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CO-EMEP

CO-EMEP * Improvement of cooperation for better energy management and reduction of energy poverty in HU-HR cross-border area

Guidelines on energy poverty mitigation planning for local and regional government units

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1. Introduction

Energy poverty is an extremely complex problem, which is why assessing the current state of energy poverty in European countries as well as its effects on the lives of citizens is not an easy task. Energy poverty most often occurs due to a combination of three factors: poor energy efficiency of the building, high energy costs and low household income. Energy poverty further leads to a number of socio-economic and health problems, but also to a reduction in the quality of life of citizens living in energy poverty. Many citizens do not recognize that they are affected by energy poverty or if they recognize that, they do not have available information on potential measures, so the real impact of energy poverty is likely to be greater than estimated. Energy poverty can seriously affect the health, well-being, social inclusion and quality of life of citizens, which is why energy poverty needs to be addressed in many public policies – including social, economic, climate and energy policies, and can best be addressed at local and regional level.

To successfully mitigate energy poverty at the local and regional government level, it is necessary to establish a quality planning process, preceded by raising awareness of local and regional government units that energy poverty is one of the key problems with whom many citizens living in their administrative area are facing. Awareness-raising activities aim to build stakeholder awareness on energy poverty and identify opportunities to address it. Once ingrained awareness that energy poverty exists and has devastating consequences for individuals and for society as a whole is a major driver of future activities aimed at energy poverty mitigation.

Because local and regional authorities have the best insight into the financial and social challenges with whom their citizens face, especially as they know the territory in all its dimensions, they must first identify the degree of energy poverty. Despite the fact that local and regional government units know their citizens best, the actual level of energy poverty is difficult to determine, especially in those areas where there is no official definition of energy poverty at the national level. Without national guidelines, local and regional government units are left to their own capacities in defining their regional and local policies aimed at energy poverty mitigation. In addition, a number of challenges have been identified that need to be overcome if the problem of energy poverty is to be addressed effectively. These challenges include the following elements:

- **different indicators** need to be taken into account when identifying energy poverty;
- **the required expertise on social issues and energy** is often located in different departments or is insufficient;
- vulnerable households have **small income** and **limited access to financing** so they are often not willing to invest in order to improve their living conditions;
- **financing energy poverty mitigation actions** can **be challenging**.

In order to overcome all of above-mentioned challenges and to use all available sources of funding, additional capacity building is needed as well as networking for the purpose of knowledge and experience exchange and gaining support from national authorities and other experts from relevant fields (social welfare system, health care, energy sector). One way to support local and regional government units in the process of energy poverty mitigation is to develop relevant documents such as programmes, criteria, plans, methodologies and/or guidelines to facilitate energy poverty mitigation planning process at the local and regional level.

In accordance with the goal of providing professional and advisory assistance to local and regional government units, the project partners as relevant experts in the field related to addressing and solving the problem of energy poverty within the project **CO-EMEP – Improvement of cooperation for better energy management and reduction of energy poverty in HU-HR cross-border area** developed these guidelines for energy poverty mitigation planning in the cross-border area. The main goal of this document is to provide guidance to local and regional government units on how to include energy poverty mitigation measures in their future strategic and planning documents and to ensure effective fight against energy poverty in their administrative area over the long time period.

The development of these guidelines is based on a **plan, implement, monitor and act** approach that enables control and continuous improvement of the implementation of activities, whereby the guidelines will be structured in order to provide the local and regional government units with basic information on steps how to:

- **PLAN** – define goals, activities and responsibilities for the implementation of measures to mitigate energy poverty in their administrative area;
- **IMPLEMENT** – implement effective measures for energy poverty mitigation;
- **MONITOR** – define the methodological and operational approach in order to monitor the entire process of energy poverty mitigation planning;
- **ACT** – continuously improve the overall process of energy poverty mitigation planning.

In accordance with the above defined approach to the implementation of energy poverty mitigation planning process, four key activities have been defined (Figure 1.1.) that local and regional government units need to implement in order to successfully establish and implement the energy poverty mitigation planning process in their administrative area:

1. Defining the problem and the context;
2. Planning energy poverty mitigation measures and involving relevant stakeholders;
3. Defining and implementation of energy poverty mitigation measures;
4. Evaluation and monitoring of the implementation of energy poverty mitigation measures and securing financial resources for the implementation of planned measures.

Each of these activities is described in detail in the following chapters.

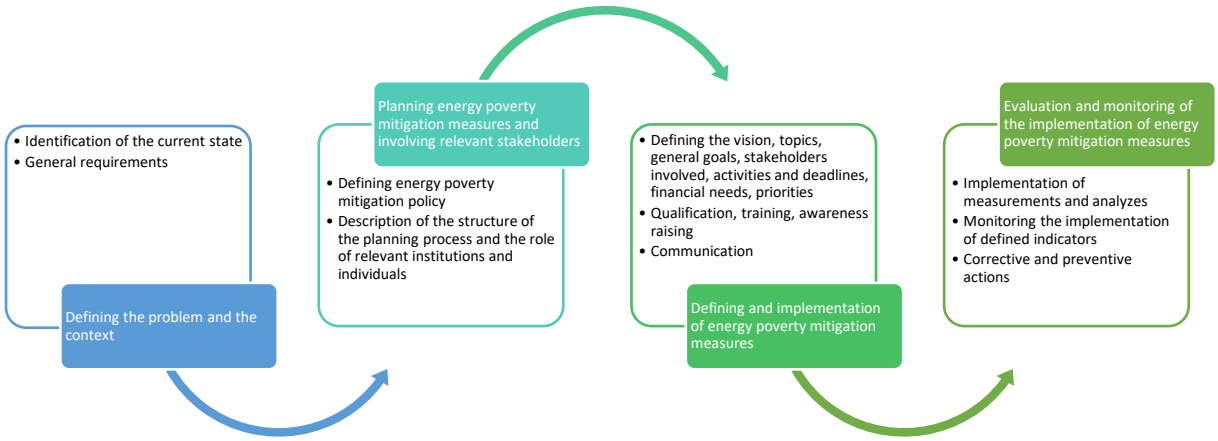

Figure 1.1. The phases in energy poverty mitigation planning process at local and regional government level

2. Characteristics of energy poverty mitigation multi-level planning in Hungary and Croatia

Energy poverty is a problem that has recently become increasingly important because a large number of citizens are unable to provide adequate living comfort. Practice has shown that so far only a few European Union countries have defined the term of energy poverty, although most of them are already familiar with this problem.

Croatian and Hungarian governments acknowledge the existence of energy poverty in their country and in the past few years they developed and implemented several actions, i.e., measures on national, regional and local level in order to tackle the problem and help vulnerable citizens, especially those who are facing energy poverty.

Due to the lack of an official definition of energy poverty at the national level in both countries, there is a problem of how and in what way to define energy poverty, while taking into account all possible criteria. This was the starting point for the development of CO-EMEP project idea, which main objective is to improve the cooperation of all relevant stakeholders and raise capacities of local and regional government units with the aim of energy poverty mitigation in the HU-HR cross-border area. Local and regional government units are legally obliged to adopt certain planning and strategic documents related to energy efficiency, but still a small number of them include measures to reduce energy poverty in these documents.

Within this document, local and regional government units will be encouraged to receive additional guidelines in order to define and implement measures to reduce energy poverty in their administrative area.

2.1. Hungary

Currently there is no officially accepted definition of energy poverty in Hungary. Also on a European level, only more general definitions exist due to the high level of diversity among member states and different methodologies of national data collection. According to the most commonly used interpretation – which was also adopted by the European Commission in 2016 – a household is considered energy poor if it is unable to heat its home to an adequate level or spends more than a certain percentage of its income on its energy bills, due to low income, high energy use or poor energy efficiency. As proposed by the European Energy Poverty Observatory, this “certain percentage” is twice the national median, i.e., more than 10% of the household income.

In a Hungarian context, according to data from the National Statistical Office, half of Hungarian households spend less than 17 percent of their income and more than half spend more on this. If households with energy costs more than twice the median are considered energy poor, 34 percent of household income has an energy poverty line. This is approximately 8-10 percent of households, which, extended to the national level, would mean ca. 300-380 thousand households. As such, energy poverty puts a huge challenge in Hungary on the shoulder of public institutions and local governments.

As a result, the Hungarian government is devoted to improve the general circumstances of energy poverty, however, specific governmental legislative measures or regulations have not yet been developed specifically on energy poverty. While relevant policies are not yet in place, the Hungarian government has already initiated some actions directly focusing on mitigating household energy poverty and raising energy efficiency in the residential sector. In this respect, the following sections provides some good examples for relevant public policies, regulations and strategic documents.

2.1.1. Public policies, regulations and strategic documents dealing with energy poverty mitigation planning

In the following text several public policies, regulations and strategic documents dealing with energy poverty mitigation planning in Hungary are evaluated.

