European Commission

Energy Poverty Advisory Hub (EPAH) Handbook 1: A Guide to Energy Poverty Diagnosis

2023

Energy Poverty Advisory Hub Handbook 1: A Guide to Energy Poverty Diagnosis
Published by the Energy Poverty Advisory Hub

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March 2023
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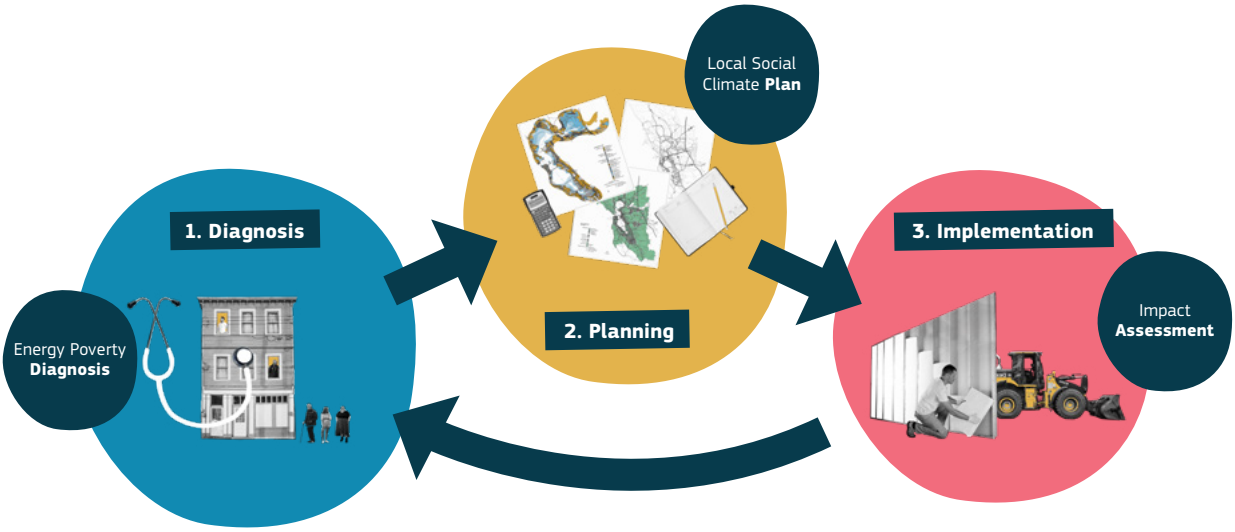
Energy Poverty Advisory Hub Handbook 1: A Guide to Energy Poverty **Diagnosis**

Energy Poverty
Advisory Hub
2023

The **"EPAH Handbooks: A Guide to Understanding and Addressing Energy Poverty"** are a series of practical guidebooks for local governments and practitioners which ensure that the social dimensions of energy transition are addressed efficiently. This series consists of:

- The **"Introduction to the EPAH Handbooks: A Guide to Understanding and Addressing Energy Poverty"** which establishes the common background to all three handbooks
- The **"EPAH Handbook 1: A Guide to Energy Poverty Diagnosis"** which focuses on the practical assessment of energy poverty at the local level
- The **"EPAH Handbook 2: A Guide to Planning Energy Poverty Mitigation Actions"** which provides information on how to prepare and integrate an energy poverty mitigation plan within the Local Social Climate Plan
- The **"EPAH Handbook 3: A Guide to Implementing Energy Poverty Mitigation Actions"** which provides information on the execution of an effective energy poverty project.

The handbooks specifically target the staff of local governmental institutions, however we welcome all the various actors to use these as a guide to better understand the energy poverty phenomenon at the local level, and to possibly gain additional perspective that can drive concrete change.



INTRODUCTION

Diagnosis is the beginning of a series of events which comprise the endeavour of energy poverty mitigation, and it is fundamental to understanding the root causes. At the end of this first phase, after implementing all the steps, you will have at your disposal a complete "Local energy poverty diagnosis" report which will effectively support you not only in the design and implementation of concrete actions but also in engaging with a wider network of stakeholders, based on concrete and defendable evidence.

This handbook focuses on the various steps in the **diagnosis phase,** providing a detailed description of each step. It is of primary importance to take adequate time to understand the challenges and to design a response. A robust diagnosis will allow you to answer the most relevant questions when designing effective solutions: Is there energy poverty in the municipality? Where is it concentrated? What is the severity of the situation? Who are those most affected? What are the most significant determining factors? What perception do the agents involved have of this problem?

The aim of the handbook is to **help municipalities in their efforts to start analysing and addressing energy poverty.** In function of this, it is designed to be adaptable to different situations. The basic idea is that it is useful as a starting point in acting against energy poverty, whether you have prior knowledge or not. Whether you have many resources or few resources. All the steps taken are important and have a purpose in improving the lives of people who are in this situation. Every action counts and the best time to act is now. Diagnosing the situation is the starting point.

Let's for a moment reflect on the possible internal or external drivers that push to start an action. **Alert signals** of the possible presence of energy poverty in your local context can come from everywhere. This can be information received from social services regarding a significant number of households calling for assistance because of very high energy bills; an awareness that a considerable part of the building stock is old and renovation rates are low; or it may simply be that you have seen the national report on energy poverty and you suspect that your municipality may be affected. The need for a detailed diagnosis can also be triggered by the introduction of new national or regional legislation addressing vulnerable consumers. In some municipalities there is an alignment of needs with political wills, and in these cases it is a question of allocating the proper resources to transform evidence of the situation into a structured starting point. In other municipalities, it may be the case that there is a need to increase awareness at the political level in order to establish an initial commitment. In these cases, it is advisable to start collecting the **initial evidence** of the situation, and to use this information to make a case for the need to further investigate the energy poverty situation at the local level. The first element that you will have available is a general **observation** of the current situation, which can be as broad as believing there may be energy poverty in a specific neighbourhood due to the fact that you received certain alert signals, or that because of an energy price increase there may be a possibility that part of the population is subject to energy poverty.

As you will observe from reading the handbook, performing a diagnosis has a cost that, especially for the first steps, is mainly represented by time invested by municipal staff to make sense of the current situation. However, there are other steps in which it is important to carefully consider the aims and resources available, to ensure that they are aligned and realistic. Keep in mind that the proposed methodology is a circular model, such that it is possible to start with limited resources and perform a first diagnosis which may be expanded later in the process.

HOW TO USE THE HANDBOOK

Although local energy poverty realities differ, the 1st **EPAH Handbook** presents **7 practical steps** that **provide a flexible framework which can be used regardless of geographical, cultural and economic settings.** You can use these steps as a **checklist** or recipe book starting from the most relevant step. The core of the methodology can be tailored to your context and support you in developing a robust set of actions, or to embed energy poverty into your existing climate and energy plans.

7 PRACTICAL STEPS TO ENERGY POVERTY DIAGNOSIS

Context and Coordination

STEP 1

Understand the complexity of energy poverty

Objective: Understand the topic in greater depth

STEP 2

Identify and engage the stakeholders involved

Objective: Establish a working group

Finalising

STEP 7

Define your local energy poverty and communicate it

Objective: Conclude the first phase keeping record of the process and sharing key information

From Information to Definition

STEP 3

Establish and analyse a hypothesis

Objective: Detail the original observation with additional elements

STEP 4

Define the information you are going to collect: relevant indicators and other sources

