with a net gain of €43,473 calculated after three years. As the academics point out, this money can then be used to assist households across Seville who continue to live in energy poverty by contributing to their energy bills or providing social tariffs.

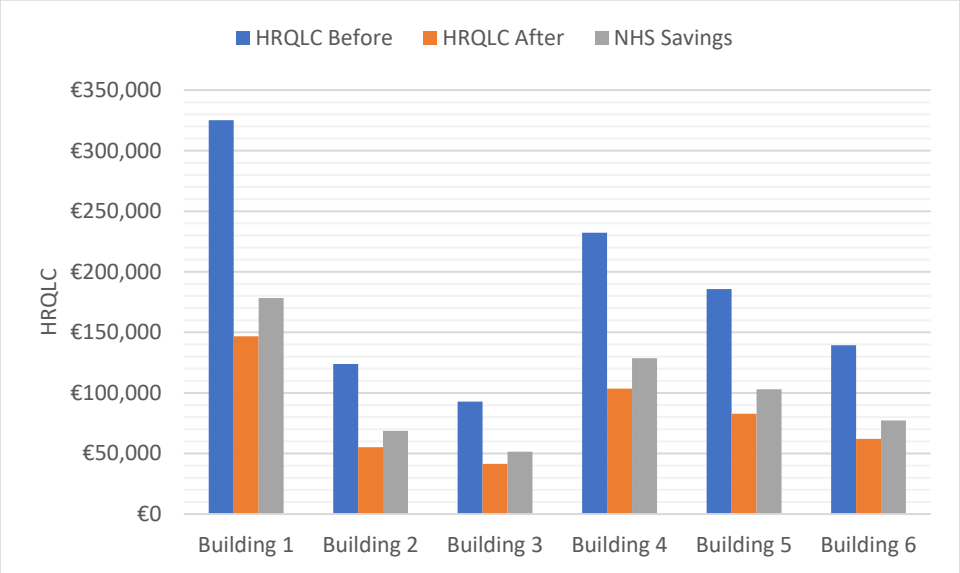

Figure Four: HRQLC costs of each building before and after energy efficiency measures were installed.

The example of POWERTY shows how it is possible and desirable to include economic savings, measured in terms of savings to national health services, in cost-benefit analyses of projects that aim to address energy poverty (primarily but not exclusively whole house retrofit). It shows that addressing energy poverty by installing energy efficiency measures in vulnerable households can lead to substantial medium- and long-term savings for national health providers, producing an eventual surplus that can be reinvested in energy poverty alleviation in different ways or injected into other parts of local/regional economies.

3. Educational attainment and energy poverty

Living in energy poverty has been shown to have a negative impact on children's educational attainment which detrimentally shapes their later life. Early research across the EU demonstrated a linear relationship between educational attainment and energy poverty. Average incidences of energy poverty were 7.4% across Europe for those with third-level qualifications, which increased to 12% among those who completed secondary education only and 19.2% among those who did not complete secondary education.[7] More recent research in France finds that 7% of people with no secondary diploma experience energy poverty, compared to less than 1% of those who do.[8] Table Two below shows some of the educational impacts associated with energy poverty:

Impact	Explanation
Bullying and stigma at school	Evidence suggests that children who live in energy poverty can be at greater risk of being bullied and stigmatised at school. For example, research suggests that children can be called 'smelly' or 'stinky' because their clothes are not washed as frequently due to their parents rationing electricity use at home, or ability to efficiently dry laundry in cold and/or damp homes.[9]
Days off school	Children living in energy poverty are more likely to develop severe physical and mental health problems, especially respiratory diseases such as asthma, as well as anxiety and depression. This can directly lead to increased hospital admissions and an increased number of days spent off school sick.[10]
Emotional wellbeing and resilience	As well as bullying and stigma, children living in energy poverty face emotional challenges from a young age. They can find it more difficult to study, due to not having a warm, suitable room to do homework in, and can feel helpless about their life chances or improving their living situation.[11]
Increase in the risk of developing unhealthy behaviours at a lower age (e.g. alcohol and tobacco use)	Some evidence suggests that there might be an association between living in energy poverty and the development of social problems such as truancy, anti-social behaviour, and drug use occurring at a younger age (e.g. alcohol, tobacco).[12]
Long-term probability of living in poverty	Research has shown that living in energy poverty as a child is a significant barrier to achieving positive outcomes later in life, such as a homeownership, well-paid employment, and social mobility. Instead, children living in energy poverty are more likely to continue to live in energy poverty as adults.[13]
Lower than average weight gain and dietary deficiency	As well as having a greater likelihood of developing physical and mental health problems, research has consistently shown that infants and young children living in energy poverty can experience lower than average weight gain, dietary deficiency, and hunger. This can be associated with lower concentration, motivation, and task persistence skills at school and can therefore contribute to lower educational attainment.[14]

