Porto Energy Hub

Energy Efficiency for all.

D2.4- Operational Porto Energy Hub

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1. Introduction

The European Green Deal[1] strives for a deep transformation in Europe targeting eight key areas, namely: 1) increased climate ambition for 2030 and 2050; 2) clean, affordable and secure energy; 3) a clean and circular economy; 4) energy and resource-efficient buildings; 5) sustainable and smart mobility; 6) a fair, healthy and environmentally-friendly "farm to fork" food system; 7) preserving and restoring ecosystems and biodiversity; and 8) zero pollution for a toxic-free environment. In this setting, an efficient and renewed building stock is key to reach a number of these goals. Furthermore, by realising the challenge of building renovation, the European Commission launched the so-called Renovation Wave[2] which, in addition to boost building renovation, is also focusing on energy poverty mitigation strategies.

Recent data indicates that buildings account for around 40% of Europe's total energy consumption and more than 75% of the building stock is inefficient considering current standards. Considering that average annual renovation rates are quite low (ca. 1%), actions are needed to accelerate these rates in all EU Member States. Home renovation one-stop shops (OSS) may play a key role in this process as they function as information and support hubs for citizens and entities in the implementation of home renovation projects, helping to increase building renovation rates.

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. PEER has developed the Porto Energy Hub (PEH), a dedicated OSS, running in both physical and online modes, to enhance public and private stakeholders' engagement, from Municipalities and Social Housing management entities to private institutions, individuals, and families. PEH is the PEER brand and the central point of search of all information and services needed to implement energy renovation projects, enabling to boost synergies, and aggregate investment volume, as well as to engage market players and, thus, mitigate market barriers.

[1] https://climate.ec.europa.eu/eu-action/european-green-deal_en
[2] https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/renovation-wave_en

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The operationalisation of the Porto Energy Hub is a critical activity of Work Package 2 – Porto Energy Hub and Stakeholder Engagement, namely Task 2.4 – Deployment of the Porto Energy Hub led by AdEPorto, in the scope of which this report is elaborated. In this setting, this document describes the steps carried out to create the dedicated project webpage (https://portoenergyhub.pt/) and to implement the physical hubs, providing a fully functioning service both in online and live modes.

2. Operational Porto Energy Hub

2.1. Starting Point: Assessment of needs and similar experiences

The Porto Energy Hub design and operation followed a 3-step approach presented in Fig. 1 and which resulted from a comprehensive work regarding OSS implementation. Below, each of these steps is detailed.

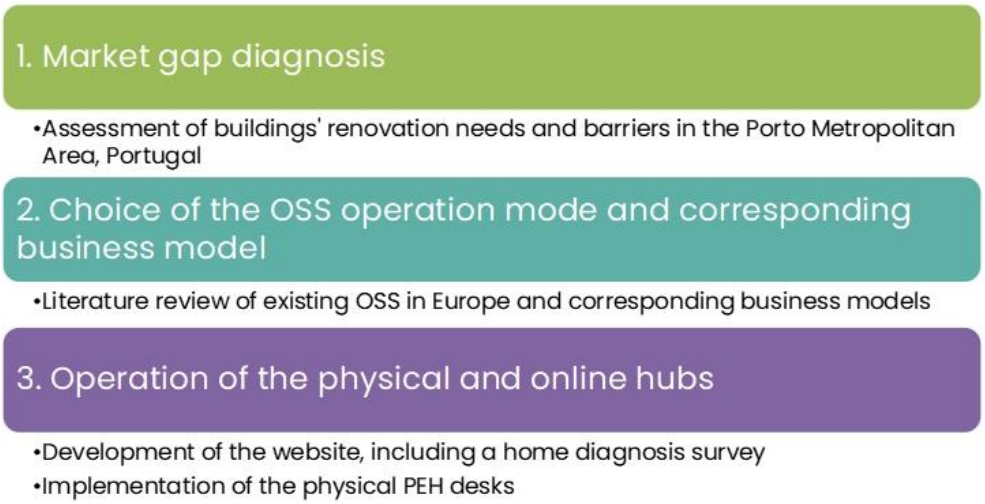

Figure 1 - PEH stepwise implementation approach.