RELEVANT

Objective: Measure impact at a local level

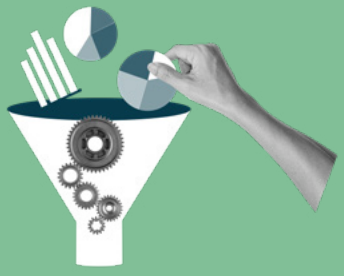
STEP 5

Collect data and additional evidence

Objective: Integrate the information you possess

STEP 6

Processing all information and data

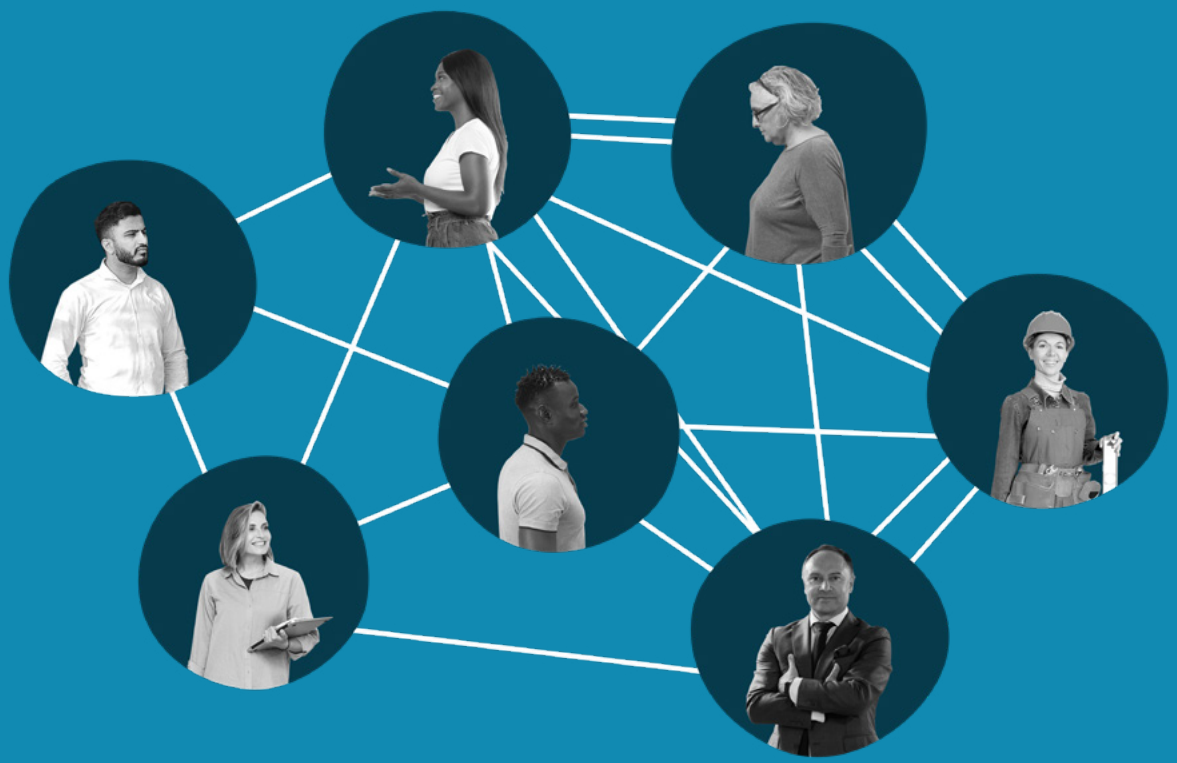


Objective: Connect the dots between hypothesis, indicators and information

Context and Coordination

The first steps are intended to guide you through the assessment of what has already been done in your municipality - both within the local public administration and externally, such as community networks or other Civil Society Organisations. The main objective is **to identify and have available the resources** and previous work that has been done and which may provide important inputs to the energy poverty diagnosis, and to identify those persons who may be suitable and willing to participate in the practical work of developing the local energy poverty diagnosis.

The following steps can often be **performed by one person or a small group** of people that take charge of kick-starting the diagnosis phase. However, you may also consider involving some external professional service provider or consultant to facilitate some of the steps.



STEP 1: UNDERSTAND THE COMPLEXITY OF ENERGY POVERTY

Objective: Understand the topic in greater depth

Energy poverty is a complex topic, since different variables come together and affect energy poverty situations: the status of the household, income, gender, knowledge, existing electrical appliances, energy sources and prices, among others. In order to understand all possible factors, it is important to gain a **full overview** of how energy poverty is manifested in the municipality.

An energy poverty diagnosis can take many forms and dimensions, depending on the geographical, social, technical and financial situations in your municipality. In function of this, we suggest you start by reading up on what is energy poverty, the causes, the drivers, the consequences and what is at stake when it comes to diagnosing this social problem. You can find some starting points by clicking on the links.

A key point is to maintain the final target output - **a local energy poverty diagnosis** - in mind at all times. This final output should be able to answer all the questions you have at the starting point, as well as the other questions that will appear during the process. For example, the identification of vulnerable groups, dimensioning the magnitude, characterisation of energy-poor groups, location-based assessments, etc.

During your research of the different perspectives of energy poverty you will find various **documents and reports** that may be useful at different stages of the diagnosis (e.g. reports from previous projects, regional or national reports and statistics, links to data sets, articles, scientific studies, maps etc.). It is of primary importance to maintain traceability of all these resources. You may use the table 1 below as an example to commence researching, organising, and making sense of the available information and resources.

Collating and becoming acquainted with the various documents and reports which may assist you in increasing your knowledge of energy poverty is the foundation for the development of an effective diagnosis. You may start by reviewing resources with specific energy poverty elements as a starting point, using the keywords in the "Introduction to the EPAH Handbooks: A Guide to Understanding and Addressing Energy Poverty" (i.e. vulnerable consumers, income, energy prices, housing energy efficiency). As a guide to commencing you can also look for documents related to the six topics that will later be used to organise the local impact indicators: Climate; Facilities/Housing; Mobility; Socio-Economic; Policy/ Regulatory Frameworks; Participation and Raising Awareness (see also Step 4). Use these inputs as a basis to kick-start the research, but do not be limited to them.

Table 1 - Examples of mapping resources (non-exhaustive)

Name of resource	Type of document (Maps, Data, Reports, Evaluations, Articles, Other: specify)	Source	Date of release	URL/Link to the resource
Income information (disaggregated spatial scale)	Data	National Statistic Office	DD/MM/YYYY	http://xxxx
Project "Title of the Project" Final Report	Report	CSOs (name of the organization)	DD/MM/YYYY	http://xxx
[...]				

SUGGESTED LINKS

- Introduction to the EPAH Handbook: A Guide to Understanding and Addressing Energy Poverty (2022)
- Tackling energy poverty through local actions – Inspiring cases from across Europe (2021)
- Bringing Energy Poverty Research into Local Practice: Exploring Subnational Scale Analyses (2022)
- EPAH online courses
- The Green/EFA energy poverty handbook (2022)
- Energy poverty in the EU
- Addressing Energy poverty in the European Union: State of Play and Action (2019)
- EP Pedia

SUGGESTED ACTIVITIES

- List the alert signals for the possible presence of energy poverty in your local context
- Make a list of the questions that you think the diagnosis should answer
- Create a list of the various documents you have located and/or are shared by other organisations (you can start with the documents related to implemented internal projects which may present some connection with energy poverty). List these in chronological order in order to have clear information relating to which document is more recent.

STEP 2: IDENTIFY AND ENGAGE THE STAKEHOLDERS INVOLVED

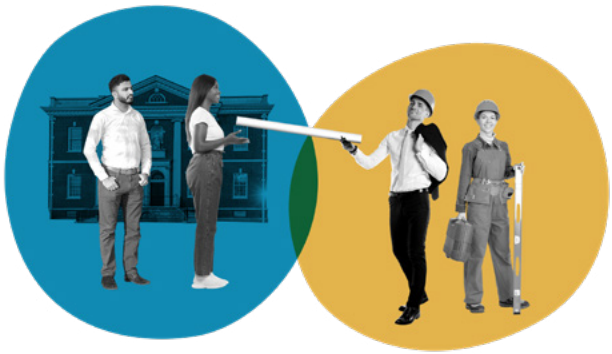
Objective: Establish a working group

Energy poverty may touch on various spheres of society, including the social, energy, housing, health and environmental sectors. In order to ensure that you access different perspectives, it is important to work jointly with various stakeholders; both internal (from other departments) and external (outside the municipal administration).

INTERNAL STAKEHOLDERS

A diversity of knowledge and approaches is more than welcome when preparing a diagnosis. Although the leadership of the initiative can come from any department, in order to make a diagnosis of energy poverty grounded in reality it is necessary to ensure that all the different perspectives are properly included in the energy poverty diagnosis scope and objectives. It is thus important to create a **cross-departmental working group** with the capacity to bring diverse **technical** and **social** perspectives to the diagnosis. Diagnosing local energy poverty is often an exercise that includes departments which seldom collaborate on a daily basis. In function of this it is highly recommended to construct a working group of colleagues covering different aspects, and to ensure their inclusion in the process at an early stage. New collaborations create new perspectives and better elaborated and informed conclusions. For instance, geographers can work with regional geodetic data and map out the vulnerability per neighbourhood, whereas social scientists or social workers can collect qualitative data from a sample of households via interviews.

Once you have identified the departments which are to be involved, it is important to actively engage them. Bringing together people from different departments and with complementary skills is a fundamental aspect of addressing complex challenges. However, this can also present difficulties due to internal conflicts, different priorities and agendas. It is important to focus the collaboration on the specific topic of energy poverty, and to gather information derived from the different perspectives of the other departments. This approach will not only help to broaden your understanding but will also increase the ownership of the various team members.



You can use the table below as an example in guiding your mapping of internal stakeholders and seeking to collate and discuss different perspectives with the other departments. It is important to understand that each department has its own primary interests, which may be only partially linked to energy poverty. The expected output from the diagnosis may also vary somewhat. Seeking to align the different perspectives can be a key element for a successful collaboration.

Table 2 – Examples of mapping on internal stakeholders (non-exhaustive and to be completed by the city representative)

Department	**Primary Interest** (What is the core topic of work of the department)	**Available Information / questions they can respond to**	**Expected Outcome** (What they would like to get from this diagnosis)	**Availability** (How much they can support the lead department)
Social	[e.g. overall welfare for vulnerable population]	[Levels of income, Unemployment, Age Who?]	[e.g. specifically understand which segment of the vulnerable population is also specifically affected by energy poverty]	to be discussed
Health	Healthcare services and planning	[related disease incidence, excess mortality rates]	Healthcare services and planning	
Environmental, Energy	[e.g. Effective energy planning]	[Energy Efficiency level GHG production Energy Distribution How?]	[e.g. understand how the energy services are related to energy poverty]	
Housing/ Urbanism		[Energy performance of buildings; Envelope and equipment characteristics; Energy efficiency levels. Mapping. Where?]		
Education		[level of education]		
Financial Department		[Cost of services Cost of material How much?]		
Other [...]				