Social isolation	Days off school can cause children to become isolated from other students due to lack of participation, especially in sports activities due to ill-health, or fear from other students of their health condition. Stigma can also lead to isolation, which can be detrimental during children's developmental years and persist into adulthood.[15]

Table Two: The impacts of energy poverty on children, young people, and educational attainment

Addressing energy poverty may therefore improve educational attainment by tackling the negative impacts of living in a cold home listed in Table Two. Addressing energy poverty may lead to improved health outcomes for infants and young children, improved attendance, and improved chances of living healthier lives in adulthood.

There are fewer examples of schemes that have definitively improved educational attainment than for health and wellbeing, carbon emissions, or economic development, but research in the UK has demonstrated the multiple benefits for children of connecting off-gas households to the gas network. Outside of the EU, The Housing and Health Research Programme in New Zealand found that fitting insulation in homes led to drier and warmer living conditions, fewer days spent off school and fewer visits to doctors or hospitals.

Case Study: Embedding children and young people into fuel poverty policies in Scotland

In June 2018, the Scottish Government conducted a **Children's Rights and Wellbeing Impact Assessment on its proposed Fuel Poverty Strategy.**[16] The overall aim of the Strategy is to set out the Scottish Government's approach to tackling fuel poverty and to enable a fairer Scotland where everyone lives in a warm home, has access to affordable, low carbon energy, and has an increased understanding of how to use energy in their home.

As part of their consultation on the new Fuel Poverty Strategy, the Scottish Government sought views from organisations that represent or work with children and young people in Scotland. The consultation document also included a specific question to help establish whether or not the proposals set out in the draft Scottish Fuel Poverty Strategy would have an impact on children and, if so, what the nature of these impacts would be.

The consultation concluded that the new Fuel Poverty Strategy would have a positive impact on the lives of children living in homes experiencing fuel poverty as they will be provided with better living conditions, warmer homes, and a better quality of life. In addition, this was expected to have a positive impact on children's health and wellbeing as well as potentially improving their opportunities for educational attainment.

The example of Scotland provides an illustration and guide of how member states' priorities of addressing energy poverty and improving educational attainment can be linked together in policy. Questions asked by the Scottish Government's assessment included the following, and organisations

in member states could use these questions as a starting point for assessing the impacts of existing or proposed energy poverty policies on children's rights and attainment:

- What impacts do energy poverty policies have on children's rights?
- How do energy poverty policies affect children's wellbeing as defined by appropriate national and/or EU health and wellbeing indicators?
- How do energy poverty policies contribute to the wellbeing of children and young people?
- Are some children and young people more impacted by energy policies than others?
- How do energy poverty policies promote or impede the implementation of the UNCRC and other relevant human rights standards?
- Should children and young people be directly involved in the development or implementation of energy poverty policies? Are there particular groups of children or young people whose views should be sought? If this is not appropriate, which stakeholders and/or experts should be further involved in the development of energy poverty policies to ensure children and young people's perspectives are included?

At a governmental level, the consultative steps taken by the Scottish Government when assessing the possible impacts of its new fuel poverty strategy could be considered and adopted by member states as best practice. These steps include:

- External stakeholder workshops with organisations that represent children and young people. In Scotland, this included representatives from a range of policy areas such as the charity Child Poverty Action Group and the Scottish Public Health Network. Organisations such as these are typically well placed to recognise the links between energy poverty, child poverty, and educational attainment, and can help member states understand the multiple benefits that addressing energy poverty may bring to children's lives and education.
- Reviewing available statistics on the prevalence of energy poverty among households with children at both member state and EU level. At the EU level, this could include reviewing available statistics from the EU Statistics on Income and Living Conditions (EU-SILC) and disaggregating these statistics by household composition. It could also include using available national statistics on energy poverty at member state level in a similar way (where data is available).
- Reviewing other research evidence from EU member states on the impacts of energy poverty on children and educational attainment, including best practice.