Overhead reduction policy

Government measures, which began in January 2013 and affect universal service consumers, have been guaranteeing affordable energy supply and financial predictability for the affected consumers. Thanks to the reduction of energy overheads, district heating, natural gas and electricity have become significantly cheaper in 2013, so Hungarian consumers pay one of the lowest prices in Europe for household energy. Hungary is measuring the effectiveness of its policy to further reduce heating difficulties by monitoring the development of the proportion of households that spend at least 25% of their income on energy costs (this was 9.8% in 2016). From this perspective, it is necessary to give priority to helping vulnerable user groups. Therefore, Hungary is focusing primarily on two well-defined social groups: large families living in a village-located family house, and retirees left alone in a condominium (and sometimes a family house).

Home Warmth Program

The outdated heating system is a problem in many apartments in Hungary. Heaters consume the largest amount of energy in a household, which on the one hand costs a lot and on the other hand has an adverse effect on the environment. According to surveys, there are about 200,000 dwellings in Hungary where heating equipment cannot be individually controlled. This is one of the most wasteful solutions, as in many cases they give off heat unnecessarily and residents control ambient temperatures by opening the windows instead of adjusting their heaters. However, the renovation and modernization of heating systems has high financial needs, which is why still a relatively low proportion of consumers replace old, obsolete appliances with modern, more environmentally conscious versions.

Therefore, the Hungarian government has created a support scheme for residential stakeholders/households where they can apply for funding to cover the cost of small-scale energy efficiency investments. As such, Hungarian households have the opportunity to secure funding for heating system renovation, insulation, installation of

solar panels or changing the outdated electric devices (especially refrigerators). As a consequence, due to the high popularity of this initiative, many households had and will also have the opportunity to invest in their energy efficiency, thus decreasing the presence of energy poverty in Hungary.

Strategic policy documents

The Hungarian government fosters the mitigation of household energy poverty not only by initiating specific policy measures but also by elaborating horizontal and vertical national-level policy strategies. From this perspective, we can enumerate the following relevant strategic documents to promote increased energy efficiency and a greener society:

- **National Energy Strategy and the (draft) National Energy & Climate Plan**: the main objectives of the newly adopted Energy Strategy and the still draft version National Energy & Climate Plan are to strengthen energy sovereignty and energy security, to maintain the results of overhead reductions and to decarbonize energy production, which can only be achieved through the combined use of nuclear and renewable energy. For countries poor in traditional energy sources, such as Hungary, energy sovereignty is a matter of prosperity, economy and national security. It is in clear national interest to reduce the domestic need for energy imports and, at the same time, to ensure wider connection to the regional electricity and gas networks, which is also a guarantee of security of supply and effective import competition. The document state that “the cleanest energy is unused fossil energy”.

  Energy sovereignty and climate protection can be achieved through the use of heating/cooling solutions based on renewable resources, the implementation of the Green District Heating Program, and the reduction of energy use in public institutions, industry and transport. Due to the high efficiency of electric motors, clear end-user energy savings are achieved with the spread of electromobility. As a result of the Green Bus Program for Greening Local Transport, environmentally friendly electric buses will run in major cities.

  The energy independence of families can be promoted by supporting renewable energy production in the backyard for one's own purposes and by promoting the spread of smart meters. In this regard, the governmental goal is for most of Hungarian electricity generation to come from two sources: nuclear energy and renewable energy, primarily solar power plants. These are not mutually exclusive technologies, but mutually supportive solutions, and both can be considered as clean energy sources.

- **Energy and Climate Awareness Action Plan**: in order to achieve the Hungarian energy policy goals, the National Energy Strategy recognizes the role of social behavior patterns in many areas and, as a result of this, emphasizes the importance of shaping citizens’ attitudes. As a matter of fact, the National Energy Strategy assigns to the Government the task of developing an action plan for raising consumers' energy and environmental awareness. Pursuant to the

decision, the Government should provide education on sustainable development and energy awareness and disseminate it through the media.

In Hungary, there is significant potential for energy savings in the modernization of energy-wasting buildings (due to the lack of good maintenance and modernization of building structures). In addition, significant potential exists in the modernization of inefficient heating systems, as well as in the replacement of energy-intensive electrical equipment. This potential is greater in case of Hungary than in the Western member states of the European Union, where, in spite of all this, public awareness raising programs are of much greater importance. Thanks to EU support programs, an increasing number of building energy modernizations are being implemented in Hungary as well. However, in order to make better use of energy efficiency potentials and increase the efficiency of resource use, it is essential to arouse general interest and provide consumers with appropriate information.

According to the latest statistics, residential energy consumption accounts for 27% of the EU's final energy consumption. However, this value can be set at 32% in Hungary, which clearly shows that the population has an important role to play in achieving energy efficiency and savings targets, especially in the following issues:

- estimating the potential for savings in household energy consumption is the subject of a number of studies and studies that consider significant savings of up to 20 percentage points to be achieved through a combination of asset and behavioral changes;
- the population as an important energy consumer should play an active role in implementing the energy strategy. In order to achieve the necessary motivation and independent action, it is necessary to provide credible and target group-specific knowledge to the population in a more intensive way than before, given that a significant part of society lacks energy and related environmental awareness. Climate change is the most significant environmental problem arising from energy consumption and should therefore, as the title of the Action Plan indicates, play a key role in achieving energy-related environmental awareness through the implementation of awareness-raising measures. This requires the transfer of detailed knowledge about it.

The Energy and Climate Awareness Action Plan encourages the implementation of awareness-raising activities in the following thematic areas:

- energy efficiency and energy saving;
- renewable energy use;
- transport energy savings and emission reductions;
- resource-efficient and low-carbon economic and social system;
- adaptation to changed climatic conditions.

The action plan makes the following suggestions on the types of attitudes:

- integration of climate protection into the legislative activities of county and local governments;
- partnership with county media;
- environmental sensibilization in education;
- social and public campaigns;
- county climate protection networking;
- helping and presenting local pilot projects, good examples.

- **The Recovery and Resilience Facility of Hungary determining EU Recovery Fund developments in the coming years**: by supporting developments that increase the flexibility of the electricity system and promote the integration of weather-dependent renewable electricity generation, the aim is to reform electricity generation. The measures will increase the share of carbon-free electricity generation, photovoltaic capacity and the share of renewables in electricity consumption. With these, the government wants to ensure that the country's final energy consumption in 2030 does not exceed the 2005 value. Its two areas of intervention are the intervention concerning the classic and intelligent network developments of the 9 transmission system operators and distributors, and the spread of smart metering, which can improve network flexibility.

  Reviewing the weather exposure of networks is essential due to climate change. A precondition for the reform is the preparation and development of the transmission and distribution network, on the one hand with developments ensuring the direct connection of PV parks, and on the other hand with the underlying network developments. On the supply side, the low number of smart meters and the lack of dynamic pricing are a problem. The main obstacle to the reform is the bottleneck in the required network capacities and the lack of resources for network companies to develop. The introduction of the Energy Efficiency Commitment System provides an answer to the problem of outdated energy efficiency residential buildings. With it, 1.29 PJ of new energy savings per year can be achieved between 2021-2030. Renovation of energy efficiency in residential buildings, especially in the residential sector to be supported, without intervention called energy poverty, no significant progress can be predicted, as investments are expensive and slow or do not pay off.

  The low level of construction capacity and energy awareness of residents can be a difficulty in implementation. Promoting residential renewable energy investments focuses on two areas of intervention: investment support for residential solar systems and electrification of residential heating systems in combination with a solar system. Its investment support could be claimed for a roof-mounted solar system to replace its own consumption. In accordance with Directive 2019/944, the current net settlement-based household-scale household power plant regulation would be replaced by gross settlement, concentrating on

settlements of less than 5,000 people in rural Hungary. In the context of Directive 2018/2001/EU (Renewable Energy Directive), the aim is to create a regulatory framework that supports prosumer. Solar systems could provide their own energy consumption, and electrification of the heating system would help the poorest households, where they are currently heated with fossil fuels and wood. Non-repayable investments could reduce the resulting environmental and health impacts and improve economic and socio-demographic indicators. Within its framework, a cooling-heating air conditioner associated with a smart meter, an electric boiler and a solar system designed for this purpose, as well as a heat pump and the necessary solar system can be supported.

2.1.2. Multi-level public authority capacities and budgets in energy poverty mitigation planning and development of public policies, regulations and strategic documents regarding energy poverty

Regarding the public authority capacities in Hungary connected to energy poverty mitigation planning, we cannot really identify a classic multi-level structure with separated budgets and competences. Due to the centralized structure of the Hungarian public administration, governmental-level and the municipal-level can be only separated in terms of planning and strategy-building. Consequently, the multi-level structure can be described according to the following framework:

- **Governmental level capacities**: in the Hungarian development policy structure, this is the central government in Budapest which is responsible for the articulation of the strategic goals, the most significant measures and the structures of sectoral strategies. As such, energy and environmental policy – as other policies as well – is based on governmental strategy-building documents (that were presented in the previous sub-chapter) determining the financial support schemes funded mainly by EU sources and a lesser extent by national sources. As a consequence, the Hungarian government provides a top-down direct funding for public institutions (such as municipalities) with a 100% intensity rate – especially through EU-funded operative programs – which is the easiest way of funding from a municipal perspective (compared to loans, ESCO funding, etc.);
- **Municipal-level capacities**: due to highly centralized national tax structure, municipalities and other public institutions don't have their own financial capacity for implementing or financing energy efficiency measures to mitigate energy poverty. While at the same time, based on the national-level sectoral strategies, they have to create climate mitigation and adaptation strategies and action plans focusing on the complex treatment of the municipal energy and environmental ecosystem. Therefore, municipalities can elaborate autonomous energy strategies for which they can secure funding by applying for government-initiated sectoral calls to reach the targets of the municipal strategies. Of course, by adhering to strict financial rules, municipalities can also obtain a bank loan or contract an ECSO agent, but in parallel with the 100% funding intensity rate of government-promoted developments, these alternatives are not competitive in

case of public institutions. However, bank loans and ESCO agents can provide a significant support for residential stakeholders.

