Porto Energy Hub

Energy Efficiency for all.

D2.1 Porto Energy Hub Local Development Plan

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708

Porto Energy Hub

Energy Efficiency for all.

This publication reflects only the author's view. The Agency and the European Commission are not responsible for any use that may be made of the information it contains.

Document information	
Project Acronym:	PEER
Grant Agreement ID:	101033708
Work package:	WP2
Dissemination level:	Public
Lead Partner:	AdEPorto
Version:	2.0 (Final version)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708

Document history			
Date:	**Author:**	**Partner:**	**Changes:**
20/05/2022	Inês Reis	AdEPorto	Writing document draft (0.0)
31/05/2022	Emanuel Sá Cátia da Costa Carolina Gonçalves Rui Pimenta Ricardo Barbosa	AdEPorto	Writing document draft after internal review (1.0)
05/07/2022	Joana Andrade	RdA	Revision (1.0)
06/07/2022	Rui Ferreira de Almeida	Telles de Abreu	Revision (1.0)
01/08/2022	Ana Gonçalves	S317	Revision (1.0)
02/08/2022	Inês Reis Ricardo Barbosa	AdEPorto	Final revision (2.0)

Table of contents

Table of figures

1. Introduction

1.1. Background

The buildings sector is responsible for around 40% of the final energy demand in Europe and about 30% in Portugal. However, more than 50% of this energy use can be decreased through energy efficiency gains from improvements in both the passive performance of buildings and the equipment used [1]. As only around 1% of the EU buildings undergo energy-efficient renovation every year, action is crucial to reach Europe's ambitious climate-neutral (net-zero emissions) targets before 2050. However, building renovation is not always an easy path to follow and it does not provide all the answers. According to a report on the Energy Efficiency Directive, produced by the Joint Research Centre, among the 28 Member States, Portugal is the EU country in which building renovations are less effective in terms of energy savings, regardless of the level of renovation (light, moderate and intense) [2]. This buildings' inefficiency has very significant impacts on the energy bills and the thermal comfort of occupants. Indeed, in 2020, Portugal occupied the 5th worst position in terms of the inability in maintaining homes adequately warm, only ahead of Bulgaria, Lithuania, Cyprus, and Turkey (Fig.1) [3].

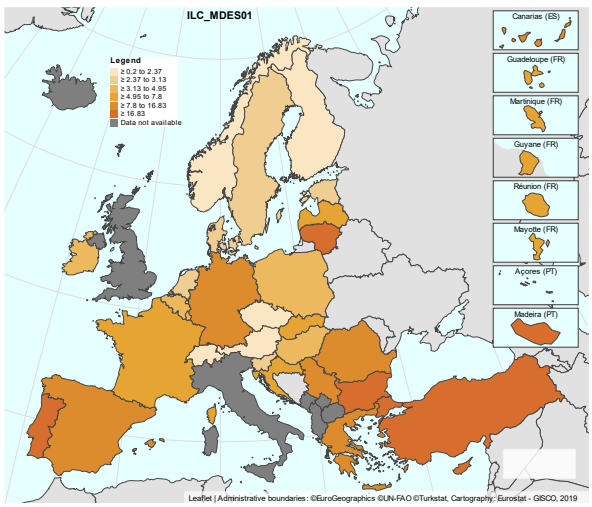


Figure 1 - Inability to keep home adequately warm [3].

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708

The focus on buildings is boosted by the European Green Deal through the strategy "A Renovation Wave for Europe – Greening our buildings, creating jobs, improving lives" which aims to boost renovation in the EU by doubling annual energy renovation rates in the next 10 years. The Renovation Wave identifies 3 focus areas: a) tackling energy poverty and worst-performing buildings; b) public buildings and social infrastructure; and c) decarbonizing heating and cooling.

Energy poverty is an increasingly discussed topic in the EU since, according to the EU Energy Poverty Observatory (EPOV), more than 50 million EU families are in this situation [4]. There is no legal definition of Energy Poverty in the EU, however it is generally accepted as a situation where households or individuals cannot access essential energy services such as heating and cooling at affordable costs, and it is caused by a combination of low wages, high energy prices and inefficient buildings. This phenomenon has health consequences, as well as impacts in well-being and ability to fully participate in all societal domains [5].

But why is a country with a mild climate like Portugal a place where more citizens are exposed to the cold and discomfort at home? Several factors contribute to these worrying levels, including [5]:

- *inefficient residential buildings*: many of the existing buildings were built before 1990 when the first Portuguese regulation on the thermal conditions of buildings was published, and historically, thermal insulation was not one of the priorities when designing/building new buildings; therefore, most houses do not have any kind of thermal insulation. As a result, the energy performance of most buildings in the country is poor. Among the residential buildings whose energy certificates have already been issued, 69.9% obtained a classification between C and F, which are the lowest classes (on a scale in which A+ is the better one)[6]. Also, in 2020, more than 25% of the Portuguese population declared to live in a house with a "leaking roof, damp walls, floors or foundation, or rot in window frames or floor", the second worst position at European level behind Cyprus (EU27 average is 13.9%) [7].
- *infrastructure and equipment available*: while in most EU countries there is central heating equipment in the majority of homes, in Portugal, only a small share of homes (about 13%) own systems of this type. The use of electric heaters (Joule

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708

effect), very common in Portugal, results in exceptionally high energy bills, which contributes to a very restrained use of these devices. Also, wood-fuelled fireplaces and stoves are heating equipment widely used in most homes in Portugal due to their low cost. However, their low efficiency contributes to the persistence of people getting cold in their homes.

- *social practices, norms, and aspirations*: the culture of southern European countries favours personal adaptive comfort practices (through outerwear, for example) to the detriment of heating the house. The main reason for not using more often (or at all) heating equipment has economic order, normalizing excessive cold or heat in homes, which are perceived as "usual" and accepted [5]. According to the results of a survey performed in 2017, 20% of the Portuguese population uses only clothes and blankets as a strategy to improve their thermal comfort [8].
- *low average incomes of citizens and energy prices*: Portugal is characterized by high levels of poverty and economic inequalities. In 2020, 20% of the Portuguese population was at risk of poverty or social exclusion [7]. Also, the high GINI index (33% in 2020 [9]) reveals the social gap between the richest and the poorest, placing Portugal as one of the European countries with the highest income inequality. On the other hand, energy in Portugal is one of the most expensive in the EU. Since the liberalization of the electricity market, citizens have been able to choose between several suppliers. Still, in the second half of 2021, Eurostat estimated that Portugal was the 10th EU country with the most expensive electricity for households[1]. Regarding gas, in the second half of 2021, Portugal was also among the ten EU countries where the highest prices were recorded [2].This lack of political understanding regarding the price of energy charged to families, in a country where most of the energy used at home concerns the most basic domestic tasks, such as food (and not heating the house, as happens in most other countries in the EU), also seems to reveal how neglected the thermal discomfort at homes is in the Portuguese society.
- *literacy of citizens and relevant agents*: in addition to the financial incapacity to carry out renovation works at home, there is also a generalised lack of

[1] Retrieved from: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Electricity_price_statistics

[2] Retrieved from: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Natural_gas_price_statistics#Natural_gas_prices_for_household_consumers

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708

knowledge about what can be done to improve thermal comfort and which materials and techniques are most suitable for each case. Uncertainty as to the cost-effectiveness and the current outcomes in terms of savings of such investments also holds back action.