4. Health, wellbeing, and energy poverty

The health impacts of energy poverty centre on the conditions that are exacerbated or caused by living in a cold home. In EU Member States, energy poverty has been found to have a strong association with poor health, and the impact of energy poverty on health tends to worsen during economic crisis. It also disproportionately impacts women and Member States with high levels of structural vulnerability, such as higher long-term unemployment rates, poor dwelling efficiency, and a lack of adequate heating systems in the housing stock.[17]

There is also an association between cold and damp housing and Excess Winter Deaths (EWD). The Excess Winter Deaths Index (EWDI), which compares the number of deaths that occur between December and March with other times of the year, shows that historical levels of EWD vary considerably by member state, ranging from an average of 8.2% in Slovakia to 29.4% in Malta (based on an analysis of 30 European countries between 1980 and 2013).[18] The most recently available EU statistics from 2014 on EWD also show a wide variation, ranging from under 5% in Slovakia and Finland to above 20% in southern Member States such as Cyprus, Portugal, and Malta (see Figure Five below).[19] The most prevalent cause of EWD in member states is cardiovascular or respiratory diseases linked to living in energy poverty, particularly in older people and those with long-term health conditions.[20] Research in the UK has also suggested that those living in the coldest 25% of homes are 20% more likely to die in winter than those living in the warmest 25% of homes.[21]

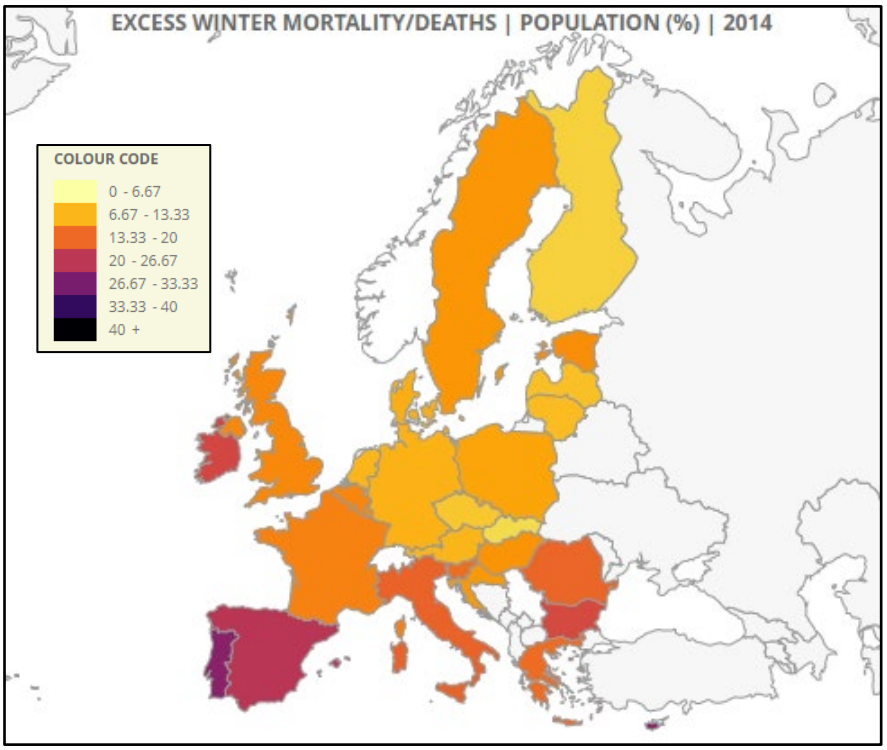

Figure Five: Percentage of Excess Winter Mortality in the European Union in 2014[22]

Table Three below shows the impact of living in a cold home on respiratory and cardiovascular diseases, as well as on mental ill-health, musculoskeletal problems, and diet and nutrition.