Once you understand the different perspectives, you can establish a common objective and create a timeline in which all the various roles and responsibilities are identified, as well as the synergies. Jointly agree on the best way to communicate and proceed with the exchange of information.

EXTERNAL STAKEHOLDERS

There are perspectives which can substantially enrich the local diagnosis of energy poverty. **External stakeholders** can refer to local experts, Civil Society Organisations, non governmental organisations (NGOs), Social Services, Cooperatives, Research Centres, Universities, Energy Agencies, Energy Companies, Banks, Investment Funds, Small and medium-sized enterprises (SMEs) etc., which can assist you in any way (e.g. providing information, facilitating communication with citizens, accessing innovative financial instruments etc.). For example, Universities or NGOs can assist you by engaging post-graduate students/volunteers to perform specific tasks, which may be beneficial for both parties.

Once you have identified the external stakeholders, it is important to involve them and to better understand their interest in energy poverty and explore the possibilities for joining forces to perform the diagnosis and to develop future actions.

You can use the table below as an example in guiding your mapping of external stakeholders and efforts to collect and discuss information with them.

Table 3 - Mapping external stakeholders

Type of Organisation (CSO/NGOs, Research Centre/Universities, Energy Agencies/Energy Providers, Communities, Social Services, Other: Specify)	**Name**	**Useful Experience**	**Interest in EP Diagnosis**	**Availability and Possible Assistance**	**Role**
University		[Active departmental research on energy poverty assessment and mapping]	[To develop applied research and provide measuring and mapping skills]	[Post-graduate students or researchers can provide support on data collection, interviews and data analysis]	Data collection and analysis; diagnostic support; impact measurement
Civil Society Organisations (CSOs)		[Helpdesk for psychosocial support in vulnerable communities]	[To understand how to assist communities that are also facing energy poverty]	[Availability to train their workers to also provide energy related information to assist the community]	
Groups from the affected sectors (women's associations, immigrants, unemployed, elderly, young)					
[...]					

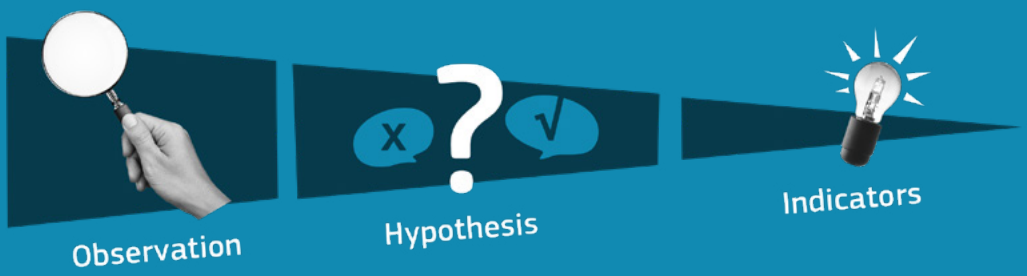
SUGGESTED LINKS

- Stakeholder Analysis, ODI (2009)
- A Multi-Stakeholders partnership to eradicate energy poverty in Zagreb
- Stakeholders Mapping (example)

SUGGESTED ACTIVITIES

- Host a meeting to validate your alert signals and diagnosis questions with all stakeholders, in order to have a consensus to continue the process.
- Prepare internal and external stakeholder mapping (try to focus on mapping different realities, especially those that have an established level of trust with vulnerable consumers)
- Host an internal meeting with colleagues from different departments and complete the mapping with the additional information they can provide. Seek to align the different perspectives with a common goal and record this in writing.
- Host a meeting with all external stakeholders and complete the mapping with the additional information they can provide. Try to identify possible common interests and opportunities to work together.

From Information to Definition



The next steps focus on evaluating the general observations that triggered the process, transforming this into a more specific **hypothesis**, establishing **indicators** and creating the basis to **assess** local energy poverty.

The principle objective is to collect enough elements to transform the initial observation into a concrete assessment, and to characterize local energy poverty through a series of indicators which will also be of use in monitoring the impact of implemented actions.

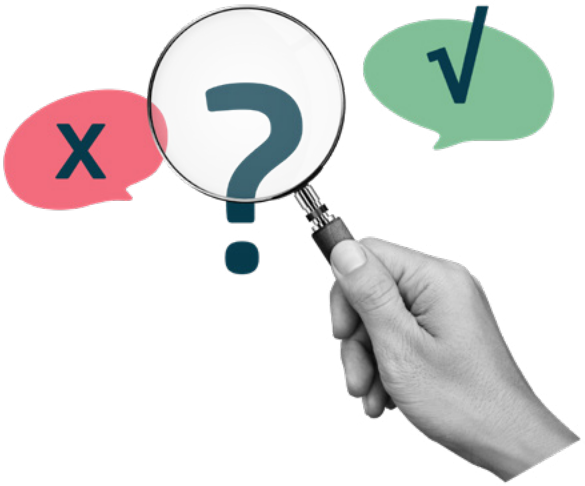
These steps are specifically interconnected in order that you can work on them in parallel. It may be necessary to repeat these steps in order to enter into more detail on specific aspects that you want to investigate.

There are multiple paths to move from an observation to a final definition. Each path may describe different realities and yield different outputs, resulting in varying levels of robustness and reliability (based on the data and evidence that are available to support the reasoning).

Different levels of commitment may be needed to perform the activities, depending on the approach you decide to adopt. A **full working group** should be involved, but the **external stakeholders** should also be included, including **expert services** that may be available to you for certain specific detailed analyses.

STEP 3: ESTABLISH AND ANALYSE A HYPOTHESIS

Objective: Detail the original observation with additional elements



Due to its multidimensional characteristics, energy poverty may be defined in various complementary manners. In order to compose the complete picture, it is useful to commence by compiling a table with the various hypotheses, which may provide additional information on the starting observation and may provide a guide to the final description of local energy poverty.

At this stage you will build on the **practical experience** and knowledge pool of the working groups with regard to local challenges and the provision of support to vulnerable citizens, as well as building on the **information obtained** through the research conducted and integrated by the various stakeholders, in order to establish a set of hypotheses relating to potential issues to be investigated.

As a first step, the **practical experience** from within the working group should be compiled during meetings where all the various social and technical perspectives can be brought together. You can kick off the discussion using different elements such as focusing on vulnerable consumers and aiming to identify "what" characterizes energy poverty in the municipality, "where" it is spread, and its possible "causes and effects". You can also focus on the common elements of the various alert signals which you received and the details observed (e.g. type of alert signal, if they come from the same geographical area and/or from similar groups of people, etc.). The more you involve all the various stakeholders in the discussion, the higher the chance your hypothesis will be well-defined, which can facilitate your entire process. At this stage your approach should be as broad as possible, and you should record everything that comes to mind. You can find some examples in the following Table.

Each hypothesis should then be **critically analysed.** It helps to use **specific questions** that can open additional possible discussions (Table 4, Column 2).

Finally, before proceeding to the next steps, you should evaluate how strongly the hypothesis is backed up by the information, which will determine how further research will be conducted. You basically ask yourself: *how good are these hypotheses? Are the data and information collected enough to support them? Do we have the resources to investigate further?* This investigation is essential to move from challenges perceived by individual colleagues or local organisations to broadly agreed conclusions.

The Table 4 shows some examples of possible questions which can guide your process in critically investigating your local energy poverty.

Table 4 – Questionnaire to investigate your local energy poverty

Observation Based on Alert Signals	Questions on the Observation	Several hypotheses are developed to answer these questions, based on the practical experience of the various stakeholders	
We think there may be energy poverty in that neighbourhood because we received various alert signals	Why? What specifically are the alert signals? What may be the causes (climate, economic, social)?		
Hypothesis	**Framing Questions**	**Supporting Information**	**Robustness of the Hypothesis**
We think there may be energy poverty in X neighbourhood due to the poor quality of dwellings	What are the problems with the dwellings (roof insulation, poor windows, old building, old heating system etc.)? Why are they not refurbished?	Yes: status of dwellings (from housing department), a survey from CSOs	High
We think there may be energy poverty in X neighbourhood because the buildings are not connected to district heating	What energy sources are they using? What is the energy mix?	Partially: Information on the lack of district heating. No data or information on the energy mix	Medium → if you can collect additional data
			Low → if you cannot collect additional information to investigate missing parts
We think there may be energy poverty in X neighbourhood due to low energy literacy	What is the social-economic status of those people living in the neighbourhood? What determines poor energy literacy?	Data showing opposing elements A survey confirms a sufficient level of energy literacy	Not validated → needs to be reviewed and reformulated

Based on the reply to the various questions, you may find that:

1	**The hypothesis is strongly validated by the available information**	You have enough input to confidently reply to the specific questions and back up your hypothesis. However, continue to the next step in order to evaluate if you can gain an even deeper understanding.
2	**The available information is not enough to validate the hypothesis, but you have the possibility to investigate further**	The information you have available is not enough to reply to all the framing questions. Further research is needed that may either validate the hypothesis or otherwise.
3	**The available information is not enough to validate the hypothesis, and you do not have the possibility to research further**	In this case it is important to still proceed with the next steps, trusting your experience. However, keep in mind that moving forward you are working on a non-validated hypothesis, and therefor it may be the case that there will be zero or low impact from the action, and the resources may not be used most effectively.
4	**The Hypothesis is not validated**	The data and information you collected point in a different direction. At this point it is time to reformulate the hypothesis in light of the information available.