To offset these issues, many cities and regions in Europe are developing actions to help their population in their renovation journey and promote private buildings' renovation. This includes physically or virtually based One-Stop-Shops (OSS), which provide an important advice and information centre for both citizens and professionals. An OSS designed to assist buildings renovation can be described as an advisory tool where multiple services are provided and needs are met in a single location, helping homeowners, designers, and contractors to plan renovation works in all their aspects.

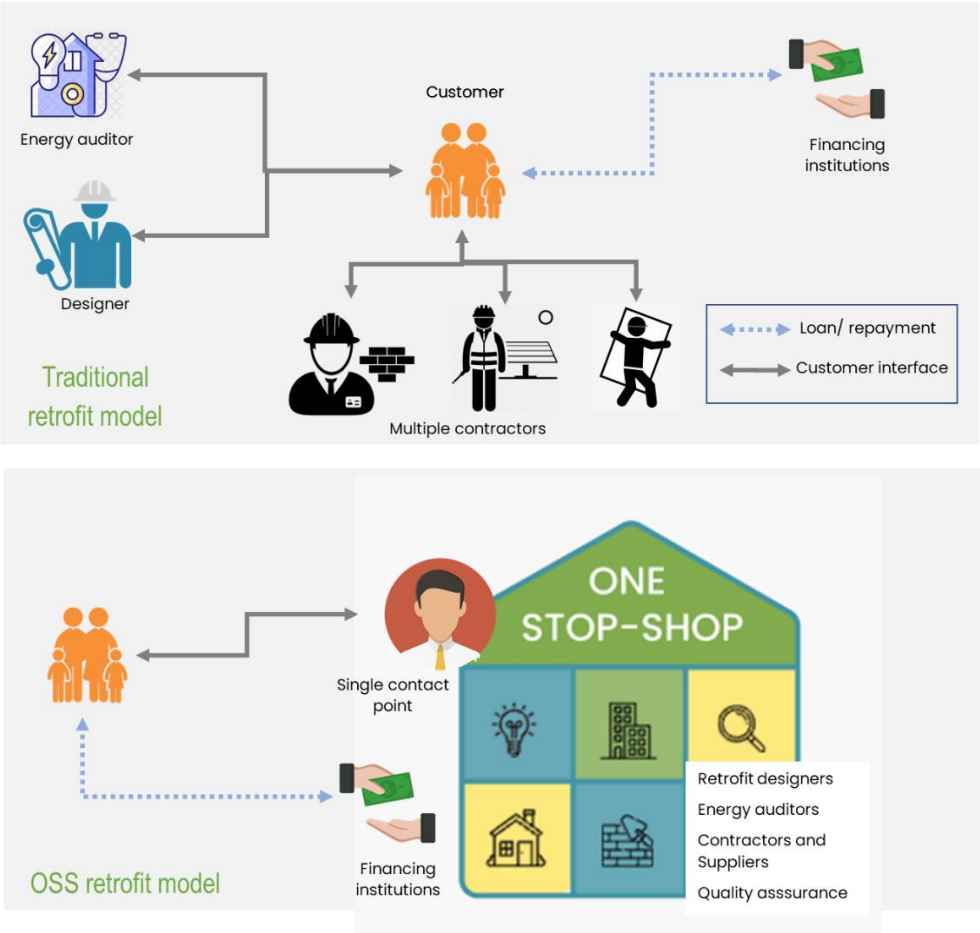


Figure 2 – Traditional vs. OSS retrofit models (own figure inspired on https://www.interregeurope.eu/sites/default/files/inline/2019_02_10_PolicyBrief_OSS.pdf).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708

These physical and/or online platforms are generally free-of-charge for customers and provide advice, services, and solutions, linking all the interested parties, namely, tenants, property owners, construction companies, funding institutions, and public organizations, raising awareness concerning the energy poverty topic. The concept has been introduced in the revised Energy Performance in Buildings Directive (EU) 2018/844 [10] and since then, OSS have been developing across Europe as a way to effectively manage renovation projects by creating and making available useful resources such as reliable and sound information, checklists, tools, process descriptions, catalogue of practical policies and measures, discussion forums, training material, contacts of accredited renovation work companies and dedicated services like accessibility to funding, incentives and other financial mechanisms.

1.2. The PEER project contribution

The Porto Energy Elevator (PEER) project aims at developing a bold renovation program to fight energy poverty, promoting buildings' energy efficiency and self-consumption renewable energy communities, as well as mainstreaming new financial schemes.

The most relevant driver for achieving PEER's objectives will be Porto Energy Hub (PEH), a dedicated OSS to enhance public and private stakeholders' engagement, from municipalities and social housing management entities to private institutions, individuals, and households. The PEH will be the PEER public brand and the central point to search all information and services needed to implement energy renovation projects, enabling to boost synergies, and aggregate investment volume, as well as to engage the market stakeholders and mitigate market barriers.

PEH is created to address one of the most relevant barriers to sustainable, effective, and inclusive building retrofitting: the fragmentation of the building renovation value chain. This fragmentation contributes to the perception citizens have regarding building renovations as complicated and uncertain, mainly due to unstable factors affecting the works' duration and costs. In this setting, OSS's are promising tools as they gather, in a single contact point, several services and dimensions involved in building renovations, ranging from information to technical assistance, financial advice, and support, as well as the monitoring of energy savings after works

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708

completion, providing a full range service path from the renovation design to the coordination of the process and the provision of adequate (and affordable) financing schemes.