Impact	Explanation
Respiratory disease	Respiratory disease has been linked to living in a cold and damp home. Inhaling cold air causes airways to tighten and is linked to increased production of mucus. In turn, this can irritate the bronchial lining of the respiratory tract and can therefore reduce resistance to infection, potentially leading to pneumonia in asthma and COPD sufferers. This will often lead to hospital admission and is associated with a greater risk of death.[23] Cold temperatures also suppress the immune system in other ways, increasing the risk of infection and the risk of developing cold and flu.[24]
Cardiovascular disease	There is a strong association between energy poverty and deaths resulting from heart disease. Cold temperatures can increase blood pressure by constricting the blood vessels, increasing the risk of thrombosis, heart attacks, and strokes due to the extreme pressure placed on the heart. Moreover, blood viscosity and fibrinogen levels rise in cold temperatures, increasing the risk of thrombosis and strokes.[25]
Mental ill-health	Strong associations have been observed between energy poverty, anxiety, depression, and other forms of self-reported mental ill-health. The stress and worry associated with living in a cold home, accumulating energy debt, and having little or no control over heating systems has also been noted by numerous studies. As noted in the section on energy poverty and educational attainment, there are also several negative mental health consequences of energy poverty for children and young people, such as stigmatisation, social isolation, and early development of mental health conditions such as depression.[26]
Musculoskeletal problems	Cold homes are frequently linked with the exacerbation of longstanding musculoskeletal problems such as rheumatoid arthritis, and studies have reported that those living in cold homes experience 'stiffenings' of their joints and muscles due to cold indoor temperature. Research has also demonstrated that colder indoor temperatures can increase the risk of falls and accidents among elderly populations by reducing dexterity and exacerbating joint pain. This may result in increased hospital admissions due to hip fractures and broken wrists, clavicles, and other bones.[27]
Diet and nutrition	Energy poverty is understood to be driven by low household incomes, high energy costs, and poor dwelling efficiency. As a consequence, many households will ration food in order to be able to pay their energy bills, parents may forgo meals in order to provide for their children or other family members, or they may cut back on other essentials in a complex set off trade-offs. These potentially harmful 'coping practices'

	potentially increase the risk of malnutrition, poor diet, fatigue and exhaustion, and negative outcomes for children, young people, and their educational attainment.[28]
Heat stroke and stress	Particularly in warmer Member States, though increasingly so across Europe, the consequences of having inadequate cooling systems is associated with negative health outcomes, especially in densely populated cities. A lack of appropriate air conditioning systems can lead to heat stress, hospitalisations, and excess deaths during heat waves. The combination of excess heat and inadequate cooling systems can also result in hypertension, heart attacks, dehydration, renal failure, and increased insomnia and sleep disturbance.[29]

Table Three: The impacts of energy poverty on different mental and physical health conditions.

The links between energy poverty and health can be observed through a number of the EU's official statistics,[30] such as:

- Statistics on excess winter mortality/deaths
- Statistics on the share of member state populations living in a dwelling equipped with heating facilities
- Statistics on the share of member state populations living in a dwelling equipped with cooling facilities
- Statistics on the share of member state populations living a dwelling with leak, damp, or rot

Member state level statistics can also help to measure the association between energy poverty and health, and member states can also look to develop bespoke health-based indicators that can measure the association between energy poverty and health at different geographical scales. Survey based studies can also be deployed to assess self-reported associations between energy poverty and health in different member states, such as those which ask households to quantify and describe possible health improvements resulting from energy poverty interventions (such as heating system installations).

Addressing energy poverty can help to alleviate the health conditions discussed in this section. Studies have suggested that the impact of heating interventions on respiratory health can be significant, particularly for children, and self-reported improvements in cardiovascular conditions are also associated with higher indoor temperatures.[31] Studies have also stressed the connection between energy efficiency, energy advice, and heating interventions and improved mental health; these improvements are often connected to the alleviation of financial stress, increases in feelings of control over the heating system, increased use of the whole home (especially bedrooms, bathrooms, and spare rooms that were previously uninhabitable due to the cold), and decreased worry about the safety and operability of old heating systems and equipment.[32] Taken together this can result in more general feelings of security, happiness, and 'homeliness' which evidently have positive mental health implications.

Case Study: Designing a health-focused energy poverty programme in Ireland

The Warmth and Wellbeing Pilot Scheme (2016-2019) was a free home insulation and heating scheme for people in Dublin, Ireland, with chronic respiratory conditions.[33] It is part of the Better Energy Programme, the umbrella for a number of Irish Government schemes that provide full or partial grants to households to improve their energy efficiency. The Warmth and Wellbeing Pilot aimed to make homes in Ireland both warmer and healthier to live in by providing energy efficiency upgrades to the homes of people living in energy poverty who have chronic respiratory conditions, such as severe asthma and COPD.