As can be seen, these different scenarios present different levels of risk. In the first case, it is likely your hypothesis correctly represents one of the cases of energy poverty and will therefore more likely result in the planning and implementation of impactful actions. In the second case it is fundamental to proceed and collect more information. On the other hand, in the third case the situation is risky: the hypothesis may still be confirmed and future actions implemented, but this may also result in the hypothesis not being validated at the end of your process. The fourth case should be completely excluded, however the analysis process may have led you to a deeper understanding and facilitates a corrected renewed reformulation.

It is important to **identify multiple hypothesis to investigate** which can better describe the local situation when all are considered. You can prioritise working on those that are validated. Whilst you collect specific data and you proceed with your planning and implementation you may collect additional information and evidence, which may become useful in developing and validating other hypotheses.

SUGGESTED LINKS

- Online article: What is a scientific hypothesis?

SUGGESTED ACTIVITIES

- During a joint session with the working group (and possibly external stakeholders) analyse the various items of information available and undertake a critical review in light of the experience of the different departments. Collate a series of hypothesis and specific questions that can then be analysed.
- Look at the list of hypotheses and questions and identify if information is already available to support the hypotheses. Based on this analysis, agree on a prioritised list of hypotheses. Prioritise the challenges that are most likely to be confirmed and form an effective definition.

STEP 4: DEFINE THE INFORMATION YOU ARE GOING TO COLLECT: RELEVANT INDICATORS AND OTHER SOURCES

Objective: Measure impact at a local level

In order to design, implement, monitor and evaluate future actions it is important to select indicators or other sources of information that can characterize your situation. Indicators are essentially a method for measuring our efforts and are therefore useful in guiding and/or adjusting the actions to be implemented to improve the impact of our efforts. There are various types of indicators, however commencing with the identification of the most suitable indicators allows you to establish a baseline, a starting point. Where are we? To be able to see what effects the implemented actions have had at a later stage.

Indicators can be applied when planning the energy transition and its social impacts, such as energy poverty consequences. The aim is to identify specific, observable and measurable characteristics that can best respond to the questions posed in the previous step.

The energy poverty indicators should be selected keeping in mind that:

- They should be **suitable for monitoring local impact.** When defining an indicator, give thorough consideration to what data you will need to measure it, and whether you will be able to access current data and **update this in the future.** The impact of each locally implemented project should be visible through a change in the indicators. As such, national energy poverty indicators may not be sufficiently representative in the local context. When improving the situation for energy poverty within the municipality, it is very likely this will constitute minimal or no change in the national indicators, whereas you may have significantly changed the situation locally with directly affected households. Remember that in order to evaluate the impact you need at least two sets of the same data collected at different times. An indicator that you can properly monitor has more value than the “perfect” indicator that you are not able to update.

- The indicators should represent **different aspects** of the problem, such as focusing on socioeconomic conditions of the population, demographics, climate, building and equipment stock, energy costs, cultural habits, and will enable a more comprehensive picture of the vulnerabilities causing the problem.

- You must have **a budget** to properly collect data to monitor the indicators, if data is not already available. Although the data collection details are provided in the next step, it is important to keep this in mind when defining the indicators. Collecting the data to measure indicators can be done in many different ways

and requires different budget amounts. As a way to face data shortage and a lack of budget, consider the use of Citizen Science data and also the use of proxy indicators, i.e. indicators that provide an indirect picture of another factor or phenomenon related to that which you are seeking to study.

- Both **quantitative and qualitative** aspects should be adequately represented. Ideally the quantitative information should be combined with further qualitative information that can provide additional inputs to assess the situation. An important aspect to consider is the different values of **quantitative** (meaning numeric) or **qualitative** (meaning contextual) data. **Quantitative indicators** measure changes expressed as numbers or statistics, e.g. **frequency** of events, **number** of people, **percentage** of increase/decrease. Quantitative data can also measure changes in attitudes, beliefs, and perceptions when respondents express opinions in the form of **ratings** or **rankings**. This type of data may be easy to collect and interpret, however on the other hand this data may lack personal perspectives and may not be able to capture detail and aspects relating to the situation of vulnerable households. **Qualitative data relates** more to observations and often takes the form of narratives and descriptions. This data is more useful in investigating feelings and perceptions, and to obtain additional insights. In the absence of local level high-quality quantitative data, qualitative data may be more easily collected and it is highly insightful if knowledgeable stakeholders are involved as participants.

- Depending on the aim of your project, there should be a high enough **level of flexibility and nuance** to be able to capture and assess vulnerability in differing segments of the population and household groups, whose characteristics can be very different.

- Preferably provide an outcome or result that is more comprehensive than just a “yes or no” output, in order that the diagnosis is **more informative** and provides additional details regarding, for instance, the different types of energy poverty, different drivers of vulnerability and also different **severity levels.**

To define an indicator that is representative, measurable and precise may be challenging for everyone. A good starting point is to look at the available sets of **56 local energy poverty indicators** proposed by **The Covenant of Mayors** jointly with the Energy Poverty Advisory Hub. These indicators have been discussed and confirmed to be relevant for local authorities through a participatory approach involving the Covenant group of local authorities and experts from across Europe.

It is recommended to refer to them and to identify which indicators can be relevant to characterize your local context and that can be properly monitored. There is no need to cover all the 56 indicators, focus only on those that can represent the principles mentioned above, and disregard the remainder. However, it may also be relevant to go through the full list, which can undoubtedly open up new questions and perspectives.

THE COVENANT OF MAYORS AND THEIR PROPOSED LOCAL ENERGY POVERTY INDICATORS[1]

The Covenant of Mayors is the world's largest local initiative. More than 10,000 municipalities have signed a political declaration to take climate change action through the Covenant of Mayors.

Since 2015 all municipalities who have signed or renewed their commitments to the Covenant of Mayors in Europe have committed to take action on energy poverty.

The Energy Poverty Advisory Hub, the Office of the Covenant of Mayors and the Covenant Community have developed a framework to provide a trusted and locally anchored framework to act on energy poverty. The framework focuses on setting **goals**, defining **local indicators** and **planning actions.**

The energy poverty goal for signatories of the Covenant of Mayors

When adhering to the Covenant of Mayors - Europe Commitment document, local governments declare that they will continue to (1) reduce greenhouses gas emissions on their territory; (2) increase resilience and prepare for the adverse impacts of climate change and (3) tackle energy poverty as a key action to ensure a just transition.

Setting these goals signals the starting point to turning the commitment into real actions. In some cases the official start date of the commitment may coincide with the signature of the Covenant of Mayors. However, it may be useful to define an official starting date that is aligned with ongoing energy poverty actions, which can also facilitate monitoring the impact of implemented projects. If there are ongoing cycles for urban, social, environmental and energy planning, it may make sense to align the starting date of the work on energy poverty with their programmes, timeframes and goals (especially taking into account the social aspect of energy poverty).

Assessment - the Covenant of Mayors Europe Local Indicators

The indicators presented by the Covenant of Mayors serve as an inspiration and are provided from other local governments with experience of working on local energy poverty assessments, and can be of great assistance to you in selecting the most relevant indicators that capture your local specific circumstances.

There are a total of 56 indicators, grouped by topics relevant to local governments:

- **Climate**
  As our energy consumption and production is closely connected to climate patterns, a change in the climate or instabilities in predictions are therefore likely to expose more households to budgetary instability and increase the risk of energy poverty. When outside temperatures deviate significantly from comfortable indoor temperatures, this may require an increase in energy consumption to balance the difference. Monitoring climate change can also enable you to foresee how weather and temperature patterns may further challenge those in energy poverty and those in risk of entering energy poverty.

- **Facilities/Housing**
  The condition of housing, both qualitatively and as perceived by the inhabitants, plays

1 If you are interested to learn more about the Covenant of Mayors you are welcome to consult their website (www.eumayors.eu) where you can find the offline excel version of the planning tool, or access the integrated version as part of MyCovenant (only if you are a signatory of the Covenant of Mayors).

an important role in the identification of energy poverty. Lack of energy efficiency is one of the three main causes of energy poverty. When talking about energy efficiency we must consider other factors such as the existence or otherwise of insulation in the dwelling, as well as the quality and efficiency of appliances and the lighting system. Note that there are indicators within this group with more technical specifications relating to housing conditions, as well as indicators that focus on the perceived comfort of members of the household. In fact, as mentioned in Chapter 1.3 of the "Introduction to the EPAH Handbook: A Guide to Understanding and Addressing Energy poverty" similar conditions can be perceived differently by different members of the household, and this may be connected with cultural, gender, age and traditional elements. When we work on local indicators we must take note of these possible differences and bear them in mind.

- **Mobility**
  To be, or to be at risk of becoming vulnerable to energy poverty may also be related to where we reside. Rural or urban areas come with different mobility opportunities and different citizen needs, which again can be linked to varying levels of resilience towards energy poverty. For instance, the majority of our current modes of transport are dependent on fossil fuels and are subject to increasing energy prices, and will therefore exacerbate the accessibility of the energy poor, leaving them further challenged in accessing essential services such as healthcare or education, as well as limiting their geographical range for their job opportunities.