2. PEH local development plan

The PEH Local Development Plan (LDP), presented in this document, aims to set the scene, and establish all the steps and required conditions to set up the PEH. A LDP is an operational document which helps to define the required steps and terms to meet the goals to be achieved – to set up an OSS to support energy efficient home renovation and local energy generation - based on a comprehensive market gap analysis. This document aims to address questions as following, but not limited to: *What are local/regional market needs? What are the PEH objectives? What is the operational strategy? Who shall be involved? In what time? Which are the best service packages to be offered to different target groups?*

The general architecture of the PEH LDP is described in Fig. 3 and is inspired in the LDP template developed and implemented in the scope of the INNOVATE project (http://www.financingbuildingrenovation.eu/). Each dimension is further detailed in the next sections.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708

What is the starting point? - Market gap diagnosis

- Synthesis of the market gap analysis (MGA) and relevant issues to be addressed in a LDP: Why take action? What are the needs and opportunities?

Where to? - PEH goals and value proposition

- What is the PEH aim? What are the objectives? What is the added value of PEH? Description of the overall PEH goals which would allow to fill the gap identified in the MGA

How? - PEH operationalization

- What is the operational strategy? What are the main steps to be taken? What are the key activities needed to be implemented to operationalize PEH? Which partners/market players will be mobilized and when?

Who are the project human resources?

- Who are the project human resources / project-holders? What role the project consortium will play (facilitator, developer, coordinator?) and how each member will collaborate?

PEH operation stages - Action plan

- What are the operational stages and timing for the implementation of the project?

PEH success indicators

- How the project's success can be assessed? What are the measurable indicators?

Figure 3 – PEH Development Plan framework

2.1. What is the starting point? - Market gap diagnosis

To set up a successful OSS, territorial and local characteristics must be considered. Climatic and building features (e.g., age of the building stock), households' socio-demographic characteristics as well as functional, social, behavioural, and technological questions must be assessed as they may directly or indirectly influence the PEH market and shape its underlying business model.

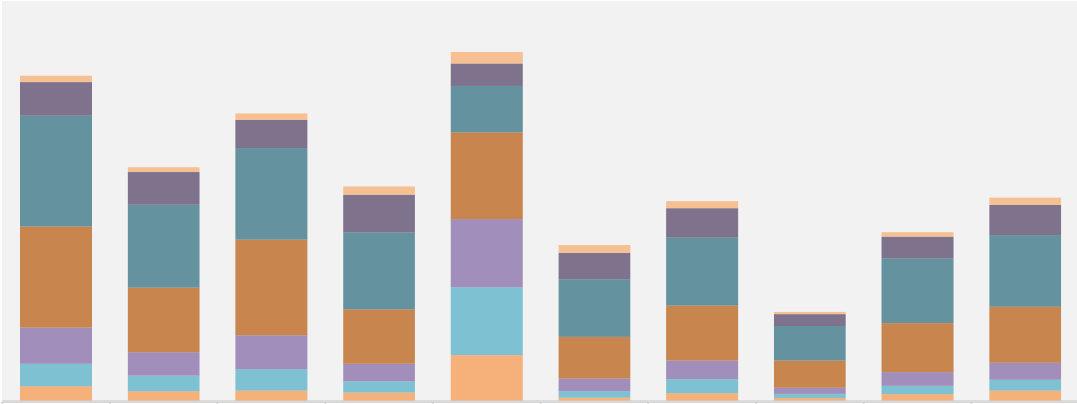
The PEH will be available for all the citizens who will require its assistance. However, this analysis will focus on the ten municipalities of the Porto Metropolitan Area supported by the Porto Energy Agency (AdEPorto) (Gondomar, Maia, Matosinhos, Paredes, Porto, Póvoa de Varzim, Santo Tirso, Trofa, Valongo and Vila do Conde), who will promote and ensure the continuity of this initiative after the end of the PEER project.

These ten municipalities represent more than 1.1 million people, 66% of which located in the municipalities of Porto, Matosinhos, Gondomar and Maia. In the ten municipalities there is currently more than 251 thousand residential buildings from which more than 84% are detached homes or small apartment buildings. This fact is

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708

relevant as few homeowners are easier to engage and convince to undertake renovation projects than multiple homeowners. Also, more than 85% of the existing buildings in the referred municipalities are more than 20 years old (built before the 2000s), and although around 61% of them are already certified, 64% of these buildings score C or worst in the efficiency scale, revealing the general low energy performance of Portuguese residential buildings. The advanced age of the built stock and its poor energy performance anticipates a high market potential for the PEH.

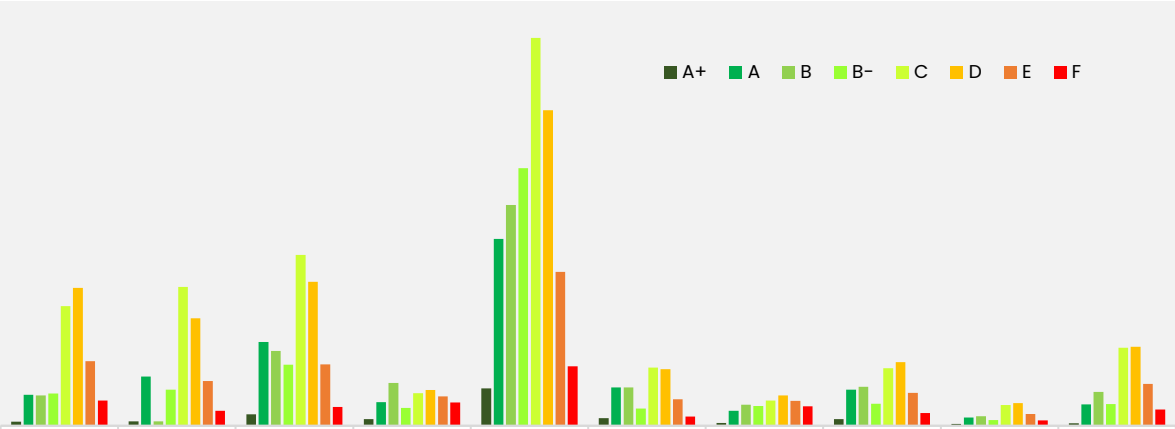
Another factor to consider is the strong existing architectural heritage which characterize some of the cities as is the case of Porto, which has one of the biggest historical city centres in Portugal. This factor constrains renovation works which may compromise the building aesthetic as is the case of adding external wall insulation or installing onsite renewable energy systems in the rooftops. Therefore, the local rules imposed by each municipality must be considered which may result in technical and infrastructural limitations and/ or more costly works.