2.2. Croatia

Croatia, like many other European countries is missing a systematic and adequate policy framework to tackle the problem of energy poverty. One of the biggest problems in Croatia is that, currently there is no distinction between energy and general poverty in national legislation. Local and national authorities are lacking validated facts to make informed investments that would make a long-term impact on lowering energy demand, but also improving living conditions and quality of life of energy poor.

Croatia, prior to energy poverty defined the concept and status of vulnerable customer in 2012 in the Energy Act and in 2015 started to implemented first measures in a form of vulnerable customer subsidy. Until the adoption of the European Directives of the Third Energy Package, Croatia was trying to mitigate the problem by energy tariffs lower than the market value and by the social allowance within the social policy system. Except the customers who were entitled to social allowance, there were no clear criteria for any kind of allowance for the energy consumption. Since the Third Energy Package didn't allow energy prices below market value, Croatia has started to implement new measures in the field of social and energy policy.

In the field of social policy, energy vulnerable customers that are beneficiaries of guaranteed minimum allowance of social welfare centers are entitled to the subsidy – monthly voucher dedicated for electricity costs, which amounts 26,00 EUR. In the field of energy policy, there are several measures that can be divided into two categories: energy efficiency measures and regulatory measures. The most important group of measures to address the energy poverty issue is related to energy efficiency improvements in family houses and residential buildings because they lead to significant energy savings. First measure within energy efficiency improvements in family houses directly targeted vulnerable groups of citizens at risk of energy poverty is initiated in 2020 by Croatian Environmental Protection and Energy Efficiency Fund.

2.2.1. Public policies, regulations and strategic documents dealing with energy poverty mitigation planning

One of the most important initiatives to tackle the problem of energy poverty in Croatia was the **Programme of energy renovation of family houses 2014-2020** which was amended in 2020 by the Government of the Republic of Croatia on 14 May 2020 at the proposal of the Ministry of Construction and Physical Planning. The Amendments to the Program include the following:

- implementation plan for the allocation of national funds (EPEEF);
- elaboration of measures that are the subject of co-financing (determination of the rate and maximum amounts by measures and activities within individual measures);

- method of implementation of the Program for vulnerable groups of citizens at risk of energy poverty.

Following the Programme of energy renovation of family houses 2014-2020 the Environmental Protection and Energy Efficiency Fund has provided 32 million HRK in 2020 for the measure of energy renovation of family houses of a vulnerable group of citizens affected by energy poverty. For citizens at risk of energy poverty the energy renovation was fully financed (100%) by the national funds. According to the social criteria set out in the Amendments, social welfare centers coordinated authorized EPC certifiers to help the most vulnerable citizens during the application process. The planned energy renovation measures and the cost of EPC certifiers were fully financed by the national funds for all such citizens.

In December 2020, Croatian government adopted **Long-Term Strategy for Mobilising Investment in Renovation of the National Building Stock of the Republic of Croatia** where is stated that family houses are also a priority category of buidlings to be renovated in view of combating energy poverty because of great potential for energy savings, which is among the measures of the **4th National Energy Efficiency Action Plan 2017-2019**. The plan initiates design and launch of a systematic **Programme of Energy Poverty Reduction** through implementing energy efficiency measures, and establishes a list of available measures and co-funding rates for specific measures. The prerequisite for co-funding programme participation is the acquisition of the status of a vulnerable energy customer in accordance with the legal regulations in force at the time of the implementation of an individual measure. The specific objective of the measure is the establishment of a system that would allow vulnerable energy consumers to improve energy efficiency at the household level while improving living conditions at the same time. According to Long-Term Strategy for Mobilising Investment in Renovation of the National Building Stock, citizens are particularly vulnerable groups of end-consumers, so not only special financial models but also promotional campaigns are necessary to raise their awareness and level of information on the need for and benefits of investing in the energy renovation of their homes. The energy renovation in the sector of family houses and apartment buildings can be used to efficiently combat a growing danger of energy poverty among citizens.

According to **Integrated National Energy and Climate Plan for the Republic of Croatia for the period 2021-2030** where applicable, national objectives with regard to energy poverty, including a timeframe for when these objectives should be met. Before the start of the implementation of the Integrated National Energy and Climate Plan, **the Programme for reduction of energy poverty** should be prepared, within the framework of which a model of support to affected households will be developed. Within the Programme for the reduction of energy poverty, capacity building will be continued through local info centers, and energy poor citizens as well as citizens at risk of energy poverty will be provided with adequate information and advice on energy efficiency measures that contribute to the reduction of energy poverty and on opportunities of co-financing activities in this area. This will contribute to the reduction of energy poverty and vulnerability level and encourage the use of available resources, from European Structural and Investment (ESI) Funds and national sources. The

measures to eliminate energy poverty within the Programme for reduction of energy poverty should have the following goals:

- provide energy consulting for all energy-poor citizens of the Republic of Croatia,
- establish a system of measuring and monitoring energy poverty indicators at the national level and
- establish a system of increasing energy efficiency at the level of energy-poor households and households at risk of energy poverty.

The Draft Programme for Combating Energy Poverty, which includes the use of renewable energy sources in residential buildings in supported areas and areas of special state concern for the period 2021 – 2025 address the issue of energy poverty and set a basis for defining energy poverty, as well as for expanding criteria for the determination of citizens that are at risk of energy poverty and in need of assistance in energy renovation.

New potential in reducing energy poverty among Croatian cities and municipalities should be found in development of **Sustainable Energy and Climate Action Plans** for local government units, signatories of Covenant of Mayors. In the 2030 framework of the Covenant of Mayors in Europe, alongside with taking action on mitigating climate change and adapting to its unavoidable effects, signatories also commit to providing access to secure, sustainable and affordable energy for all. In the European context this means taking action to alleviate energy poverty. By alleviating energy poverty, Covenant signatories can enhance the quality of life of their citizens and create a more just and inclusive society. The European Covenant of Mayors and the European Energy Poverty Observatory are teaming up to address energy poverty. These two initiatives, funded by the European Commission, will support local and regional authorities across Europe in alleviating energy poverty by sharing knowledge and resources to build local capacities. Policies and measures to tackling energy poverty need to be adapted to the specific situation in terms of climate, housing quality, economy and the structure of energy costs, as well as mobility patterns. Some examples on how energy poverty can be tacked are the following:

- financing improvements in the energy efficiency of households;
- minimum energy efficiency standards in buildings;
- free of charge energy audits and advice for low-income households;
- reducing energy bills via social tariffs or energy bill subsidies;
- disconnection protection during the winter months;
- information and awareness raising on energy & climate issues;
- improvement of the accessibility to public transport connections;
- insulation of vulnerable facilities to protect against cold and heat (possibly accompanied by green solutions at neighborhood scale).

2.2.2. Multi-level public authority capacities and budgets in energy poverty mitigation planning and development of public policies, regulations and strategic documents regarding energy poverty

When talking about multi-level public authorities in Croatia three levels of government could be identified: national, regional (counties) and local (cities and municipalities). These levels can be separated in the terms of planning and strategy-building as in case of Hungarian multi-level capacities. While identifying capacities of multi-level public authorities in Croatia connected to energy poverty mitigation planning, we can identify a multi-level structure with separated budgets and competences whereas the policies of regional and local government levels depend on those defined at the national level. Consequently, the multi-level structure in Croatia in the terms of energy poverty mitigation planning can be described according to the following framework:

- **National level capacities**: at national level in Croatia the central government is placed in Zagreb and it is responsible for defining the strategic goals, the most significant measures and the structures of sectoral strategies. As such, energy and environmental policy is based on national strategic and planning documents which are also determining the financial support schemes funded by national and EU sources. As a consequence, the Croatian government also provides a partial funding for public institutions (such as counties, cities, municipalities) – especially through EU-funded operative programs – which is the easiest way of funding.
- **Regional level capacities**: in many cases regional government units don't have financial and human capacity for implementing or financing energy efficiency measures to mitigate energy poverty. Regardless, they have to create climate mitigation and adaptation strategies and action plans focusing on energy and environment based on the national-level strategies, programmes and relevant regulations. Therefore, municipalities can develop energy strategies, action plans and programmes in cooperation with relevant stakeholders for which they can secure funding by applying for government-initiated sectoral calls. In contrast to Hungary, in Croatia local and regional government units have only certain co-financing rates available, which is why they need to look for additional sources of funding, which is a particular challenge for them (ESI funds, ESCO, PPP, innovative financial schemes, bank loans, etc.).
- **Local level capacities**: when we go down to the lowest government level, it can be noticed that cities and municipalities have very small budgets and capacities and find it harder to decide to implement large-scale projects related to energy, climate and energy poverty. In many cases they are interested only with support of relevant institutions who are experts in the field and with acceptable funding rates that in Croatia are up to some 80% depending on the activity.