- **Socio-economic Aspects**
  Information on the socio-economical situation of the local population is directly related to the identification and monitoring of energy poverty, and may be linked to income levels and household composition. Collating these indicators can provide an insightful characterization of citizens' condition and vulnerability levels.

- **Policy and Regulatory Framework**
  A dynamic and responsive regulatory framework at both national and local levels which includes energy poverty can be a reflection of a specific sensibility to the topic and willingness to create an impact. Setting indicators based on policy and regulation in force can simplify the process to monitor their impact and their direct effects.

- **Participation and Raising Awareness**
  An important component of every action that is implemented is to make sure that the target audience, beneficiaries, and all key stakeholders are adequately outreached and informed of what is happening and all the different options available to them. Improving energy literacy is a key driver for reducing citizen vulnerability and improving the ability and knowledge to implement mitigation measures.

Each topic has a series of indicators, and you may select those that can assist you in organizing your local challenges, measure the impact of projects, and assess progress in alleviating energy poverty. 56 indicators may seem to be challenging; for this reason, to simplify the assessment, there is a smaller list of 24 monitoring indicators which are considered to be the most relevant, and that can assist you in monitoring the improvement in local activities on energy poverty. In the event that any of the monitoring indicators is not adequate for describing your local situation, these can be replaced by any other indicators from the main list (56 indicators) which may be more suitable to your situation. Alternatively, you may also use these indicators as inspiration for customizing your own indicators tailored to your local context.

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Covenant of **Mayors Signatories** may access the entire list of indicators on their dedicated web site - MyCovenant, and may follow the guidelines for the reporting tool on energy poverty. It is advised to make use of as many indicators as possible in each topic area in order to have a wider and diverse understanding of this multi-faceted problem. However, only one Indicator will become mandatory following the transition period running up to 1 January 2025. This is: Percentage of persons/households spending up to XX % of their income on energy services.

Planning Actions

As mentioned above, the third part of the Covenant of Mayor framework focuses on planning actions. This important section is considered as the entire second phase in the Energy Poverty Advisory Hub Circular model, and is discussed in detail in the *"EPAH Handbook 2: A Guide to Planning Energy Poverty Mitigation Actions".*

Whether you are from a municipality which is a signatory of the Covenant of Mayor or otherwise, the list of indicators provided can be a good starting point to understand which parameters can provide a characterization of energy poverty, and begin to learn what information may already be available or accessible to you. The tables on the following pages provide a complete list of the indicators. Each indicator comes with a short description, as well as a unit of measure. This will allow you to have a better understanding of each suggested local indicator, as well as initial guidance on the next step, related to how to harvest data for your selected indicators.

Keep in mind that you are the expert in your municipality, it is therefore likely that you will wish to modify some of the indicators, or create your own, in order to evaluate your specific situation. It may be pertinent to develop **your own customised indicator(s)**. Brainstorm with the entire working group to identify possible additional indicators which, when carefully designed, may show an even finer level of details than the recommended indicators presented here. A combination of choosing from the list and customizing some indicators may be your path to effectively capture the local energy poverty situation in a measurable and quantifiable manner.

Consider that to adequately describe the local situation you require a set of multiple indicators which are often drawn from different thematic groups in order to address all the various aspects. It may be useful to start selecting at least one indicator per topic and understand how they are interlinked in order to better describe your situation.

You can use the questions defined in the previous steps to guide you in the selection of indicators. For example, if we want to know: Who are the vulnerable groups in the area? You may be interested in selecting a socio-economic indicator.

When you have prepared the final list of indicators, using the Covenant of Mayors or your own, it is advisable to consider the scenarios where you will implement a concrete action related to your local challenge. In such a scenario, consider if this particular action will be captured and reflected through your selected indicators. Consider how the action will change the indicators. If you feel the set of indicators will not be affected or is not adequate to monitor the action, it is worthwhile considering adding to, replacing, or reformulating your list.

HELP EXAMPLES

During a joint meeting the working group discussed the increases cost of energy at a household level. The group questioned the effect of this phenomenon in a specific neighbourhood in the municipality which, by experience, presents specific challenges (e.g. high level of criminality, lack of efficient connection to the city centre). Looking at the Covenant of Mayor indicators, they selected an indicator from the **social-economical group**: *"Percentage of persons/household spending up to XX% their income on energy services"* where X is a specific percentage defined by the municipality itself (for example 10%). This is an indicator which can be accessed from the database that they possess, and for this reason it seems appropriate.

However, while thinking about the indicator they realise that it is not adequate to respond to other questions they have, such as: "what is the impact of poor energy efficiency and appliances?" Or "are people aware of possible good practices?" Or furthermore "who exactly are the people that live in this neighbourhood (people affected by unemployment, people with special health conditions etc.)?"

They decide to look again at other indicators which, when combined with the indicator already selected, can help them to better understand their local situation and to design their actions. They decide to add an indicator from the **facilities/ housing group**: *"F+G+H band (EPC) dwelling / total number of dwellings"* that the urban planning department assures may have accessible data.

The social services department proposes to integrate the indicator from the **socio-economic group**: *"persons aged over 65"* because they are already working on this target population and they can provide additional information and can also include energy poverty actions into already planned surveys.

Looking at this selection of indicators, the team decides that they will add something to improve their **level of awareness** to assist them in responding to the question "Is the bureaucratic process to access support too complicated?". Looking at the budget they realise they can undertake research combined with other on-going assessments, and they decide to define a customized indicator which can provide the first number in a feasible manner. They decide to include in the list the indicator: *"% of people that declare that the process to access support services is complicated".*

Having established this, they can adequately respond to their questions, define a baseline, and monitor progress following implementation of specific actions.

SUGGESTED LINKS

- Bringing Energy poverty Research into Local Practice: Exploring Subnational Scale Analyses
- Covenant of Mayors: Alleviating Energy Poverty
- Covenant of Mayors: reporting template (EXCEL table with indicators)
- Covenant of Mayors: reporting guidelines

SUGGESTED ACTIVITIES

- Identify a set of indicators from the tables below which may be suitable for your local context, and evaluate whether they can be useful in responding to the questions you posed in the previous step.
- Try to understand how likely it is that you will be able to collect data to both set a baseline and also to monitor the changes in the indicators over time.

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Table 5 – Covenant of Mayors energy poverty indicators

Energy poverty Assessment			
24 Most Used			
Macro-area	Indicator(s) Used		Unit
Climate	Frequency of heat waves	Frequency of heat waves per month in a year	days per year
	Frequency of cold waves	Frequency of cold waves per month in a year	days per year
	Number of heating degree days per year	Heating degree day is a measurement designed to quantify the demand for energy needed to heat a building; it is based on the outside temperature where heating is needed	HDD + CDD / year
	Number of cooling degree days per year	Cooling degree day is a measurement designed to quantify the demand for energy needed to cool a building; it is based on the outside temperature where cooling is needed	HDD + CDD / year
Facilities / housing	F+G+H band (EPC) dwelling / total number of dwellings	Percentage of buildings with Energy Performance Certifications bands F, G and H in the municipality	[%]
	Energy consumption (electricity + heating) per capita / national energy consumption (electricity + heating) per capita	Share of municipal energy consumption per capita / national energy consumption per capita	[%]
	Share of buildings renovated per year	Share of buildings renovated per year / total buildings	[%]
	Share of households or persons with presence of water leakage, dampness or rot in their dwelling / total households or persons	Share of population/households with leakage, dampness or rot in their dwelling, based on the question "Do you have any of the following problems with your dwelling/ accommodation: a leaking roof; damp walls/floors/ foundation; rot in window frames or floor.	[%]
	Percentage of households or persons within the municipality experiencing heating discomfort / total households or population	Share of households or persons experiencing heating discomfort / total households	[%]
	Percentage of households or persons within the municipality experiencing cooling discomfort / total households or population	Share of household or persons experiencing cooling discomfort out of total households	[%]
	Households or persons connected to the electricity grid / total households or persons	Share of households or persons connected to the electricity grid / total households	[%]
	Households or persons connected to the gas grid / total households or persons	Share of households or persons connected to the gas grid out of total households	[%]
	Additional Indicators are available in the relevant table		

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Energy poverty Assessment			
24 Most Used			
Macro-area	Indicator(s) Used		Unit
Mobility	Population or households not having access to essential services within 1 hour by walking, cycling or public transport / total population or households	Percentage of the population or households not having access to essential services (pharmacies, food stores, health facilities) within 1 hour by walking, cycling or public transport / total population	[%]
	Persons or households living more than 1 km from the nearest public transport station / number of persons or households	Percentage of persons or households living more than 1 km from nearest public transport station / total population	[%]
	Additional Indicators are available in the relevant table		
Socio - economic	Percentage of persons or households spending up to XX % of their income on energy services	Share of persons or households spending more than a specific percentage of their incomes on energy services, putting them in an situation of energy poverty	[%]
	Vulnerable persons or households / total persons or households	[This description is an example only; municipalities can define on their own] Households with lone parents, parents with more than three children, families with low income, households receiving social support, families with low level of education.	[%]
	Arrears on utility bills / total population or households	Share of (sub-)population or households having arrears on utility bills, based on question "In the last twelve months, has the household been in arrears, i.e. has been unable to pay a utility bill on time for the main dwelling due to financial difficulties (heating, electricity, gas, water, etc.)?"	[%]
	Inability to keep the home adequately warm	Share of the population or households not able to maintain their home adequately warm.	[%]
	Inability to keep the home adequately cool	Share of the population or households not able to maintain their home adequately cool.	[%]
	High share of energy expenditure in relation to income (2M)	The 2M indicator represents the proportion of households whose share of energy expenditure within their income is more than twice the national average. Note: where income distributions are more equal, variance in energy expenditure translates to higher 2M shares. High variance in energy/income can occur due to structural differences in energy expenditure between household groups, as well as in situations where energy is often, but not exclusively, included in rent.	[%]
	Additional Indicators are available in the relevant table		