	Gondomar	Maia	Matosinhos	Paredes	Porto	Póvoa de Varzim	Santo Tirso	Trofa	Valongo	Vila do Conde
2011 - 2021	707	521	706	950	1284	908	789	252	490	810
2001 - 2010	3761	3681	3178	4244	2532	2952	3307	1304	2470	3414
1981 - 2000	12473	9319	10290	8616	5206	6476	7632	3902	7276	8056
1961 - 1980	11371	7293	10743	6125	9758	4698	6199	3058	5483	6305
1946 - 1960	4072	2624	3823	2007	7672	1417	2064	675	1552	1899
1919 - 1945	2511	1737	2421	1227	7628	746	1609	483	948	1215
Before 1919	1737	1179	1226	1035	5223	432	933	398	830	1237

Figure 4 – Number of buildings by location and construction period (retrieved from: https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_indicadores&indOcorrCod=0011155&contexto=bd&selTab=tab2).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708



	Gondomar	Maia	Matosinhos	Paredes	Porto	Póvoa de Varzim	Santo Tirso	Vila do Conde	Trofa	Valongo
A+	156	163	431	256	1409	284	110	254	67	94
A	1165	1855	3151	894	7039	1441	566	1362	307	811
B	1148	173	2823	1609	8310	1449	792	1464	354	1278
B-	1219	1362	2302	677	9700	655	742	829	214	814
C	4502	5226	6436	1225	14604	2192	954	2173	786	2944
D	5187	4048	5425	1350	11877	2130	1139	2394	856	2975
E	2433	1682	2316	1110	5794	998	934	1238	444	1581
F	949	568	715	881	2234	347	732	484	206	611

Gondomar	Maia	Matosinhos	Paredes	Porto	Póvoa de Varzim	Santo Tirso	Vila do Conde	Trofa	Valongo	
74527	60725	83719	35653	140814	36115	30391	38818	15990	41218	Total Number of Dwellings
16759	15097	23599	8002	60967	9496	5969	10198	3234	11108	Issued Energy Certificates
22%	25%	28%	22%	43%	26%	20%	26%	20%	27%	Share of certificate dwellings

Figure 5 – Number of energy certificates issued for residential buildings per performance level (retrieved from: https://www.sce.pt/estatisticas/).

On the positive side, the local commitment of this group of municipalities regarding the energy transition and the mitigation of energy poverty in their territories must be highlighted. All these municipalities (except for Paredes) are signatories of the Covenant of Mayors for Climate and Energy[3] and integrate detailed targets for buildings' renovation in their Sustainable Energy and Climate Action Plans, for private, public, and buildings under municipal management, with a strong focus on the issue of energy poverty, especially in the context of social housing. In fact, a great collective effort has been made by these municipalities towards the improvement of the energy and thermal performance of social housing districts which, in the set of ten municipalities, includes 263 neighbourhoods and shelter more than 25,800 families. In addition to the political commitment, the current enabling framework of financial

[3] https://www.covenantofmayors.eu/en/

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708

support and incentives for building renovation, energy efficiency and renewable energies fostered by the Recovery and Resilience Plan (RRP) is also triggering the interest of citizens regarding these issues. The Portuguese RRP identifies energy efficiency in buildings as a priority for economic recovery in line with climate and digital transition. Therefore, a special emphasis is given to the European Renovation Wave, dedicated to building renovation and which aims to address the current low rates of renovation across the EU.

Within the RRP's *Resilience* dimension, Investment RE-C02-i01 concerns the Support Program for Access to Housing and has an allocation of €1,211 million aimed at supporting 26,000 families by 2026. This investment line reinforces the funding granted under the "1º Direito" Programme[4], created by Decree-Law no. 37/2018, which aims to provide adequate solutions for people who live in unworthy housing conditions and who do not have the financial capability to bear the costs of accessing acceptable housing. This programme aims to implement the Local Housing Strategies developed by local authorities where diagnoses of the existing housing conditions and the scheduling of investments to be supported in each territory are made. Under this context, local entities are focusing their attention on the renovation of social housing projects to promote proper housing situations for these citizens.

Also, the "Vale Eficiência"[5] program, as part of the investment TC-C13-i01 – Energy Efficiency in Residential Buildings of Component C13 – "Energy Efficiency in Buildings of the RRP intends to deliver 100,000 "efficiency vouchers" to economically vulnerable families by 2025. Each "efficiency vouchers" provides €1,300 (plus Value Added Tax) per household so that they can invest in improving the thermal comfort of their home, either through interventions in the envelope, or through the replacement/acquisition of energy efficient equipment and solutions. This investment line has an allocation of €300M.

More recently, a special investment line of the RRP was open to trigger the financing of renewable energy communities and collective self-consumption projects, both in residential (03/C13-i01/2022), public (02/C13-i02/2022) and commercial (02/C13-

[4] More information on the "1º Direito" Programme available at: https://recuperarportugal.gov.pt/candidatura/programa-de-apoio-ao-acesso-a-habitacao-n-o-01-c02-i01-2021/

[5] More information on the "Vale Eficiência" Programme available at: https://recuperarportugal.gov.pt/wp-content/uploads/2021/08/Aviso_VE_FA.pdf

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708

i03/2022) settings. This funding line has a budget allocation of €30 M and aims to promote the installation of 93 MW of photovoltaic energy.

From the supply side, building renovation industry is covered by several highly qualified home renovation companies and professionals which increases the chance of delivering good-quality renovation services to homeowners. Still, one-stop advice points dedicated to support citizens during the whole home renovation journey are not yet common in Portugal. So far, only few projects are aiming to support Portuguese homeowners in renovation processes. The H2020 EUROPA Project – Energy Efficiency Subscription for Deep Renovations with Performance Guarantee[6] - is one of them. This project is intended to create an OSS to facilitate the renovation process of residential buildings in Alentejo (South Region of Portugal). The "Ponto de Transição"[7] pilot-project, promoted by Calouste Gulbenkian Foundation, also focuses on the energy poverty issue through the support of qualified experts who advise homeowners on electricity and gas bills, inform on how to obtain financing for homes energy renovation and support funding applications, while provide free-of-charge simplified energy audits. Despite the existence of these projects in the country, none of them covers the geographic area of northern Portugal.