3. Defining the problem and the context

As is the case in any planning process, the first and fundamental step to initiating it, is the activity of defining the problem and the context. During the implementation of this activity as part of energy poverty mitigation planning process at the local and regional level, it is necessary to answer the following questions:

1. Why should local and regional government units plan to mitigate energy poverty in their administrative area?
2. How and where to start with the implementation of energy poverty mitigation planning process?
3. What resources are needed for this?
4. What legislative framework needs to be taken into account?

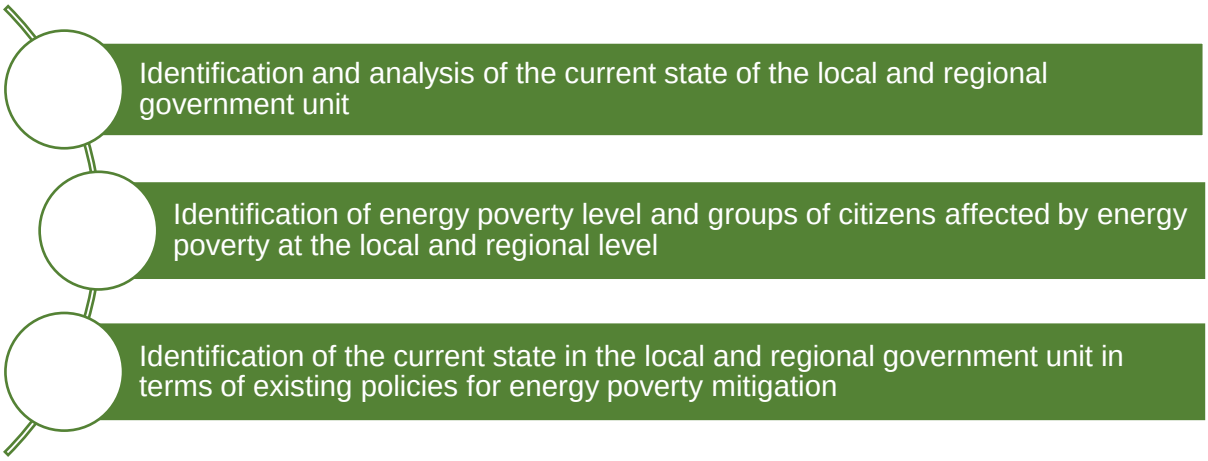

Figure 2.1. Defining the problem and the context

Local and regional government units know best their territory as well as the problems with whom their citizens are facing, and accordingly they should be leaders in the fight against energy poverty. The fight against energy poverty itself brings multiple benefits, including reduced government spending on health, air pollution and CO_2 emissions, and increased comfort and well-being, household budgets and economic activity in general. In addition to the above, it is necessary to raise awareness of local and regional government units of the existence of energy poverty and motivate them to include energy poverty mitigation measures in their future strategic framework and budget.

> Energy poverty is a situation in which a household or individual is unable to afford basic energy services (heating, cooling, lighting, mobility and energy) that guarantee a decent lifestyle, due to low incomes, high energy costs and low energy efficiency of such homes.
>
> *European Commission, Energy Citizens Forum 2016*

3.1. Identification and analysis of the current state of the local and regional government unit

Before embarking on activities aimed at energy poverty mitigation at the local and regional level, local and regional government units should analyze and identify the current state of human, technical and financial resources available for the implementation of additional measures aimed at energy poverty mitigation. The lack of favorable and stable sources of funding, leads to the implementation of exclusively commercial projects at the local and regional level. This lack of public funding as well as reallocation of available public funding to energy poverty is a result of insufficient awareness of the problem. This is a key obstacle in the wider implementation of energy projects aimed at energy poverty mitigation.

In the HU-HR cross border area, a household is considered to be energy poor if all of the following criteria are met:

- ✓ the annual costs for providing the basic needs of the living comfort (room temperature as around 20 – 22 °C) in a residential space exceed 10% of the total annual household income;
- ✓ the total monthly income of the household does not exceed the two median monthly salaries at the regional level + 200,00 € per each subsequent member of the household;
- ✓ the residential space, i.e., the building in which the household members live was built in the period up to 1987, and in the period after its construction no measures were taken to improve its physical properties in terms of energy efficiency.

Project CO-EMEP, 2021

Energy poverty is an extremely complex problem that needs to be viewed from several different aspects (social, technical, economic, energy, budgetary) and it is important to involve a wide range of experts, key stakeholders and the interested public in solving it. Common indicators which show how household is affected by energy poverty include: low incomes and difficulties in covering overhead costs, inability to keep the household warm enough during the winter, inability to keep the household cool enough during the summer, old buildings that have not been energy refurbished, condensation, moisture and mold, usage of old and inefficient appliances, etc.

Since local and regional government units are limited in terms of human capacity with relevant knowledge and limited in terms of availability of financial resources, in order to establish a quality energy poverty mitigation process, it is necessary to determine the actual situation and future needs with regard to defined objectives. In addition to the available budgets available to them, local and regional government units should ensure an additional inflow of financial resources to launch projects/activities/ measures aimed at energy poverty mitigation in their administrative area.

3.2. Identification of energy poverty level and groups of citizens affected by energy poverty at the local and regional level

After identifying the potential of local and regional government units in the fight against energy poverty, it is necessary to determine the level of energy poverty and groups of citizens at the local and regional government units level affected by energy poverty, which is the starting point for further energy poverty policy development at the local and regional level. Local and regional government units are able to determine exactly which people are affected by energy poverty and what are its causes, and accordingly can directly advise and guide citizens. In order to determine or roughly assess the level of energy poverty and take concrete steps to address this problem at the local and regional level, it is necessary to collect and research a large amount of information as well as energy poverty indicators and analyze them in detail. Accordingly, it is very important to define appropriate data collection methods as well as information sources where it is possible to find the most relevant and accurate data. Which methods and techniques of data collection and analysis to apply depends exclusively on individual local and regional government units, i.e., their existing capacities, either in financial terms or in terms of available staff. When talking about energy poverty, it is very important to be aware of the fact that most of the data needed to define the number of energy-poor households are not publicly available, so it is necessary to seek support from other institutions such as government bodies, statistical offices, energy and development agencies and other relevant institutions that collect and possess certain data such as data on energy consumption, household income, area and energy condition of buildings and other data relevant to the identification of energy-poor households.

57 million people cannot keep their homes warm during the winter;
104 million people cannot keep their homes comfortably chilled during the summer;
52 million people are late in paying their energy bills.

Energy Poverty Observatory, https://www.energypoverty.eu/

In order to determine exactly what data needs to be collected, local and regional governments need to identify the key financial and social challenges that such households may face, which have the consequent impact of being or at risk of becoming energy poor. According to the EU Energy Poverty Observatory (EPOV), the main indicators of energy poverty are low energy expenditure in absolute terms, outstanding utility bills, a high share of energy expenditure in relation to income and the inability to maintain adequate living temperatures. By monitoring the status of these indicators, it is possible to identify the number of energy-poor households.

In addition to high bills and growing energy needs, inefficient housing, low-efficiency heating systems, poor insulation, moisture-proof roofs, etc. are also a big problem for energy poor households. What is often overlooked in energy poverty issue is the fact that it affects the human health.

This addresses only some of the challenges with whom energy-poor households face, but their identification is the basis for defining the data that needs to be collected in order to identify the number of energy-poor households.

3.3. Identification of the current state in the local and regional government unit in terms of existing policies for energy poverty mitigation

An important segment of defining the problem and context is the identification of the current policy of the local and regional government unit, especially if some of the existing measures to reduce energy poverty are already being implemented at the local and/or regional level. Despite the fact that in most cases local and regional government units do not have a specific policy aimed only at energy poverty mitigation, the existence of some measures to reduce it at the local and regional level is only an indication that local and regional government units are aware of this problem. Promotion of energy efficiency, financial assistance, consumer protection in vulnerable situations and information and counseling are just some of the measures used so far to reduce energy poverty all across the European Union. When defining energy poverty mitigation policy, it is important to identify mechanisms for its implementation which would not only aim to alleviate the inability to pay energy bills, but also should mitigate all the consequences of energy poverty, which implies impaired health and comfort of housing. Such mechanism is the implementation of energy efficiency measures in vulnerable households, which would lead to energy poverty mitigation, as well as poverty in general, will have a positive impact on health and the environment (reduced greenhouse gas emissions and increased opportunities to use renewable sources).