The objectives of the scheme were to improve the living conditions of people with these respiratory conditions, and also eliminate their need to be admitted to hospital in the winter months due to their conditions. The scheme provided a range of measures depending on the specific need of the householder and the fabric quality of each dwelling; these measures included attic insulation, cavity wall insulation, internal and external wall insulation, ventilation, and oil and gas boiler replacements. It also aimed to provide households with energy-related advice such as information on how to compare and switch energy suppliers.

Eligibility was determined by a number of criteria: to receive support the applicant had to be over 55 years of age, living with a chronic respiratory disease, an owner-occupier or renter from a local authority or housing association, and in receipt of fuel allowance. These criteria aimed to target the most in need households that were not only living with a respiratory condition, but who were also at risk of having that condition exacerbated by their age, their low income, or the quality of their dwelling fabric. Once an application was made and approved, an initial survey was undertaken to establish precisely which energy efficiency measures were suitable for each dwelling. On completion of the measures, all homes received a new Building Energy Rating (BER) and in many cases, a follow-up inspection, to ensure the work was carried out to a high standard.

While an independent evaluation of the Pilot Scheme is currently underway to assess its direct impact on severe respiratory conditions, it provides an example of how energy poverty schemes can be directly targeted at vulnerable households with specific health conditions. Based on EU and national statistics, member states could look to establish and map the association between energy poverty and different health conditions (cardiovascular, respiratory, etc.) at different geographical scales, and could subsequently try to design programmes similar to the Warmth and Wellbeing Pilot Scheme to target households with poor health.

The multiple benefits of addressing energy poverty – from theory to practice

The multiple benefits of addressing energy poverty are holistic and linked together in different ways

Table Four below summarises the key aspects of each of the four themes.

Theme	Main aspects of theme	Key benefits of addressing energy poverty to theme
Carbon reduction	Energy inefficient homes require households to spend more on energy, increasing energy poverty and carbon emissions simultaneously.	Improving the energy efficiency of homes through insulation, ventilation, and the installation of low-carbon heating solutions reduces energy poverty and carbon emissions.
Economic growth	Energy poverty is associated with higher public expenditure on unemployment and welfare, and low disposable incomes for energy-poor households. Households full participation in and ability to benefit from market economies is constrained.	Investing in measures to improve energy efficiency and decrease energy poverty can create jobs, clean growth, and health savings for local, regional, and national economies while increasing household spending power.
Educational attainment	Energy poverty is linked to a range of adverse outcomes for children and young people, particularly lower attainment and increased absence at school, the development of cold-related health conditions at a young age, and lower social and emotional wellbeing.	By making homes healthier places to live and study, addressing energy poverty gives children and young people a stable developmental platform from which they can fulfil their educational potential and achieve social mobility.
Health and wellbeing	In Member States, Excess Winter Deaths are most commonly caused by cardiovascular or respiratory diseases linked to living in energy poverty, and there are a range of other adverse health outcomes associated with living in an inadequately heated or cooled home.	The impact of energy efficiency and heating interventions on the prevalence and severity of cardiovascular and respiratory health are substantial, and can also improve households' mental health, stress, and wellbeing.

Table Four: Key linkages between energy poverty and carbon reduction, economic growth, educational attainment, and health and wellbeing.

How can actors in Member States incorporate these four areas into policymaking on energy poverty?

The EU Energy Poverty Observatory has produced a series of guides for policymakers about how to design effective energy poverty policies.[34] This section considers how carbon reduction, economic development, educational attainment, and health and wellbeing could be incorporated into three core elements of energy poverty policy: measurement and definition; stakeholder development; and financing and funding.

Measurement and definition

Energy poverty is notoriously difficult to measure and define, and different Member States may adopt different ways of identifying and quantifying it. Guidance for policymakers suggests that energy costs and income, self-assessment, direct measurement, and proxy indicators can be used to measure energy poverty. Different combinations of these indicators can be used to identify social, economic, or geographic groupings of energy poverty at different scales.[35] In light of the four themes of this document, the following could be considered when thinking about how to measure and define energy poverty:

- Self-assessments can ask households directly the extent to which the temperature of their home, or ability to meet their energy needs, impacts on their physical and/or mental health, or on the health and education of children and others in the home.
- Direct measurement can be expanded to include approximations or determinations of the amount of energy lost through poor insulation and/or the amount of energy required to heat a home to a specific temperature (e.g. 21 degrees Celsius). Overall assessments of energy efficiency can be built into energy poverty strategies and definitions.[36]
- Proxy indicators can be expanded to include the prevalence of ill health (e.g. cardiovascular or respiratory illnesses), the number of avoidable cold-related hospital admissions, and/or statistics on multiple domains of deprivation, utility debt, energy performance ratings, educational attainment and child poverty. While insufficient on their own, these indicators can be cross-referenced with other indicators across local, regional, and national scales to identify patterns and trends associated with energy poverty.