In addition to these projects, other energy advisory initiatives are available in the country. Noteworthy is the Energy Advisory Office (GAE – developed by DECO (https://deco.pt/timeline/gae-gabinete-de-aconselhamento-de-energia/) and created under the H2020 STEP project. GAE provides personalized, detailed, and free of charge advice to consumers focusing on issues related to the access to the energy social tariff, the change of energy supplier or the existing financial incentives. Additionally, platforms such as the "Portal Casa Mais" (https://portalcasamais.pt/) stand out. This online platform helps citizens to identify opportunities for energy improvement in homes in order to reduce energy and water consumption and increase comfort. This platform also allows to identify professionals and businesses involved in building renovation and energy efficiency equipment, as well as incentives and financing solutions. The Green Renovation Menu platform (https://www.menurenovacaoverde.pt/pt/pt/casas) is also intended to help

[6] https://europaonestop.eu/

[7] https://gulbenkian.pt/programas/programa-desenvolvimento-sustentavel/acao-climatica/ponto-de-transicao/

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708

homeowners to increase the sustainability of their homes and improve their comfort conditions, in particular by focusing on the most vulnerable ones and those who live in older and inefficient buildings. Despite these strengths, none of these projects can provide tailored support for several types of entities, ranging from citizens to municipalities and private and public housing management entities in both energy efficiency and renewable energy generation. This gap, associated with the need to create a space of proximity where people and entities can go to ask for support, motivates the existence of the PEH.

Based on this information, the following market gaps can be listed:

- Lack of a coordinated advice and guidance for home renovation activities;
- Lack of access to reliable and intelligible information on energy efficiency, renewable energy and funding opportunities;
- Lack of citizens awareness on energy savings potential; and
- Lack of awareness on the existing financial options for energy efficiency actions[12];
- Lack of financial schemes customized to each case [11].

2.2. Where to? - PEH goals and value proposition

PEH is envisioned to be a centre for knowledge dissemination, advice, monitoring, and quality guarantee to support citizens towards the implementation of energy efficiency and renewable energy projects in their homes. The PEH OSS should follow all the steps of an energy efficiency project, starting from raising citizen awareness up to the implementation and following quality assurance and monitoring. The PEH OSS will be responsible for coordinating the whole value chain, linking market gaps wherever necessary, as explained in the MGA. Although both the banking and the construction are mature sectors, a well-designed support through the whole value chain is missing. This role will be fulfilled by the PEH team and partners.

A summary of the main market gaps and activities that the PEH will develop to overcome them is presented as follows:

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708

Market gap	Proposed activities
Lack of a coordinated advice and guidance	Establishment of a reference point for citizens to encourage them to adopt energy efficiency and renewable energy in their home while accompanies them throughout renovation works. The support of Municipalities and trusted partners will create a trustful environment which will attract citizens. PEH staff will elaborate customized energy renovation and financial plans for each project or bundle. PEH can assist the choice and facilitate the link between customers (demand) and suppliers by providing access and guiding the citizen through a supplier and experts' database.
Access to reliable and intelligible information	The PEH OSS aims to be a reference point for energy efficiency related information dissemination as well as available financing schemes. The PEH OSS will not be granting incentives directly, but it will help citizens to find the best available financing options, if required. Through appropriate marketing materials, PEH will gather and disseminate information on energy efficiency and its financial and environmental benefits acting as a knowledge hub.
Lack of awareness about energy savings potential	Citizens aiming to perform energy efficiency renovations and implement renewable energy in their homes will benefit from preliminary studies with estimates of energy and cost savings, which will help customers make more informed decisions.
Lack of awareness on existing options to finance energy efficiency projects	Citizens aiming to implement energy efficiency actions (replacement of equipment, insulation, renewable energy generation, etc.) and needing for external funding options will be duly informed of the existing solutions and supported in the application processes for funding sources.
Lack of financial schemes customized to each case	Collaboration with banks and financial entities to co-design innovative financial tools (e.g., soft loans), ensuring long-term and affordable financing options.

PEH services will be available to a wide range of customers namely, households (detached homes, apartments, etc.) from different socioeconomic levels, condominiums, social housing managers, residents' cooperatives, municipalities, etc. The Hub will work online and physically at both AdEPorto and Municipalities premises where staff trained to support citizens in basic questions and perform a first screening will be available in specific days (by demand).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708

2.3. How? - PEH operationalisation

To start the discussion on how the PEH OSS will be implemented, a brainstorming session was carried on 12 April 2022 at AdEPorto's facilities (Fig.6). This discussion session was attended by all project partners and served to begin outlining the business model that will sustain the PEH OSS. The business model canvas template was used to trigger the discussion.

The outcomes of this session will be further elaborated in the PEH Business Plan. Still, a first draft of the steps that PEH' clients and staff need to go through is presented in Figure 7 and described as follows.

In a nutshell, clients contact the PEH services and fill a survey which allows a preliminary characterization of the baseline scenario as well as to identify the required support needs. These data allow a first screening and trigger the next steps.

If required, visits to clients' homes are scheduled, a simplified energy audit is carried out and a proposal with the identification of interventions is issued. The Hub can also support customers by providing access to contacts for engineering, architecture, designers, contractors, equipment and service providers, auditors, etc. This support is sustained by a database, created in an exempt way, and which will contain a list of technicians who fulfil a set of quality prerequisites. PEH customers may also need financing. In this sense, advice on available funding schemes and support for applications will be provided by the Hub staff. Once the technical and financial conditions are met, contracts are established between the companies that provide the services and customers and the measures are implemented. During implementation, the PEH staff monitors the work, and the results are analysed for quality assurance.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708