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Energy poverty Assessment			
24 Most Used			
Macro-area	Indicator(s) Used		Unit
Policy and regulatory framework	Existence of energy poverty strategy / specific measures related to energy poverty	Yes or No answer to the question: "Is there an energy poverty strategy"?	Yes / No
	Existing rent regulation	Yes or No answer to the question: "Are there rent regulations"?	Yes / No
	Additional Indicators are available in the relevant table		
Participation / awareness-raising	Awareness-raising campaigns targeting vulnerable households	Preventing rent increases due to energy retrofits, balancing the PRS with interest in home ownership and social housing	Yes / No
	Engagement and cooperation with stakeholders	Yes or No answer to the question: "Is there engagement and cooperation with local stakeholders for energy poverty reduction"?	Yes / No

Energy poverty Assessment			
Additional Indicators			
Macro-area	Indicator(s) Used		Unit
Facilities / housing	EPC bands of dwelling higher than B	Percentage of dwellings with EPC higher than B out of total dwellings with certificate	[%]
	Households with centralised heating system / total households	Share of households with a centralised heating system / total households	[%]
	Ownership of heating and cooling systems	Share of households with heating and cooling systems / total households	[%]
	Number of social housing apartments / total number of apartments	Percentage of social housing apartments / total number of apartments	[%]
	Average energy demand of social housing / sq.m	Energy demand of social housing compared to median national demand	[kWh/ sq.m]
	Absolute lowest energy expenditure (M/2)	The M/2 indicator represents the share of households whose absolute energy expenditure is below half the national median, or in other words abnormally low. This may be due to high energy efficiency standards, but may also be indicative of households dangerously under-consuming energy. M/2 is a relatively new indicator that has been used in Belgian to complement other expenditure and self-reported indicators. Note: this indicator is influenced by the underlying distribution of absolute energy expense in the lower half of households. If the median is relatively high and the distribution below this is very unequal, the M/2 indicator is high	[%]

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Energy poverty Assessment			
Additional Indicators			
Macro-area	Indicator(s) Used		Unit
Facilities / housing	Number of households with only oil boilers, wood-burning heaters, conventional gas boilers	Share of households with oil boilers, wood-burning heaters, conventional gas boilers / total households	[%]
	Households with centralised cooling system / total households	Share of households with a centralised cooling system / total households	[%]
	Households with centralised cooling system older than 10 years / total households with cooling system	Share of households with a centralised cooling system older than 10 years old / total households with centralised cooling system	[%]
	Average age of buildings	Average age of buildings per period of construction	Years
	Dwelling ownership	Percentage of households that own the dwelling / total households	[%]
	Over and under occupation of dwellings	Percentages of households according to number of occupants	[%]
	Percentage of households or persons within the municipality with access to clean cooking fuels and technologies	Proportion of households or persons with primary reliance on clean fuels and technology is calculated as the number of people using clean fuels and technologies for cooking, heating and lighting divided by total population reporting that have any cooking, heating or lighting, expressed as percentage. “Clean” is defined by the emission rate targets and specific fuel recommendations (i.e. against unprocessed coal and kerosene) included in the normative guidance WHO guidelines for indoor air quality: household fuel combustion.	[%]
	Additional Indicators are available in the relevant table		
Mobility	The local public transport frequency is adequate, providing for the essential necessities of the population	Yes or No answer to the question: "does the local public transport system have adequate frequency, providing for the essential necessities the population"?	Yes / No
	Social housing apartments not having easy access to public transport(*) / all government-provided apartments	Percentage of social housing apartments not having easy access to public transport / all government-provided apartments	[%]
	Persons or households receiving support to pay for public transport services / all public transport users	Percentage of persons or households receiving support to pay for public transport services / total public transport users	[%]
Socio - economic	Average price of electricity	Average price in [€] of electricity consumed [per kW.hr] in municipal households	[€]
	Average price of gas	Average price in [€] of gas consumed [per m3] in municipal households	[€]

Covenant of Mayors for Climate & Energy EUROPE

Energy poverty Assessment			
Additional Indicators			
Macro-area	Indicator(s) Used		Unit
Socio - economic	Energy related expenditure / local GDP	Relationship between the yearly energy cost for households and the local GDP, percentage average of the local GDP compared to energy cost	[%]
	Persons or households under the poverty threshold / number of persons or households	Percentage of persons or households suffering from poverty / persons or households and families under the income limit considering the size of the family	[%]
	At-risk-of-poverty rate	Persons or households at risk of poverty or social exclusion (% of population). The at-risk-of-poverty rate is the share of people with an equalized disposable income (after social transfer) below the at-risk-of-poverty threshold, which is set at 60 % of the national median equalized disposable income after social transfers.	[%]
	Persons or households receiving social assistance	Number of persons or households receiving financial assistance from administrative institutions	[%]
	Money spent to support energy poor households or persons in relation to local GDP	Percentage of public funds spent in assistance programs as a share of total local GDP	[%]
	Energy poor persons or households receiving assistance / total energy poor households requesting assistance	Percentage of energy poor persons or households benefiting from some form of assistance programme / total number of households requesting assistance	[%]
	Energy poor persons or households receiving assistance / total energy poor households detected	Percentage of energy poor persons or households benefiting from some form of assistance programme / total number of energy poor households	[%]
	Unemployment rate	The unemployment rate is a measure of the prevalence of unemployment and it is calculated as a percentage by dividing the number of unemployed individuals by all individuals currently in the labour force	[%]
	Persons aged under 12	Persons aged under 12 / total population	[%]
	Persons aged over 65	Persons aged over 65 / total population	[%]
	Persons with respiratory and circulatory problems	Persons with respiratory and circulatory problems / total population	[%]
	Persons with an education level less than lower secondary school	Taking in account the International Standard Classification of education (ISCED from the Unesco) a lower education level refers to an education level under lower secondary school	[%]
Policy and regulatory framework	Specific measures related energy poverty	Yes or No answer to the question: "Are there energy poverty specific measures"?	Yes / No
	Existing incentives within landlord programmes	Yes or no answer to the question: "are there incentives/ programmes for landlords"?	Yes / No

STEP 5: COLLECT DATA AND ADDITIONAL EVIDENCE

Objective: Integrate the information you possess

At this step it is time to seek the data that answers the questions posed in the previous steps and which can be associated with the selected indicators. In this step the purpose is the collation of information and data to feed the indicators selected in Step 4 and provide more evidence to support the hypothesis. The aim is to understand whether the information we have available is sufficient to properly define the chosen indicators, or if there is still a need to fill some gaps, and how to proceed in this case.

Regardless of whether the information and data have been collected directly by yourself or another internal department (**primary data collection**) or by different external organisations (**secondary data**), it is important to verify that the data respects certain basic principles in order to make it useful in understanding the local situation.

1. Geographic Distribution. The data and evidence collated should be available at the scale of your interest (either at the national, regional and local or sub-local levels). As previously mentioned, data available at the national level may be an interesting initial resource, especially for formulating the analysis questions (See Step 3) but this does not represent your local context: national medians hide local specifics and variations. Descaling national data to the local level risks making it incongruent with your local circumstances and policy actions and creates misrepresentations. Moreover, local actions will rarely be reflected by these indicators, and you may only see changes when the whole country and thus the national indicator changes. When possible, it is preferable to prioritise information at the municipal level, either via external sources or by collecting the data yourself. In practical terms, you should be able to easily identify the geographical scale of the data. Consider, for example, countries with very different climatic zones such as Greece, where on the same day in winter, a city in the north can experience -10 ˚C while an island in the south has a temperature of 25 ˚C. This difference will most certainly have an impact on some indicators (e.g. those associated with the climate), which skews the results if we only look at the local level.

2. Time Distribution. You should verify that the dataset is available for different periods (monthly, annual or bi-annual) in order to understand trends. Moreover, it is important that you ensure that the data will be updated in the future to enable monitoring the changes and effectiveness of your actions. It is also important to take into consideration how often the data should be updated to correctly represent the phenomenon you are interested in capturing (e.g. some events are affected by seasonality, such that a data update every year or every two years may not be able to capture the changes; this requires more frequent updates). In practice, the timeline should be clear and the period that occurs between one collection and the next must be stated. For example, if a country is mostly affected by winter energy poverty, information concerning the annual energy bills will not be sufficient to narrow down the specific problem.