Measuring energy poverty in a way that incorporates carbon reduction, educational attainment, and health and wellbeing can simultaneously improve how actors in Member States can target socio-economic groups living in the most damaging and acute energy poverty. For example, it can help municipalities identify neighbourhoods that might have high rates of energy poverty, ill-health, and lower educational outcomes – which then become the optimal targets for interventions.

Stakeholder development

Previous guidance for municipalities produced by the EU Energy Poverty Observatory discusses how measurement and definition identifies target groups (who measures should focus on) and stakeholders (who might be involved in developing and delivering energy poverty interventions). Recognising the multiple benefits of addressing energy poverty means recognising new possible target groups and, therefore, new stakeholders. For example:

New target group	New internal stakeholders	New external stakeholders
Children and young people living in energy poverty	-Education department within the municipality	-Educational charities and foundations advocating for children and young people -Public health, primary health care practitioners and other health bodies focusing on children and young people (e.g. midwives and children's health specialists)
Households with respiratory, cardiovascular, or other cold related ill-health	-Health department within the municipality	-Health charities and foundations with specialist interests in cold-related illness (e.g. European Heart Network or different national Heart Foundations). -Public health bodies, including university health departments and research groups (e.g. health economists)
Dwellings with poor energy efficiency	-Building and constructions department within the municipality	-Installers, engineers, and contractors who deliver energy efficiency measures -Heating systems trade bodies, manufacturers, and designers

The EU Energy Poverty Observatory provides guidance for municipalities to develop stakeholder identification and engagement. For example, the Observatory assisted five municipalities in the UK, Netherlands, Romania, Albania, and Portugal with a stakeholder mapping exercise to enable them to identify possible partners for projects and prospective funding opportunities.[37]

Financing and funding

Recognising that addressing energy poverty can have multiple benefits also expands opportunities for funding policies and measures. Cases for public and private funding can be enhanced by showing how addressing energy poverty has positive implications for carbon reduction and economic development, and linking energy poverty more closely to health and education can open up new pathways for match, gap, or comprehensive funding from health and education funds and foundations. For example:

Public funding	Private funding	Charitable trusts and foundations
•Aligning energy poverty proposals with broader public priorities of carbon reduction, economic growth/recovery, and job creation can leverage funds for energy poverty programmes	• Building business cases for investment by demonstrating how energy poverty schemes improve productivity, support energy infrastructure investment and supply chain resilience	•Health and education foundations become possible sources of funding for measures that target energy poverty, educational attainment, and ill-health together

The EU Energy Poverty Observatory provides technical assistance to organisations, municipalities, and other actors in Member States who are interested in measuring and defining energy poverty, mapping local, regional, and national stakeholders; and identifying and pursuing optimal funding pathways. Enquiries regarding technical assistance can be sent to contact@energypoverty.eu

Further guidance and resources for policymakers

Guidance for policymakers

Designing effective energy poverty policies in municipalities

Selecting Indicators to Measure Energy Poverty

Notes

[1] This figure is produced from EU emissions statistics, env_ac_io10, available from the following link: https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_io10&lang=en

[2] Houlden, V; Weich, S; de Albuquerque, J.P; Jarvis, S. and Rees, K. (2018) The relationship between greenspace and the mental wellbeing of adults: A systematic review, *Plos One*.

[3] Further information on the programme can be found at the following link in Croatian: https://www.fzoeu.hr/hr/energetska_ucinkovitost/enu_u_zgradarstvu/energetska_obnova_obiteljskih_kuca/. Croatia has also recently announced that the programme will be continuing from 2020 with some amendments: https://balkangreenenergynews.com/croatia-approves-energy-renovation-plan-for-family-houses-worth-eur-18-7-million/

[4] International Energy Agency (2015) Capturing the Multiple Benefits of Energy Efficiency.