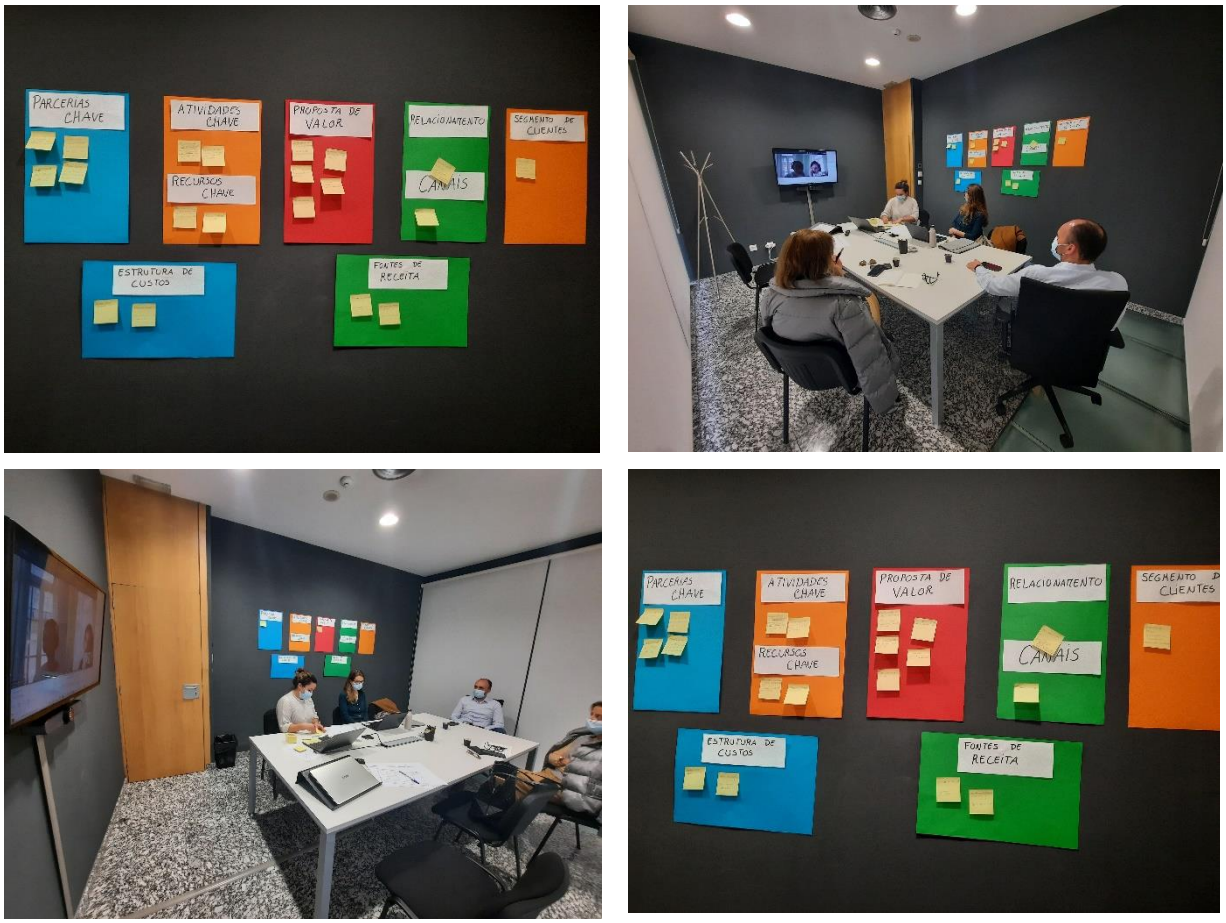


Figure 6 – Brainstorm session to discuss PEH business model.

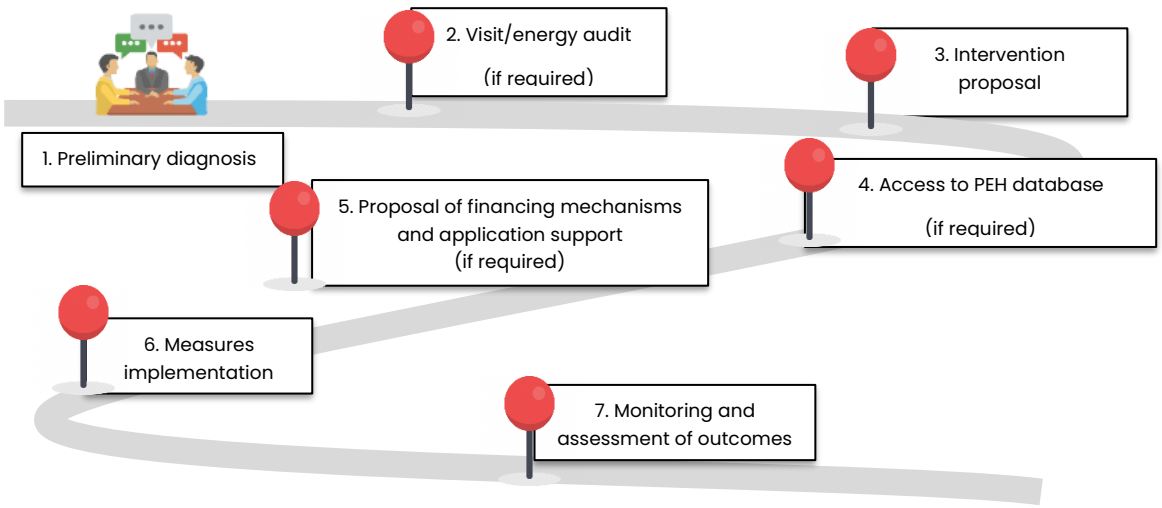


Figure 7 – PEH renovation path.

To launch the PEH services, the subsequent steps are being/need to be followed:

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708

1. Discussion on the PEH OSS business plan - the brainstorming session carried on mid-April and illustrated in Fig.6 kicked off the PEH OSS discussion following the main outcomes of D3.1 - Benchmark Report that included a first review of other renovation OSS implemented across Europe. The first ideas gathered in this session were presented and discussed with the project Advisory Board during a meeting carried out in June 2022.
2. Preparation of the Porto Energy Hub OSS platform – one of the main channels for contact is through the website. Thus, since the beginning of the PEER project, a great focus was put on the website implementation having been hired a dedicated marketing and communication team responsible for both the website and the project communication materials. The website includes a preliminary survey which allows to gather information on energy consumption and buildings performance for a first screening as displayed in Fig. 8. Based on the information retrieved, a preliminary assessment is carried out and a conversation (over the phone, online or in person) is triggered with the PEH staff.

Client identification and scope	Buildings	Thermal comfort	Equipment
• Choice of location and email contact	• Type of building • Age • Size • Housing situation • Type of glazing • Type of framing • Insulation	• Perception on the thermal comfort of the dwelling • Practices regarding home heating/cooling	• Characterization of the existing equipment (listing, age, and energy label)

Figure 8 – Dimensions assessed in the online platform.