Success in the implementation of policies in general, as well as policies aiming at energy poverty mitigation at the local and regional level, is assured by the identification of challenges and obstacles that need to be overcome in order for implementation to result in positive effects for citizens and local and regional government units. The first and the most important challenge is the **motivation and awareness of local and regional government unit leader** (mayors, prefects, etc.) for starting the energy poverty mitigation policy implementation. He is a person who should make his employees aware of energy poverty problem and encourage them to increase their knowledge in this area in order to become a central point for informing and advising citizens. Another challenge is the **lack of professional staff**. When talking about local and regional government units, they usually have staff who do not have knowledge relevant to this topic, which makes it difficult to collect all relevant data to identify the level of energy poverty and the number of energy-poor households. Likewise, they are very unlikely to be competent enough to participate in the creation of local and regional policies aimed at energy poverty mitigation and to provide quality advice to citizens on energy efficiency and the use of renewable energy sources. Accordingly, they should be ready to further improve their knowledge and competencies and achieve close cooperation with relevant experts in the observed field (energy agencies, institutes, social welfare centers, etc.).

The next key challenge is the **possibility of financing projects and activities aimed at energy poverty mitigation and its eradication**. Co-financing projects of this nature can be a challenge for most local and regional government units, as they find it difficult to obtain the funds available through European Union funds. This challenge can be overcome by stronger capacity building efforts and networking and support activities from relevant experts.

4. Planning energy poverty mitigation measures and involving relevant stakeholders

After determining the characteristics of the local and regional government unit in terms of existing capacities, especially human and financial, identification of energy poverty level at the local and regional level and the potential of the local and regional government unit to implement policies and quality measures to reduce energy poverty it is possible to implement the future step which is referring to planning energy poverty mitigation measures and involving relevant stakeholders in the whole energy poverty mitigation planning process.

Figure 3.1. Planning energy poverty mitigation measures and involving relevant stakeholders

In order to establish a quality energy poverty mitigation planning process, certain preconditions must be met, such as the political will of local and regional government units, the existence of projects and activities related to energy poverty mitigation, good internal organization of local and regional government units, the availability of adequate human and technical resources, appropriate access to the past and current data related to households in general, and those facing energy poverty in particular.

4.1. Establishment of a multidisciplinary team of experts and/or defining an expert who will work with relevant stakeholders

In order to implement a quality energy poverty mitigation planning process, i.e., to establish a relevant energy poverty mitigation policy at the local and regional level, it is necessary to ensure the cooperation of relevant stakeholders with extensive knowledge and experience in energy poverty mitigation activities. Accordingly, it is necessary to establish a multidisciplinary team of experts with relevant knowledge and experience in the field of energy poverty or, in the case of smaller local and regional government units define a person (expert) employed within them who is sufficiently professional and competent to work with relevant stakeholders in the field. In addition,

it is important to establish and maintain constant communication with relevant experts such as energy and/or development agencies, environmental associations, etc.

For the needs of efficient work of such team or person in charge of issues related to energy poverty in the local and regional government units, it is necessary to:

- **ensure capacity building, training and awareness raising** – it is necessary to determine the level of competence of persons responsible for energy poverty mitigation planning process; develop and implement a training plan, occasionally attend relevant seminars and educational workshops related to the problem of energy poverty, use online courses for employees or participate in specialized courses organized by external experts and thus become a central contact point for informing and advising citizens;
- **ensure continuous communication** – establish an appropriate system of internal communication and communication with key stakeholders whereas staff in charge of energy poverty issues should receive timely information and be able to give specific comments, suggestions or recommendations to improve the overall energy poverty mitigation process, but also involve all relevant stakeholders in the implementation of the energy poverty mitigation planning process.

4.2. Defining the methodology for involving stakeholders and experts in overall planning process

In addition to establishment of a team of experts and/or defining person in charge of cooperating with relevant experts in energy poverty mitigation policy implementation process, it is necessary to define an appropriate methodology for involvement of relevant stakeholders like social partners, housing associations, energy and development agencies, energy companies, social welfare centers, civil society, the general public in the overall energy poverty mitigation process. It should be emphasized that energy poverty as a phenomenon that permeates several sectors, so multilevel governance and cross-sectoral cooperation are necessary. The participation of the interested public is crucial in the creation of appropriate policies and guarantees for the success of their implementation.

4.3. Inclusion of citizens in defining measures through the establishment of consulting services and participation mechanisms

Since citizens are in the center of the fight against energy poverty, especially those who suffer the consequences of energy poverty in everyday life, it is essential to involve them in the whole planning and policy-making process at the local and regional level. To ensure their involvement, the establishment of consulting services as well as other participation and networking mechanisms (such as focus groups, round tables, educational and networking workshops, etc.) at local and regional level are needed. They on the one hand aim to gather information on the problems and challenges that

energy-poor households face, but also help to identify their needs in order to create and improve existing energy poverty mitigation policies, i.e., effective measures to help them improve their current living conditions.

Accordingly, it is necessary to place citizens, i.e., persons, at the center of creating energy poverty mitigation policies, and one of the ways to achieve this is by defining measures to increase energy efficiency, which would reduce energy bills and improve the quality of life of affected households.

4.4. Defining energy poverty mitigation policy

Awareness of the existence of energy poverty is growing, which can be seen in a large number of institutions at European and national level that have identified this problem as a political priority. In case of local and regional government units, the problem of energy poverty has not been identified as a priority, so it is necessary to encourage energy poverty mitigation process to achieve the political level of local and regional government units, given that energy poverty affects the lives of many people and as a political question requires a political response.

Accordingly, the crucial step in defining a quality energy poverty mitigation planning process is to establish an appropriate policy (including a vision and mission for energy poverty mitigation) at the local and regional level and make its determinants part of the strategic goals of the municipality, city or county. This policy should be formed as **planning implementation document adopted by the executive or representative body of the local and regional government unit**, and the development of such document would be the last step in the process of planning energy poverty mitigation measures and involving relevant stakeholders. That document should describe all the steps necessary to implement energy poverty mitigation policy at local or regional level. In addition, it is necessary to define energy poverty mitigation measures and include them in existing strategic and planning documents. Policies and measures aimed at energy poverty mitigation need to be adapted to the specific situation in terms of climate, housing quality, the economy and the general structure of energy costs.

In addition to bringing the problem of energy poverty to the political level, local and regional government units need to ensure close cooperation with civil society and civil organizations and the private sector and involve citizens to further raise awareness of the importance of energy poverty mitigation and the benefits of such actions.

The EU Energy Poverty Observatory (EPOV) has identified several key points to consider when designing energy poverty mitigation public policies in terms of measurement, definition, type of policy and funding.

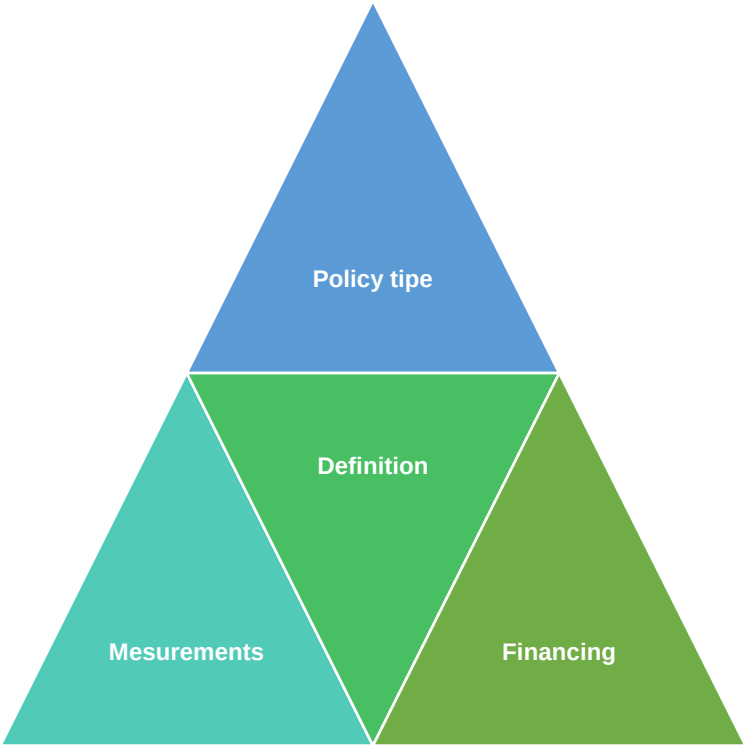

Figure 3.2. Elements of energy poverty mitigation policy[1]

Measuring the level of energy poverty is important for assessing the current situation with regard to the development of policies for energy poverty mitigation, especially because it is difficult to quantify and measure it. Energy poverty is a multidimensional problem for which it is possible to use different types (or groups) of indicators in accordance with the Commission Recommendation of 14th of October 2020 on energy poverty[2]:

- **indicators comparing spending on energy with income** – they quantify energy poverty by comparing the amount households spend on energy with an income measure (e.g., percentage or number of households spending more than a certain proportion of their disposable income on domestic energy services);
- **indicators based on self-assessment** – households are asked directly to what extent they feel able to afford energy (e.g., the ability to keep the home warm enough in winter and cool enough in summer);
- **indicators based on direct measurement** – these indicators measure the physical variables in order to determine the adequacy of energy services (e.g., room temperature);
- **indirect indicators** – they measure energy poverty using associated factors, such as arrears on utility bills, the number of disconnections and the housing quality.