3. Validity and Reliability. In particular in the case of data which is not directly collected, it is important to check the resources and make sure they are reliable, for instance, ensure that quantitative data was collected respecting statistical principles. A good sign is if the source properly describes the process used to collect the data and has the contact details of the data providers. Make sure that the sample sizes are adequate. If the data is not collected uniformly or routinely, then it may be biased and induce you to make a wrong or non-effective decision. In practical terms, the collection process should be clear, and the sample size and how the sample was defined should be stated. For example, an organization may share evidence based on the feedback received on a survey among their beneficiaries that shows a significant percentage of respondents is experiencing difficulties paying energy bills. In this case, if the information provided is to be used in supporting your hypothesis, it has to be taken as representative only of the sample collected (which have the common characteristic of being beneficiaries of the organization) and it cannot be extended as relating to the entire local population and/or to the population of that neighbourhood.

In the event that you have access to data that does not respect these principles it may be worthwhile considering the data as additional information, however you should always bear in mind the limitations of the data and utilize the information in a critical manner. In practical terms this can provide only partial supporting evidence for your hypothesis.

FILL THE GAPS: COLLECT NEW INFORMATION

After reviewing existing data, do you consider that you have the necessary information to answer the questions you have asked yourself? If not, you can use several **methodologies** to advance your understanding of the phenomenon.

Surveys are a powerful tool to collect direct information from citizens, including their opinion, point of view, preferences and self-evaluations relating to their capacity to maintain their homes at an adequate temperature. Surveys are physical or digital questionnaires that gather both qualitative and quantitative data from subjects. It is important to properly define the sample to use (number of households or persons to survey) in order for the survey to be representative, and to respect certain principles to ensure that the persons surveyed are selected randomly to avoid creating any bias. Surveys can be performed on a reduced number of persons who have been pre-selected through a previous analysis (e.g. focus on the elderly, people accessing social incentives, a specific neighbourhood where buildings are older, etc.). In this case, surveys can help to capture specific aspects of the situation in the field.

Interviews and focus groups may be used, either one to one or with several persons (around 10) at the same time. This form of data collection can be time consuming, however it can be less time consuming than a survey, especially if you decide to work with focus groups and gather participants together. In these cases, it may be worthwhile specifying that the group includes key stakeholders or persons recognized and trusted by the community (formally or informally). Interviews and focus groups can be used to document the energy poverty features experienced by different social groups, and the barriers they experience in remedying their situation. They are therefore instrumental in collecting information relating to the diversity of experiences, if key groups or stakeholders with distinct characteristics of interest have been identified in advance.

It is highly recommended to have clearly structured written questions that we want to respond to during the surveys and interview sessions. It is worthwhile organizing the questions by themes and to preview the answers and to include all the possible options in order to be able to quantify the results. It is possible to use fixed questionnaires, but it is also interesting have space for open responses which have not been envisaged.

Sensors, equipment and mobile apps can be a useful way to collect data on indoor temperature, air quality, energy consumption levels, energy behaviour and occupancy patterns in the homes of vulnerable consumers, employed either by local government technicians, in-home visits or energy audits, or even by the occupants themselves

as part of an approach based on the informed participation of consumers in the overall process of energy poverty diagnosis and mitigation, and specifically in data collection for this step.

Carefully evaluate which method is more suitable for your selected indicators. Also ensure that you keep track of your timeframe and budget at this stage, since some methods can be more time-consuming than others. Discuss with the team and share experiences with the key stakeholders in order to better understand which method can be the best to collect the data and information you need.

SUGGESTED LINKS

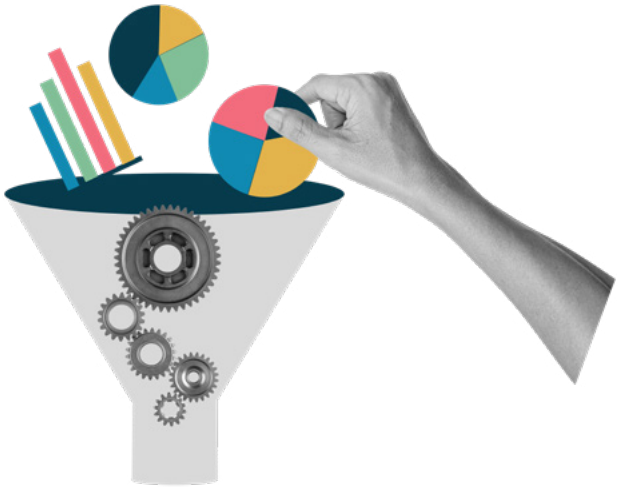
- SURVEY example: POWERPOOR toolkit
- GIS Mapping: Energy poverty in Dutch Municipalities – (Description) (Map)
- Cold homes, fuel poverty and energy efficiency improvements: a longitudinal focus group approach (Grey, C.; Schmieder-Gaite, T.; Poortinga,W. et al., 2017)
- Bringing Energy poverty Research into Local Practice: Exploring Subnational Scale Analyses. (Palma, P., & Gouveia, J. P., 2022).
- Unveiling hidden energy poverty using the energy equity gap (Cong, S.; Nock, D.; Qiu, Y.L. & Xing, B., 2022)
- Do energy subsidies affect the indoor temperature and heating energy consumption in low-income households? (Choi, Y., Song, D., Ozaki, A., Lee, H., & Park, S., 2022)
- Citizen Science and Participatory Research on air pollution (Oskarsson, 2019)

SUGGESTED ACTIVITIES

- Review the available information identified starting at Step 4, and consider the details of various characteristics the information presents. Evaluate whether the information can effectively characterize the selected indicators.
- Identify if the information available has any gaps that need to be filled. If this is the case, evaluate the best way to collect the missing information.

STEP 6: PROCESSING ALL INFORMATION AND DATA

Objective: Connect the dots between hypothesis, indicators and information



After selecting the indicators and collecting the information which adequately represent them, it is time to review the table prepared in Step 3; the involvement of all the various stakeholders may speed up this review.

There is no single correct way of analysing the collected data. This will depend on the information gathered and the questions you are interested in addressing. This section introduces a multiplicity of pathways and considerations which are worthwhile evaluating. To begin with, you may identify only one indicator as representative and able to respond to the open questions you have on the hypothesis, or you may identify a set of indicators and look at them individually or compare between each other, or you may consider them together. For example, if you wish to investigate building energy efficiency, you could select only that database which provides details on the *energy performance certificate rating* as being representative of that aspect (**one indicator**). However, you may also explore combining this information with other information which is available in order to study a particular perspective (**set of indicators**). You could decide to include (for example) *building age, type of building* and *conservation status*. Each of these items can be **analysed individually**. Another possibility is to "normalise" and **aggregate** the data, which is a process whereby you place the indicators on aligned scales of values, whereby they can be joined through mathematical operation to obtain combined information. By adopting this method you can identify the different impact of multiple factors. For example, you could find that building energy efficiency is explained 50% by age, 25% by type of building and 25% by conservation status. Maps and visualizations using Geographic Information System (GIS)[2] data and other visualization techniques can assist your analysis. Furthermore, indicators and especially the dataset used should also be consistent with each other in terms of their organization and form. For instance, you cannot compare rural houses with the conservation status of urban apartments.

When using more than one indicator it is important to try to avoid redundancy, which signifies trying to avoid indicators that provide the exact same information. Each indicator must bring new information to the considerations. For instance, *building energy needs* and *energy rate* are identical, as a building with a good energy rate has lower energy needs. However, *building age* and *conservation status* provide different information - a building can be old and have either good or bad conservation status.

2 **GIS (Geographical Information Systems)** are ways of displaying geolocated information on a map, combining data with a specific location. This can be linked to both qualitative and quantitative data and is a useful means of locating specific aspects of energy poverty within a defined context. Maps are a useful means of communicating findings, and can therefore be used as part of the concluding diagnosis, which will serve as a discussion basis for where and what to plan.

If possible, it is very beneficial to **integrate both qualitative and quantitative information**, to capture not only the measured energy poverty via socioeconomic and infrastructural indicators, but also the perceived energy poverty, capturing all forms of the various profiles of the energy-poor. In fact, energy poverty is strongly connected with the personal perception of thermal comfort. For example, in the same household, in the same dwelling and with the same characteristics, one person might feel cold and another does not, as personal preferences differ.

As energy poverty is **multidimensional**, you will always need more than one indicator. For example, if you wish to investigate energy poverty among the elderly in a specific neighbourhood, because you have information that there is a high percentage of arrears in energy bills in that area, you may need indicators on the elderly population distribution in that neighbourhood, arrears with bills in the same neighbourhood, energy expenditure and income, energy efficiency of dwellings and additionally thermal comfort perception.

You can **re-analyse the hypothesis** in light of the new results you obtained, and discuss this with others. In some cases results may seem strange or not make sense, and there may be a hidden detail that requires additional data analysis. For example, citizens in an income-poor neighbourhood with old, energy-inefficient housing may not have any arrears or problems paying the bills, appearing not to be in energy poverty. However, this may not be the case, and there is enough evidence to go deeper into the analysis. It may be that in this area people decided not to properly heat or cool their homes, resulting in low energy bills but also poor thermal comfort. In this case, it would be necessary to further investigate, possibly analysing under-consumption or even conducting interviews to investigate how these people feel in their homes. It is better to be sure than to jump to hasty conclusions. It is vital to keep an open mind at this step, and try to understand all the aspects of the information that has been collected. For the same reason it is fundamental to involve the key stakeholders in this discussion, especially those that have closer contact with the target audience and can provide their perspective, which may not be visible through available data (e.g. Civil Society Organisations, NGOs, Social Services, etc.).