3. Preparation of the physical Porto Energy Hub OSS desks - The several municipalities associated to AdEPorto will be informed about the services and operational functioning of the Porto Energy Hub OSS and asked to express their interest in providing a physical site to implement the service. To host the PEH OSS, municipalities need to provide a room/desk in which information on the PEH services is displayed to citizens (preferably in both printed and electronic forms). If possible, the spaces designated by municipalities should allow to be used as consultation meeting rooms so that, if needed, meetings between citizens, PEH staff and experts are held.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708

4. Training of municipal staff to attend PEH customers - Municipalities willing to made PEH services available to their citizens must appoint a small team of municipal officers to support the work of the PEH staff. These officers (1-3) will mainly be doing support work including routing of phone calls, being the first point-of-contact for citizens and gathering of basic information, forwarding to the website and to PEH team contacts, scheduling of meetings, and delivery of informative support material on energy efficiency and financing programs. Initial training will be provided to municipal officers to frame them into the project, help them to sort out situations and provide appropriate follow-up to each specific case.
5. Structuring a database of experts and suppliers – In order to facilitate the contact between citizens and experts, technology providers, contractors, etc., a database will be created. To ensure exemption, the initiative will be publicized and the entities willing to participate will need to apply and gather a set of eligibility requirements to ensure the quality of services provided to PEH clients.
6. Working with municipalities, banks and financial entities for the development of energy efficiency funding schemes – As funding can be one of the main barriers to energy efficiency projects and national/regional programs are not always available, have limited resources, strict requirements and little flexibility for specific situations, a complementary work to the day-to-day work of PEH OSS will be done to, together with municipal entities, banks and private investors, create alternative funding opportunities, such as soft-loans or revolving funds.
7. Archiving and managing of data and creation of the PEH database - Information on the services provided, savings, investment, etc. will be stored at the PEH archive to keep record of the achievements. This data will not include sensitive information on customers according to the principles defined in the PEH Data Management Plan (D1.8). The gathering of these data will allow to create a valuable database through which the project consortium as well as municipalities are able to monitor the progress of energy efficiency in the territory.
8. Strategic marketing campaigns - Targeted marketing and dissemination campaigns are being implemented to promote both the website and physical service spaces. For instance, at the launch of the website on May 5, 2022,

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708

newsletters and a wide dissemination on social networks were put into motion (Fig. 9).

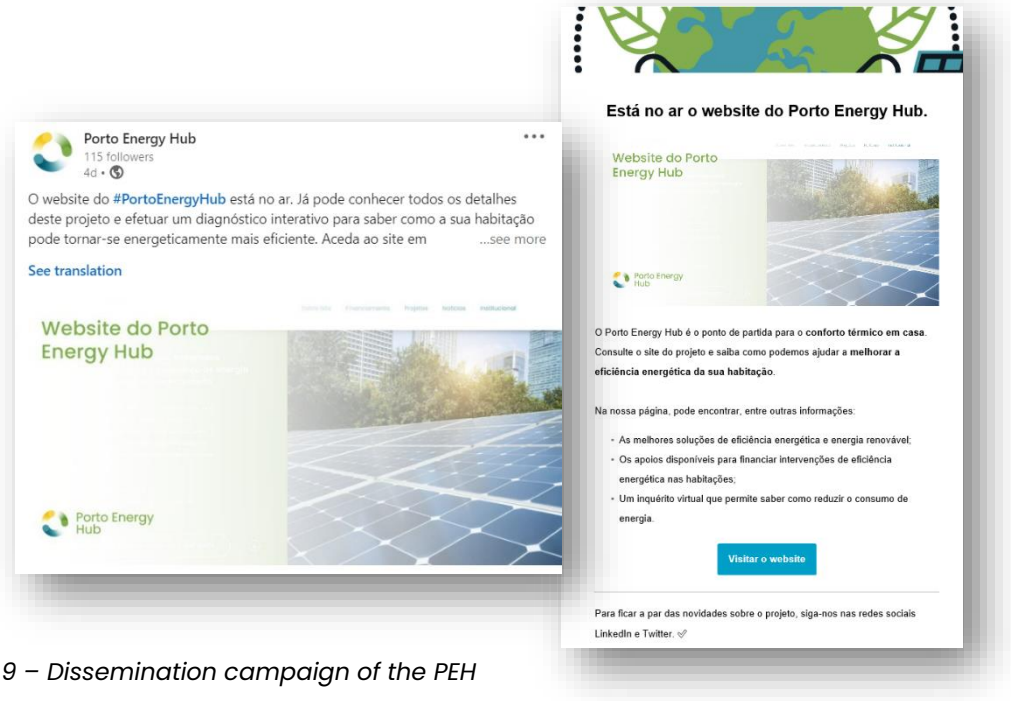


Figure 9 – Dissemination campaign of the PEH website.

2.4. Who are the project human resources?

The main human resources involved in the PEH are:

- AdEPorto – is the PEER project coordinator and plays the role of project-holder, being responsible for the connection with municipalities and local entities due to its proximity relationship and positioning in the field;
- RdA Climate Solutions – is a PEER project partner and is responsible for the technical support provided to the PEH customers and for engineering project development;
- S317 Consulting – is the partner in charge of the gathering and assessment of the available funding opportunities as well as the design of innovative financing opportunities;
- TELLES – is the partner responsible for legal advisory to the PEER project, advising namely on licensing and contracting;

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708

- Municipal staff – designated by municipalities to serve PEH customers and perform a first screening of support requests;
- Technical teams, engineers, contractors, technology suppliers, etc.

2.5. PEH operation stages – Action plan

The PEH operational stages will be further elaborated in both D2.4 - Operational Porto Energy Hub and D2.5 Porto Energy Hub Action Report.

2.6. PEH success indicators

PEH aims to trigger the renovation of 1 000 dwellings per year during PEER timeframe (2022-2024) and to support, at least, the same annual number of renovations in the coming years. This annual renovation rate would allow to reach 23.7 GWh/year of primary energy savings. To track and keep record of the PEH achievements, the data gathered in the PEH archive will be used.

The following key performance indicators (KPIs) will be recorded:

- Number of direct consultations, including but not limited to surveys filled in physical PEH OSS;
- Number of interactions through the PEH website;
- Number of interventions per year and per type (energy efficiency: replacement of equipment, renovation, replacement of energy supplier/energy vector, etc.; renewable energy: solar thermal, PV, etc.);
- Investment amount and funding statistics (e.g., national funds, own funds, etc.);
- Energy savings after interventions (estimated through the information gathered in preliminary surveys and during onsite energy audits);
- Thermal comfort improvement (assessed through measurements during audits before and after interventions);
- Satisfaction feedback from customers;
- Satisfaction feedback from entities included in the technical database.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708

2.7. PEH LDP in a nutshell

In short, the LDP of the PEH one-stop-shop is summarised in Fig. 10.