[1] Available at: https://www.energypoverty.eu/guidance-policymakers
[2] European Commission Recommendation on Energy Poverty from 14th of October 2020, available at: https://ec.europa.eu/energy/sites/ener/files/recommendation_on_energy_poverty_c2020_9600.pdf

The definition of energy-poor citizens is crucial in directing policy to those households that need help. The very definition of energy poverty as well as the type of policy for its reduction should be adapted to the specific situation. In making the definition, it is necessary to focus on vulnerable groups of citizens and this is possible given the several parameters associated with the causes of energy poverty:

- **socio-economic parameters** – some groups of citizens are particularly vulnerable in terms of energy poverty, for example chronically ill and retired people have higher energy needs because they are more often at home and often have lower incomes;
- **housing situation** – certain property rights carry certain risks in terms of energy poverty, for example households living in privately rented buildings where the landlord does not want to invest in increasing the energy efficiency of the building;
- **heating system** – the heating system used in the household greatly affects energy poverty because the use of small and inefficient boilers increases energy consumption in the household;
- **location** – in some local and regional areas there is a much larger number of energy-poor households, so it is possible to focus energy poverty mitigation policies specifically on these locations.

Defining and implementing energy poverty mitigation policies at local and regional level brings other benefits to local and regional authorities as it contributes to the success of other supporting policies aiming at energy efficiency, reducing greenhouse gas emissions and improving citizens' health, social inclusion and social protection, general quality of life and sustainability. An effective fight against energy poverty can help local and regional authorities to further broaden the social foundations of measures to combat climate change, since such policies include social groups that have so far been less active and not in the spotlight.

5. Defining and implementation of energy poverty mitigation measures

After the identified potential for the implementation of energy poverty mitigation policy at the local and regional level (in terms of available capacities and financial resources) and the definition of energy poverty mitigation policy, it is very important to identify quality measures to reduce energy poverty and ensure their implementation.

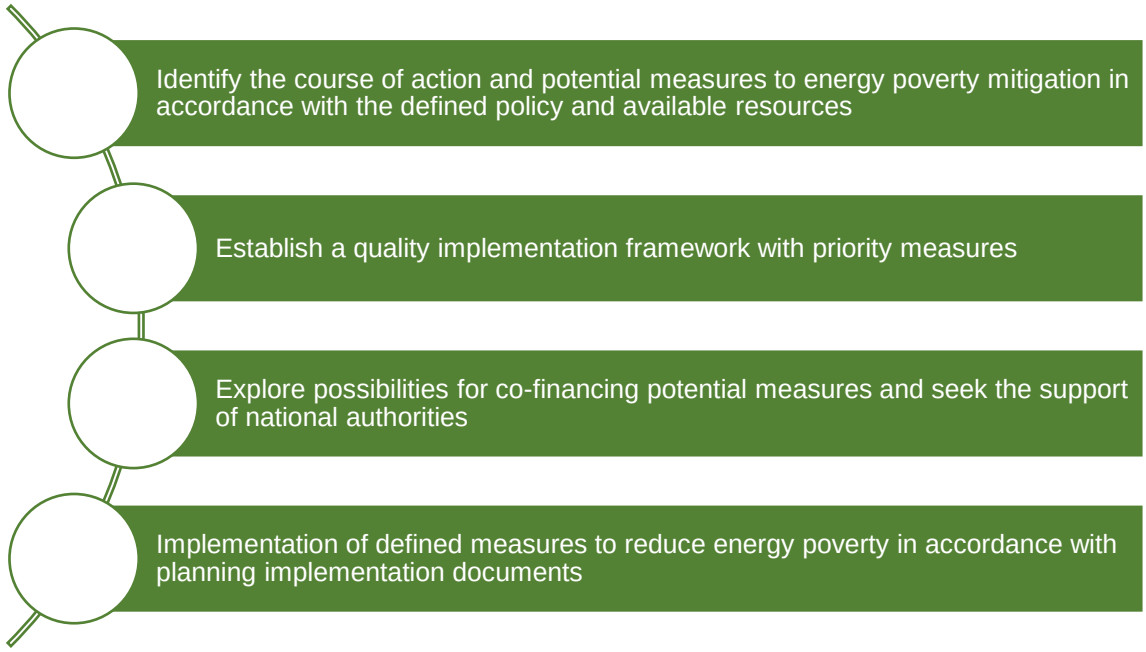

Figure 4.1. Defining and implementation of energy poverty mitigation measures

5.1. Identify the course of action and potential measures to energy poverty mitigation in accordance with the defined policy and available resources

Since the available capacities and budgets of local and regional government units are limited, and energy poverty mitigation measures require certain financial resources, it is necessary to explore and use additional sources of funding and involve other relevant institutions in implementing measures determined by the plan or implementation framework. The available energy poverty reduction measures are as follows:

- **financing specific measures to increase the energy efficiency of residential buildings** – replacement of external carpentry, installation of renewable energy source systems (solar heat converters/collectors, wood chip/pellet systems, heat pumps and photovoltaic converters/panels), thermal protection of external walls, ceilings, roofs and floors and the implementation of other smaller investments (such as replacement of old incandescent bulbs and halogen bulbs with more energy efficient LED lighting, using more efficient appliances, installation of smart meters that allow citizens to monitor their energy consumption in real time, etc.). This type of measures are considered to

be the most desirable option for structurally solving the problem of energy poverty by directly enabling the improvement of energy performance of housing;

- **direct financial assistance in the form of reducing the amount of energy bills** – this is a short-term effective and unsustainable measure where only energy costs are co-financed in the form of reducing the burden of energy bills and do not provide a long-term solution to the problem, i.e., they do not contribute to combating the causes and reduce adverse health and environmental impacts arising from energy poverty. It should be considered only after all the possibilities for increasing energy efficiency measures are exhausted;
- **protection against disconnection from the grid** – provides households with protection against power outages, often in the colder months of winter. As part of the measure, disconnection from the network during the winter is completely prevented for certain households, such as households with persons with disabilities or pensioners;
- **information and counseling measures** – measures that indirectly help households to improve their situation by providing advice, information or educational activities. One example of these measures is the implementation of comprehensive energy audits and issuance of energy certificates which is defined as procedure that analyzes the existing consumption and energy performance of the building and determines the cost-effectiveness of energy savings and thus is the first step towards energy refurbishment. A detailed energy audit includes a detailed energy analysis of all construction and technical systems in the building. This measure provides direct advice on how to improve the energy efficiency of the home and the measures are very successful, as they are often implemented in accordance with the recommendations of other professional institutions. It is also recommended to implement simple energy audits, which do not necessarily end with the issuance of energy certificates, but with recommendations for the implementation of simple measures (installation of seals, replacement of carpentry, replacement of light bulbs, etc.);
- **social benefits** – these type of measures include general support to households within social welfare system to cover certain costs such as housing or living costs, which may also include energy costs.

In addition, it is recommended to develop relevant studies that would determine habits in energy consumption and give recommendations on its reduction in order to improve the quality of life and conduct field research in order to collect relevant data on energy consumption, energy performance of buildings and the amount of the share of energy costs in total household expenditure depending on the total household income level. Based on these studies, it is possible to design and implement measures within the social protection system in order to improve energy efficiency.

Regardless of the type of energy poverty mitigation measure, it is recommended to local and regional government units that the first step in energy poverty mitigation is ensuring energy efficiency because it contributes to reduction of energy consumption,

energy expenditure and greenhouse gas emissions and encourages local and regional economy. It is also necessary to consider measures that directly impair health (e.g., replacement of faulty stoves and chimneys that impair air quality in residential spaces) or measures that can ensure the use of a cheaper energy source. The implementation of energy efficiency measures has positive effects on health (removing moisture, leaks, mold), and generally increases the comfort of living. In order to ensure that vulnerable households rationally use and monitor their energy consumption and thus ensure savings after the implementation of energy efficiency measures, it is necessary to educate those who are in regular contact with users to ensure knowledge transfer.

In addition to the implementation of energy efficiency measures, information and education is a necessary instrument for combating energy poverty. Raising awareness of the rational energy use is the key to the successful implementation of energy efficiency policies, and thus the fight against energy poverty. Energy consulting through the establishment of networks of energy advisors, which in this case can be employees of the county/city/municipality and relevant associations that provide various forms of assistance in the field, has proved to be an example of good practice for raising awareness of the benefits of rational energy use and implementation of energy efficiency measures.

5.2. Establish a quality implementation framework with priority measures

In order to monitor and successfully implement defined measures aiming at energy poverty mitigation, it is necessary to establish a quality management system for the planning process, which should be strategically designed. This requires the development of an appropriate action plan or implementation framework with priority measures.

Within the stated action plan or implementation framework with priority measures, it is necessary to define the course of action with the corresponding goals, activities and defined deadlines, financial needs and action priorities. Elements from these documents should be made as part of existing development strategies, development plans, implementation programs or other relevant planning documents at the local and/or regional level.