The approach adopted is strictly connected with the outcome you want to reach and the questions you posed. It may be that in order to plan some actions and identify the beneficiaries you need to establish a **threshold**. The diagnosis can be the identification of persons in a situation of vulnerability or energy poverty in a neighbourhood. In this instance by using the indicators you are able to separate the non-energy poor from the energy poor. You can evaluate different methods to distinguish between the groups. For instance, using *expenditure and income*, you can use the double median energy expenditure. This means that if a household has a higher energy expenditure than double the median energy expenditure of the population, then it is in energy poverty. This approach is dependent on the population and context (relative). Alternatively, you can adopt a different method and consider that a household needs to have a disposable income after energy expenses higher than 600 euros to have quality of life; any household with a lower disposable income will be in energy poverty. This approach is absolute (fixed standard of liveability). You can also evaluate the degree of the problem, whereby in this case you would evaluate the distance that each household is situated from the threshold.

During this entire process it is important to **be pragmatic** and to obtain information that you are sure is consistent and can also be collected for the next round of information gathering (monitoring progress and updating the local diagnosis). Do not forget that tackling energy poverty is a process, so you may decide to close off your diagnosis with confirmed but less widespread data at this moment, with the aim to improve and expand your knowledge in the future. Bear in mind that different factors influencing energy poverty can vary over time (e.g. rise in energy prices). It is therefore important to take into account that our diagnosis is an x-ray of energy poverty today, which can be very different in two or five years time. Moreover, changes in legislature may contribute to changes in the approach and measures implemented to support vulnerable consumers.

If household data is not available, you can develop an approach based on regional vulnerability, using average or median indicator values. The result is a range of values, which signifies that you can observe whether a region or neighbourhood is more vulnerable than another, but you cannot identify the energy poor. For instance, a neighbourhood with a higher share of inefficient dwellings, elderly people, and lower median income will be more vulnerable.

It is relevant to mention that these approaches can be conducted with higher or lower levels of complexity and reliability. A simple formula can be used to inter-relate the indicators, or statistical methods may be applied. The latter provides important information on correlations, probabilities and uncertainties between causes and consequences, with a higher level of confidence, but may require technicians with expertise in these methods. Consider whether there is the need to involve an external expert for data visualization, which may facilitate this process. Obtaining the knowledge of an expert can also be valuable in order for the outcome to be transparent.

After you have considered all the foregoing reasoning, it is time to update the table with the hypothesis. You can integrate the information based on the newly gathered information and the established indicators and proceed with a new prioritisation.

Table 6 – Energy Poverty Hypothesis associated with indicators

Hypothesis	We think there may be energy poverty in X neighbourhood due to the poor quality of dwellings	We think there may be energy poverty in X neighbourhood because the buildings are not connected to district heating	[...]
Original Robustness	Strong	Medium	
New Data	Socio-economic data Environmental data	Energy mix Socio-economic parameter	
New Robustness	Strong	Strong	
Indicators Selected	▸ Share of households or persons with presence of water leakage, dampness or rot in their dwelling / total households or persons ▸ Percentage of households or persons within the municipality experiencing heating discomfort / total households or population ▸ Number of cooling degree days per year ▸ Vulnerable persons or households / total persons or households ▸ Inability to maintain the home adequately warm	▸ Households or persons connected to the gas grid / total households or persons ▸ High share of energy expenditure in relation to income (2M) ▸ Percentage of households or persons within the municipality with access to clean cooking fuels and technologies ▸ Average price of gas ▸ Average price of electricity ▸ Persons or households receiving social assistance	

SUGGESTED LINKS

- Selecting indicators to measure energy poverty (Directorate-General for Energy, 2016)
- Energy poverty indicators: A systematic literature review and comprehensive analysis of integrity (Siksnelyte-Butkiene, I.; Stremikiene, D.; Lekavicius, V.; Belezentis, T., 2021)
- Rethinking the measurement of energy poverty in Europe: A critical analysis of indicators and data (Thomson, H.; Bouzarovski, S.; Snell, C. & al., 2017)
- European energy poverty metrics: Scales, prospects and limits. (Sareen, S.; Thomson, H; Tirado Herrero, S. & al., 2020)
- EPAH national indicators dashboard
- Energy Poverty National Indicators: Insights for a more effective measuring (2022)

SUGGESTED ACTIVITIES

- Design a table with hypothesis, indicators, dataset and combine each of the hypothesis with the specific indicators and the dataset needed to monitor it.
- Critically discuss different sets of indicators focusing on the insight they provide and how they can contribute to characterize and define your local energy poverty.

Finalising

The finalising stage can be seen as both the moment to formalise your local energy poverty assessment and the methodology adopted, as well as the time to consider how to channel the information you have collected.

You do not require the involvement of all the team nor a significant budget in order to finalize the diagnosis. It can be done independently by the focal person working on energy poverty. However, we advise the involvement of the entire working group to undertake a review and provide feedback. It may be useful to involve the communication team (if present) to reach the desired target audience. Depending on the specific objective, evaluate whether to involve a communication expert to prepare specific announcements or to advise on engaging a top-level audience (e.g. investment entities).

STEP 7: DEFINE YOUR LOCAL ENERGY POVERTY AND COMMUNICATE IT

Objective: Conclude the first phase keeping record of the process and sharing key information

Now that you have all the different elements, it is time to formalise the final Energy poverty Diagnosis Report. It is important to conclude the diagnosis phase with a structured report that keeps a trace of the methodology adopted and the steps performed. This will make it easier to remember what has been done and make the process clearer for an external person who wishes to understand how you performed the diagnosis.

Keep in mind that you must perform a second diagnosis to evaluate the impact, comparing the results with the previous diagnosis and analysing what has changed. In order to do this it is important to replicate the same action and make sure that there are no differences in the methodology which could introduce a change that is not due to the actions that have been implemented.

Focus the document on the main objective that you established when starting the whole process, and show the development of the hypothesis, indicators and information you collected. Report on the robustness, based on the various approaches you followed. If the definition reached is based only on hypotheses and indicators which are not fully confirmed, it is important to clearly state this, and to underline that the definition still needs to be fully confirmed.

In terms of the structure of the report itself, you may draw inspiration from the various steps provided, and detail each step with the material produced (stakeholder mapping, list of resources, definition of indicators, data analysis, maps and visualization, data collection method used, etc.). Considering that many steps were performed with the assistance of a team, it is worthwhile to involve different persons in compiling the final version. Also consider some additional time to request external feedback from other stakeholders. You can use the diagnosis reports in the links as inspiration.

Part of the finalising step is to understand how to channel the information in order to engage different audiences who can support the proposed actions. Being able to communicate is a powerful tool to gain consensus, mobilize political will and/or obtain funds. In order to achieve this, identify the key messages that you want to convey and define your target audience(s). It may be that you want to communicate to citizens that the municipality is taking actions, and to the stakeholders that there is a need to allocate a budget for additional actions. You can then decide how, where and when you will communicate. Different approaches can be used; you may want to develop a campaign, convene a face-to-face meeting, or send an email. You may consider using your website or social media channels, or you may prefer to present the results during an event. Finally, consider all the personnel involved and their capacity to reach your target audience. Beyond the identified personnel, evaluate if other stakeholders possess specific expertise on energy poverty and may assist you in spreading your message faster.

SUGGESTED LINKS

- Diagnosis of energy poverty: Girona Municipality (Spanish, 2017)
- Diagnosis of energy poverty: Barcelona (Catalan, 2016)
- How to communicate your project (all EU languages, 2022)

SUGGESTED ACTIVITIES

- Write your energy poverty diagnosis report draft and share it with the various stakeholders to gather their inputs. Appoint one focal person to finalise the editing.
- List 2-3 clear and concise key messages and the specific target audience(s). Evaluate possible ways to reach them with your communication.

Next steps

At this point, you have in your hands a complete diagnosis of energy poverty in your local context, plus some additional material that can assist you in your next phase: Planning.

It may be difficult to decide when to stop the diagnosis and move on to planning and implementing. Energy poverty is a multifaceted challenge and you may have the impression that you do not have enough information and constantly need more. Moreover, in this fast-changing world, you may also have the feeling that by the time you complete the diagnosis the scenario has already changed.

You may iterate the various steps in the diagnosis phase until you feel you have sufficient basis to move on. However, consider that moving to planning and implementing can also unlock a better understanding of the energy poverty situation at your local level.

Remember that we are working on a circular model where we start reviewing and updating the diagnosis after each time. You will realise that each time you will gain more confidence in the process and more information, allowing you to properly address multiple aspects of the challenge.

The overall objective of the whole process is to start tackling energy poverty, and even small actions planned on the available diagnosis may contribute to deliver a positive impact. Understand when it is the right moment to stop analysing, and don’t be afraid to take action.

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