[5] Hook, A; Court, C; Sovacool, B. and Sorrell, S. (2020) A systematic review of the energy and climate impacts of teleworking. *Environmental Research Letters*.

[6] Information on POWERTY can be found here: https://www.agenciaandaluzadelaenergia.es/es/la-agencia/proyectos-internacionales/proyectos-europeos/powerty. The information and analysis presented in this case study is also drawn from Castaño-Rosa, R; Solís-Guzmán, J. and Marrero, M. (2020) Energy poverty goes south? Understanding the costs of energy poverty with the index of vulnerable homes in Spain, *Energy Research and Social Science* 60: 101325.

[7] Healy, J.D. (2004) Housing, Fuel Poverty and Health: A Pan-European Analysis. Routledge: Oxon, p.

[8] Legendre, B. and Ricci, O. (2015) Measuring fuel poverty in France: Which households are the most vulnerable?, *Energy Economics* 49: 620-628.

[9] Csiba, K; ed. (2016) Energy Poverty Handbook, p.51.

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[11] Scottish Fuel Poverty Strategic Working Group (2016) A Scotland without fuel poverty is a fairer Scotland: Four steps to achieving sustainable, affordable and attainable warmth and energy use for all, p.60.

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[13] Legendre, B. and Ricci, O. (2015) Measuring fuel poverty in France: Which households are the most vulnerable?, *Energy Economics* 49: 620-628.

[14] National Energy Action (2018) Under One Roof: Health and housing sectors tackling fuel poverty and cold-related ill health together.

[15] Hills, J. (2011) Fuel poverty: the problem and its measurement. CASEreport, 69. Department for Energy and Climate Change, London, UK.

[16] This document is accessible at the following link: https://www.gov.scot/publications/fuel-poverty-target-definition-strategy-scotland-bill-fuel-poverty-strategy-9781787810440/

[17] Oliveras, L; et al. (2020) Energy poverty and health: Trends in the European Union before and during the economic crisis, 2007-2016, *Health and Place*: 102294.

[18] Liddell, C; Morris, C; Thomson, H. and Guiney, C. (2016) Excess winter deaths in 30 European countries 1980-2013: a critical review of methods, *Journal of Public Health* 38: 806-814.

[19] These statistics are available from the EPOV website at the following link: https://www.energypoverty.eu/indicator?primaryId=1481

[20] Fowler, T; et al. (2014) Excess Winter Deaths in Europe: a multi-country descriptive analysis, *European Journal of Public Health* 25: 339-345.

[21] National Energy Action (2018) Under One Roof: Health and housing sectors tackling fuel poverty and cold-related ill health together.

[22] This figure is produced from data on the EPOV website, available at the following link: https://www.energypoverty.eu/indicator?primaryId=1481

[23] National Energy Action (2018) Under One Roof: Health and housing sectors tackling fuel poverty and cold-related ill health together.

[24] Oliveras, L; et al. (2020) Energy poverty and health: Trends in the European Union before and during the economic crisis, 2007-2016, *Health and Place*: 102294.
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[29] Jossel, S; Sawyer, S. and Hernández, D. (2019) Energy, Poverty, and Health in Climate Change: A Comprehensive Review of an Emerging Literature, *Frontiers in Public Health*.
[30] These statistics can be accessed through the EPOV website at the following link: https://www.energypoverty.eu/indicators-data
[31] Rosenburgh, J. (2020) Connecting Homes for Health: Final project report.
[32] Stockton, H; et al. (2018) Health and Innovation Programme: Social Evaluation Report.
[33] Further information on the scheme can be found here: https://www.seai.ie/grants/home-energy-grants/free-upgrades-for-eligible-homes/warmth-and-wellbeing/
[34] EU Energy Poverty Observatory (n.d.) Guidance for Policymakers.
[35] Detailed advice on using different indicators to measure energy poverty can be found in: Trinomics (2016) Selecting Indicators to Measure Energy Poverty.
[36] An example of this is the proposed Low Income Low Energy Efficiency definition of fuel poverty in England, which will define a household as living in fuel poverty if their disposable income (after housing costs and energy needs) is below the poverty line and the energy efficiency of the property does not meet a suitable standard.
[37] See: https://www.energypoverty.eu/news/epov-assists-municipalities-develop-energy-poverty-policies