5.3. Explore possibilities for co-financing potential measures and seek the support of national authorities

As mentioned several times in the document, due to small budgets of local and regional government units, it is difficult for them to be financially independently involved in the implementation of energy poverty mitigation measures in households in their administrative area, which is why they need to explore co-financing opportunities for energy-poor households and seek support from national authorities, development and energy agencies and other relevant institutions dealing with energy poverty on a daily basis. When selecting and implementing measures, it is important to keep in mind that

there are a large number of challenges and obstacles that need to be overcome in order for the defined measures to be implemented. The obstacles and challenges themselves vary according to the characteristics of each local and regional government unit, but it is very important to identify them in time.

In addition to insufficient human capacities, the main challenge is to finance energy poverty mitigation measures which can be extremely challenging, especially for smaller local and regional government units such as municipalities since they are not realistically able to finance projects and reduce energy poverty measures. Regardless, they can provide support to their citizens by seeking additional sources of funding for measures to increase the energy efficiency of their homes.

Financing the implementation energy poverty mitigation measures can be achieved by applying different methods:

- financing energy efficiency improvement measures such as insulation of the building envelope or installation of high-efficiency boilers/furnaces for heating can be done through grants and loans. In general, grants are the preferred funding option because they are more affordable for energy-poor households. Loans are the least desirable because most of energy-poor households cannot and/or do not want to make additional financial commitments;
- financing of measures can also be done by applying public financing (from European, national, regional or local sources), private financing, public-private partnerships or various levies (electricity tax, natural gas tax or heating oil). When choosing a method of financing measures to reduce energy poverty, special attention must be paid to the effects of financing.

In addition, local and regional government units can implement some of the measures to reduce energy poverty through the application of local, regional, cross-border and international projects and seek additional sources of funding outside Croatia and Hungary, especially those from available European funds. In this way they can include energy-poor households in implementation of such projects and and thus define appropriate financial strategies for them. Having an overview of financial strategies for the implementation of measures is the first step to get things started, and when implementing measures, it is important to take into account not only technical performance, but also social acceptance, awareness raising and many other social aspects. Here, too, the cooperation of different departments of local and regional authorities is crucial.

5.4. Implementation of defined measures to reduce energy poverty in accordance with planning implementation documents

After defining measures to reduce energy poverty and creating preconditions for their implementation at the local and regional level, the local and regional government authorities can start implementing these measures in accordance with the priorities set in their strategic and planning documents. In addition to the implementation of measures, it is necessary to define appropriate indicators and systematically monitor

the success of their implementation, because without it, it is not possible to accurately assess the achievement of energy savings resulting from energy poverty mitigation measures or activities encouraged by these measures.

In addition to measures aiming at reducing energy poverty, it is necessary to implement other measures related to energy efficiency, the use of renewable energy sources and transport, and monitor the direct and/or indirect impact of these measures on energy-poor households.

6. Evaluation and monitoring of implementation of energy poverty mitigation measures

The last step in the successful implementation of the energy poverty mitigation planning process includes establishment of the quality monitoring and evaluation processes.

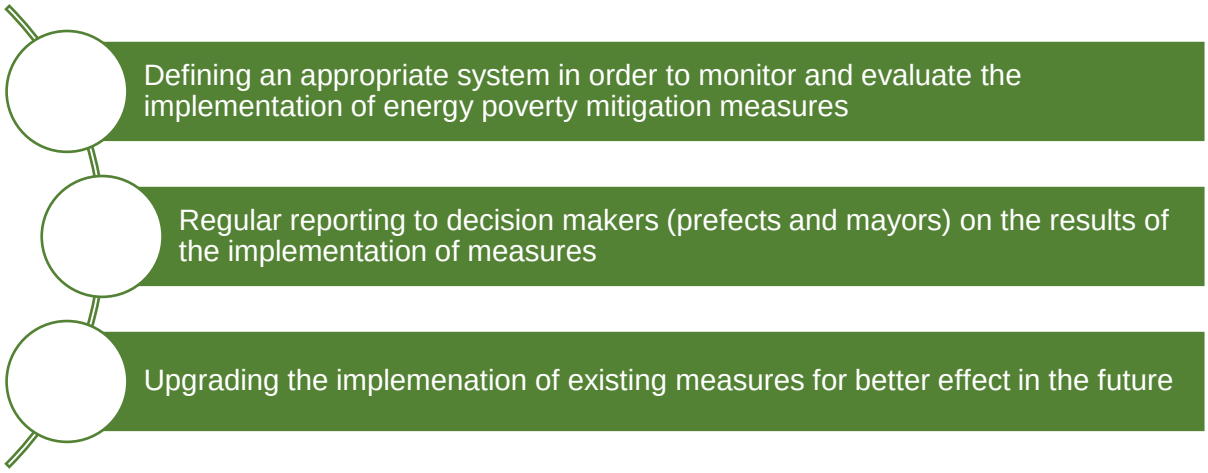

Figure 5.1. Evaluation and monitoring of implementation of energy poverty mitigation measures

6.1. Defining an appropriate system in order to monitor and evaluate the implementation of energy poverty mitigation measures

For successful implementation of energy poverty mitigation measures, it is necessary to establish an appropriate system for monitoring and evaluation of the implementation of energy poverty mitigation measures at the local and regional level. Although we are talking about two separate processes here, monitoring and evaluation together provide the necessary data to guide the planning process as well as the design, implementation of projects and measures and the allocation and redistribution of available resources for their implementation in better ways.

Accordingly, it is necessary to monitor the implementation of energy poverty mitigation measures by defining appropriate indicators/parameters in accordance with the main objectives and activities whenever possible. Setting relevant indicators is a prerequisite for accurate monitoring of the effects of individual measures and identifying the necessary changes so that the implementation itself has better effects in the future. Well-defined indicators are crucial for monitoring the implementation of the energy poverty mitigation planning process and enable an objective assessment of the implementation of measures. Depending on the implementation measure, some of the indicators that could be used are, for example, the number of energy refurbished residential buildings and family houses inhabited by energy-poor households, realized savings in energy consumption and energy costs made after the implementation of energy efficiency measures and/or more rational use of energy in the household, the number of grants awarded for energy refurbishment, etc.

Which indicators will be chosen by local and regional government units depends solely on them, and since most countries do not yet have officially defined monitoring indicators, they are more likely to choose the indicators which can be easily monitored.

6.2. Regular reporting to decision makers (prefects and mayors) on the results of the implementation of measures

Furthermore, all the results obtained on a regular basis should be presented to decision makers (prefects and mayors) in order for them to be aware of the situation and to be able to make quality decisions in the future that will result in long-term positive effects. Also, the success in the implementation of measures should be presented to the general public, especially to create a positive image of local and regional government units work and of their general care for the most vulnerable groups of citizens.

In addition to informing the heads of local and regional government units, an important element of the energy poverty mitigation policy is the exchange of experiences, both good and bad, which is considered a strong mechanism to support local and regional authorities in combating energy poverty.

6.3. Upgrading the implementation of existing measures for better effect in the future

The source of improving the implementation of existing measures to reduce energy poverty are the data on the achievement of indicators that are the starting point for defining corrective and preventive actions to implement them in the future, or to improve the implementation of individual measures. By applying corrective and preventive actions, it is possible to eliminate the causes of non-realization of certain measures to reduce energy poverty or potentially eliminate possible causes of non-realization.

As assumed in other areas, the necessary measures to reduce energy poverty will change and evolve over time. The most important thing to point out is that in the future the key guidelines and ultimate goals of all policies and concrete measures should include improving the quality of housing, finding a balance between using support and financing energy efficiency through energy refurbishment, political will and active involvement of policy makers in problem solving. Effective energy poverty mitigation policies and measures include approaches to combating and reducing the phenomenon of energy poverty through a combination of long-term and short-term measures at cross-sectoral level. Priorities of policies aimed at combating energy poverty should include aspects of ensuring access to quality and relevant data, especially data on household income and energy costs at individual household levels, data on housing conditions and actual energy consumption.

7. Examples of local and regional government units that successfully fight against energy poverty

As it was mentioned earlier in the document, most initiatives tackling energy poverty in Hungary are coordinated on a national level, and relatively few examples exist on the local and regional level. However, some good examples do exist, which are included below.

1. "Dunyha program" of the City of Szentendre

This is an initiative of the City of Szentendre (ca. 25,000 people) just North of Budapest. In February 2015 the municipality has launched this programme with the aim of accelerating the energy refurbishment of multiapartment residential homes in the city. The programme was named "dunyha", which means a very warm and cosy bed cover. This initiative is an excellent example that has efficiently bridged the gap between the municipality and the home owners' very limited financial capabilities with the high upfront investment need of energy refurbishment. As funds were insufficient to cover large-scale construction work, the decision was to position the municipality as a catalyst in the process – and this approach has proven successful beyond all expectations.