Market gap diagnosis	PEH goals and value proposition
The main market gaps identified are listed below: • Lack of a coordinated advice and guidance throughout energy efficiency/renovation interventions. • Access to reliable and intelligible information on energy efficiency benefits, funding options, technical options, etc. • Lack of awareness about energy savings potential which leads many citizens to neglect energy efficiency as they do not perceive the associated benefits (environmental, economic, comfort). • Lack of awareness on existing options to finance energy efficiency projects. • Lack of financial schemes customized to each case.	Citizens who want to implement energy efficiency actions in their homes can gather all the needed information and support, ranging from the evaluation and proposal of interventions to the implementation itself, in a single site. This, and the insurance of the quality of work provided, are the main value propositions of the PEH OSS The main PEH goals are therefore: • To create a reference point for citizens which encourage them to adopt energy efficiency and renewable energy in their home while accompanies them throughout renovation works by elaborating customized energy renovation and financial plans for each project or bundle and assist the choice and the link between customers and suppliers. • To establish a reference point for energy efficiency related information dissemination as well as available financing schemes. • To collaborate with banks and financial entities to co-design innovative energy related financial tools.
PEH operationalisation	
In order to setup the PEH OSS, the following steps are being taken: • Discussion on the PEH OSS business plan with the project partners and the Advisory Board. • Preparation of the Porto Energy Hub OSS platform, which aims to be a relevant contact point because it is through this platform that much of the process is triggered. • Preparation of the physical Porto Energy Hub OSS desks, which allow all citizens to reach PEH services. • Training of municipal staff to attend PEH customers in a preliminary stage, forwarding them to the PEH staff.	

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708

<table>
<tr><td colspan="2">

- Structuring a database of experts and suppliers to perform detailed energy audits and provide required services.
- Working with municipalities, banks and financial entities for the development of energy efficiency funding schemes.
- Archiving and managing of data and creation of the PEH database to monitor the impact of the initiative.
- Design of strategic marketing campaigns to disseminate the project.

</td></tr>
<tr><th>PEH action plan</th><th>PEH human resources</th></tr>
<tr><td>PEH operational stages will be further elaborated in both D2.4 - Operational Porto Energy Hub and D2.5 Porto Energy Hub Action Report.</td><td>PEH human resources are:
• AdEPorto;
• RdA Climate Solutions;
• S317 Consulting;
• TELLES;
• Municipal staff;
• Technical teams, engineers, contractors, technology suppliers, etc.</td></tr>
<tr><th colspan="2">PEH success indicators</th></tr>
<tr><td colspan="2">The following KPIs will be recorded:

- Number of direct consultations, including but not limited to surveys filled in physical PEH OSS;
- Number of interactions through the PEH website;
- Number of interventions per year and per type;
- Investment amount and funding statistics;
- Energy savings after interventions;
- Thermal comfort improvement;
- Satisfaction feedback from customers;
- Satisfaction feedback from entities included in the technical database.

</td></tr>
</table>

Figure 10 – PEH Development Plan

3. Conclusions

This document is an essential step towards the design and operation of the PEH OSS and will help to define the PEH business plan (D2.3) as well as D2.4 - Operational Porto Energy Hub and D2.5 Porto Energy Hub Action Report.

A local development plan is an operational document which defines all the steps and required conditions to set up a project – in this case, an OSS for home energy

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708

renovation and renewable energy projects. This document is supported on the conclusions of a market gap analysis which examined the existing renovation market and needs as well in the development of possible scenarios set up in collaboration with partners and local stakeholders. Thus, this plan is not static and must be updated if different strategies are established or whenever the baseline circumstances are changed.

References

[1] DGEG, "Energy efficiency - Buildings," Available at: *https://www.dgeg.gov.pt/pt/areas-setoriais/energia/eficiencia-energetica/edificios/#:~:text=Edif%C3%ADcios%20O%20setor%20dos%20edif%C3%ADcios%20%C3%A9%20respons%C3%A1vel%20pelo,cerca%20de%2030%25%20para%20o%20caso%20de%20Portugal.* Accessed in 02/04/2022.

[2] P. Zangheri *et al.*, "Progress of the Member States in implementing the Energy Performance of Building Directive," 2021, doi: 10.2760/914310. Available at: https://op.europa.eu/en/publication-detail/-/publication/40299428-f65d-11eb-9037-01aa75ed71a1/language-en/format-PDF/source-221952657. Accessed in 02/04/2022.

[3] EUROSTAT, "Inability to keep home adequately warm - EU-SILC survey," *EUROSILC*, 2021. Available at: https://ec.europa.eu/eurostat/web/products-datasets/-/ILC_MDES01. Accessed in 08/04/2022

[4] EPOV, "Member State Reports on Energy Poverty 2019," 2021. doi: 10.2833/81567. Available at: https://energy-poverty.ec.europa.eu/discover/practices-and-policies-toolkit/publications/epov-member-state-reports-energy-poverty-2019_en. Accessed in 08/04/2022

[5] L. S. Ana Horta, "Policy Brief 2021 POBREZA ENERGÉTICA EM PORTUGAL," Lisbon, 2021. Available at: https://repositorio.ul.pt/bitstream/10451/48206/1/ICS_AHorta_LSchmidt_PobrezaEnergetica_.pdf. Accessed in 11/04/2022

[6] ADENE, "Buildings certification statistics," Available at: *https://www.sce.pt/estatisticas/*.

[7] EUROSTAT, "Income and Living Conditions (EU-SILC)," *Living conditions database*, 2020. Available at: https://ec.europa.eu/eurostat/web/microdata/european-union-statistics-on-income-and-living-conditions. Accessed in 11/04/2022

[8] Quercus ANCN, "Survey carried out in mainland Portugal about thermal comfort at home," 2017. Available at: https://www.csustentavel.com/wp-content/uploads/2017/12/an%C3%A1liseresultadosinqu%C3%A9rito_esta%C3%A7%C3%A3ofria.pdf. Accessed in 15/02/2022.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708

[9] Pordata, "Gini index (%)," Available at: *https://www.pordata.pt/en/Portugal/Gini+index+(percentage)-2166*. Accessed in 02/03/2022.

[10] European Parliament, "DIRECTIVE (EU) 2018/844 on the energy performance of buildings and on energy efficiency," 2018. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L0844&from=EN. Accessed in: 15/02/2022.

[11] A. Bagaini, E. Croci, and T. Molteni, "Boosting energy home renovation through innovative business models: ONE-STOP-SHOP solutions assessment," *Journal of Cleaner Production*, vol. 331, p. 129990, 2022, doi: 10.1016/j.jclepro.2021.129990.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708

Porto Energy Hub

Energy Efficiency for all.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033708