As part of this programme the municipality has launched a public call in February 2015. It had two components: 1) financial support for preparing project proposals for national funding, 2) financial support for the actual implementation of the planned measures. The available funds were HUF 10 million (ca. EUR 30,000) for both components. This is a very modest amount in light of the actual funds needed for refurbishment – and yet no less than 25 condominiums were renewed in the end!

Although some measures were in fact implemented from the second component, the biggest impact was registered under component one. It essentially included financial (and partially professional) support to help project preparation to apply for co-funding under the national "Warmth of Home" programme. It included: preparation of a certified energy audit for the building's present state, preparation of a feasibility study for building energy refurbishment, preparation of refurbishment technical specifications, preparation of a preliminary budget, obtaining the energy provider's statement regarding the possible use of renewable energies, and preparation of the project proposal package to be submitted for national government funding. Financial support included non-refundable support in the range of 10-40 EUR/flat.

Component two included direct non-refundable financial support for the energy refurbishment works. The co-funding rate was 10%. The idea here was to catalyse the process and focus on implementing low-cost measures. In spite of the low co-funding rate in the end one 40 flat condominium was insulated from this co-funding.

The real success was in component one. At those time the national "Warmth of Home" programme provided 50% co-funding for the energy refurbishment of medium size multiapartment homes (ca. 40-60 homes / building). This is a huge help, but on

the other hand the call was very competitive. The available funds were exhausted typically within days in most parts of the country. And it demanded a rather complex application package, which relatively few building representatives were able to compile in a timely and quality manner.

However, in Szentendre, due to the help of the municipality's "Dunyha programme", building representatives were able to prepare all the necessary documentation by the time the national "Warmth of Home" call came out. This has resulted in a very high success rate in funding. Although national funds allocated for Pest County were exhausted in a matter of days, Szentendre has attracted the most funding in the county! This has resulted in the energy refurbishment of 25 condominiums, which is more than half of all such buildings in the city. In the years following, the city's biggest budget investment has been implemented in these buildings. The overall cost was ca. 4.5 EUR, which has contributed to an estimated energy saving of 2200 t CO_2/year.

2. Free energy-efficiency consulting for district residents in Budapest

This is an initiative launched by the municipality of Budapest's XIV. district. (Also called Zugló, which is a transition district between the city's historic centre and the suburban areas) The Zugló Energy Efficiency Office ("ZETI") was established by the Zugló Municipality and the Budapest and Pest County Chamber of Engineers in order to provide free of charge information on energy efficiency issues to the residents and SME's of the district. It is located in an office at the district's main square, and it is open every Tuesday and Thursday between 15.00 and 18.00 o'clock. Occasionally it also organises public information days, e.g., when a national call for proposals is published to support residential energy refurbishment.

The creators of the office have recognised that although a lot of information on this topic is available on the internet today, for many it is difficult to understand how an energy efficiency investment is designed and implemented, be that the replacement of lighting in an apartment or the complete thermal insulation of a family house. Therefore, this office provides expert help to overcome this challenge. At the Zugló Energy Efficiency Advisory Office, specialists help district residents and businesses seeking advice on energy efficiency to develop solutions that help save energy and costs. ZETI acts as a consulting office, so its experts do not perform engineering work, construction, calculations, certifications, tender writing, and they do not recommend specific specialists, traders or tender writers. The office helps to:

- examine in which areas energy efficiency could be increased,
- provides information on what is needed to start and carry out energy efficiency investments - for example, how to start without existing financial resources,
- helps you see what these processes look like for a building or for a business,
- helps you determine the steps required to carry out an investment professionally and cost-effectively, and

- provides information on energy efficiency tenders, opportunities and innovations affecting the district.

Topics covered in the consulting include:

- lighting modernization;
- door and window replacement;
- shading solutions;
- ventilation solutions;
- building insulation;
- heating upgrade;
- use of renewable energies;
- building automation, smart solutions in energy efficiency;
- purchase of energy efficient household appliances;
- tips for energy-efficient daily living.

3. Szeged geothermal project

Continental Europe's largest geothermal project is currently being implemented in the South Hungarian city of Szeged. (i.e., this is the world's second largest, after Reykjavik). By providing heat from sustainable and reliable sources, the project will provide district heating to more than 50 thousand residents at an affordable and stable price. By becoming independent from market price fluctuations of natural gas, the new system will provide a long-term solution to tackle energy poverty.

The city of Szeged has a district heating system, which supplies heat to 27,251 homes and 450 public institutions. Currently in 21 heat districts there are 23 power stations and 240 heat centres. The total pipeline length is 202 km. Annually ca. 30 million m^3 natural gas is burnt, which contributes to the emission of ca. 55 thousand tons of CO_2 annually.

The geothermal project is implemented by a project consortium. The district heating operator is part of the project consortium as a professional partner. Another consortium member is the National Development Project Office, which is a 100% nationally owned company and is in charge of project management, promotion and public outreach.

Construction started in March 2019 and the system will be completed in May 2022. The total costs are 22 billion HUF, which is ca. 65 million EUR. 45% of the costs are covered by the European Union and 55% by a financial investment company called Geohőterm Ltd.

The new geothermal system will include nine grids. Each grid is composed of three wells. Water is derived from one ca. 2000 m deep production well and reinjected into two ca. 1600-1700 m deep reinjection wells. The average expected water production will be 80 m^3/hour at a temperature of above 90 degrees, which is an exceptionally

excellent value in Europe. Construction is already in progress. The first wells were drilled first in the outer districts and then they moved closer to the residential areas. Drilling of one well lasts for about 3-4 months. It is unfortunately a rather noisy activity. Although noise protection walls were erected where necessary, construction noise pollution was and is a source of a conflict between the project developer and the public.

Once completed, ca. 450-500 thousand GJ/year is expected to come from geothermal source. The rated heat power of the whole system will be 6-8 MW. Geothermal will cover ca. 60% of total heat demand, and will lead to a corresponding 60% of CO_2 emission reduction. i.e., the currently 55 thousand ton/year CO_2 emission will reduce to ca. 20 thousand tons / year.

The system will be able to contribute to the lasting reduction of energy prices and thus combat energy poverty. Consumers are typically lower income residents, living in small, pre-fabricated apartment blocks. Calculations show that for each GJ of heat there will be a ca. 14-15% cost saving. This will be enough to cover the currently existing operational deficit. In other words, a corresponding future price increase will be avoided. One can also this in a way so that residents will not see any reduction in energy prices. However, in the Szeged air quality is also an important aspect. Most energy poor families in Hungary live in areas that have poor air quality – and in Szeged local air quality will be significantly improved by the 60% reduction of local fuel use.

8. Conclusion

As highlighted on several occasions in this document, energy poverty is a complex problem that affects a variety of areas, from social welfare to energy and from environment to health. Achieving affordable energy services for all requires putting low-income households at the back when it comes to energy policy-making at the local and regional government unit's level. Energy is recognized as an essential service in the European pillar of social rights, i.e., access to energy is equated with access to other public services – including access to water, sanitation services, financial services, digital communications and public transport. Accordingly, the role of local and regional authorities in the fight against energy poverty has been recognized. In this fight, it is necessary to rely on various public policy instruments and take into account issues related to energy efficiency and social protection.

Due to the complexity of the approach to tackling energy poverty in different regions, it is not possible to implement a single solution, which is why local and regional governments can seek support from other institutions with expertise in various fields, but also find appropriate funding for implementation of energy poverty mitigation measures.

Policies aimed at reducing energy poverty bring other benefits to local and regional authorities as they contribute to the success of other policies and support policies aimed at energy efficiency, reducing greenhouse gas emissions and improving citizens' health, social inclusion and social protection, and thus overall quality of life and sustainability. An effective fight against energy poverty can also help to further broaden the social foundations of measures to combat climate change, as they include social groups that have so far been less active and have not been the focus of local and regional government policies.

Taking into account all the above as well as certain limitations in terms of available human capacity and small budgets of local and regional government units, the ultimate goal of establishing energy poverty mitigation policy and the starting point for further activities should be the establishment of energy poverty center at the county level which would be a kind of one-stop-shop for citizens, but also a central point that would monitor the implementation of energy poverty mitigation measures at the county level. The members of this body should be representatives of counties and cities that have individuals and relatively well-developed social policies and instruments.

Practice shows that municipalities do not have the capacity for dealing with energy poverty because it is a specific branch that requires specific knowledge but with the support of the county energy poverty center, they could develop additional capacities that could contribute to joint efforts to monitor and implement measures to prevent energy poverty at the local level. The establishment of such institution carries certain risks, especially in terms of funding so this should become a priority in the future. In addition, it is necessary to establish a clear definition and criteria of energy poverty at the national level, because otherwise local and regional government units will rely on individual criteria related to the provision of assistance, as has been the case so far.

The local and regional government units should in the future arbitrarily contribute to reducing energy poverty in their administrative area, their public policies aimed at reducing energy poverty should be based on existing initiatives and examples and it is important for them to improve understanding of the needs of energy-poor households as well as ways to identify them.

With the involvement of local and regional government units, small changes in everyday life and significant in public policies and national strategy, the involvement of civil society organizations, public media and science, significant positive changes could be achieved towards a successful fight against energy poverty.

9. Literature list

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