The first step was a market gap diagnosis which allowed to realise what PEH is aimed at. This step, further detailed in *2.1 - Porto Energy Hub Local Development Plan,* allowed to understand the features of the existing residential buildings (type, age, renovation needs, energy savings potential; type of improvement needs); the type of people living in these buildings (tenants vs. homeowners and income profiles); and the

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stakeholders operating in the home renovation market and in the covered area (e.g., existing OSS, suppliers, contractors, type of companies and their operation modes). This first stage was key to identify the major market gaps PEH needs to circumvent, namely:

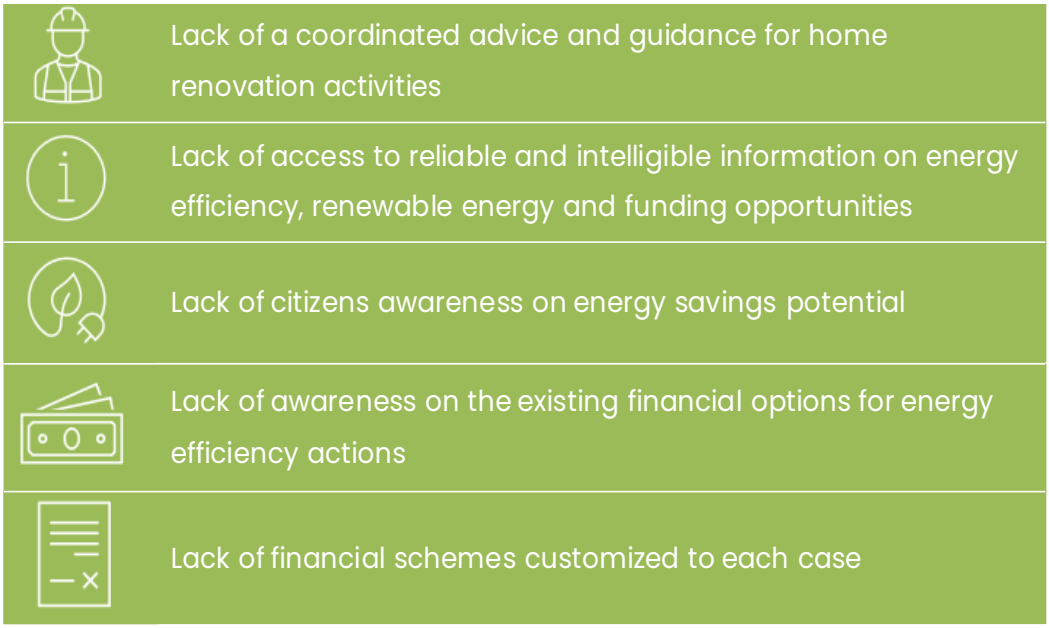

Figure 2 – Identified market gaps in the Portuguese home renovation sector.

As the Portuguese market was proved immature in this topic, meaning that citizens are little aware of the benefits of home renovation (although the needs are significative and the existing renovation market is poorly structured) lacking supporting entities able to assist citizens throughout the home renovation journey, the services of a home renovation OSS as PEH may be key to stimulate the market and create an increased renovation interest. Thus, a comprehensive understanding of OSS operation, services and business models was required as it allowed to start the drafting of PEH operation.

By realising the lack of similar supporting structures in the country, and in order to ensure a steady and robust design of PEH, a comprehensive review of existing home renovation OSS running across Europe was performed as starting point. This review allowed to learn how successful examples dealt with implementation enablers and barriers.

This revising work was initiated in the very beginning of PEER, in *D3.1 – Benchmark analysis* which set the scene for the discussion on the support and services PEH aimed

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to provide and was further continued in *D2.2 – Replicable Business Models,* which examined the most prominent OSS established in Europe, focusing on their business models. This reviewing work allowed to reflect on the pros and cons of the different possibilities of action and informed the decision on the services to provide, entities to engage and business model to pursue. Based on it, and after being discussed in several consortium meetings, the PEH business model was drafted and thoroughly described in *D2.3 – Porto Energy Hub Business Plan*.

2.2. Operationalisation: Balancing digital and physical approaches to reach everyone

To implement the foreseen PEH services while reaching the broader population as possible, PEH was created in both online and physical modes: the online mode allows for a better dissemination of information whereas the existence of physical desks brings the citizens closer to the PEER team and gives the project a "face".

As most of the people currently is able (and used) to access information through digital means, the project website was defined as a key tool for both information dissemination and the OSS operation as it hosts the survey which allows for a first screening of energy efficiency potential, and which triggers the technical support. Fig. 3 displays how the process is conducted, and the role played by the project website.

As several physical hubs may be created in different neighbour municipalities, landing pages tailored with information on each physical desk can be developed. In addition to providing local information, such pages have the purpose to redirect users for the main homepage of the project (https://portoenergyhub.pt/) (1). In the main homepage, users may look for more information on technical aspects of energy efficiency measures (best systems and technologies for water heating, insulation, glazing, etc.), existing funding opportunities, and updated legal framework (2). In turn, users have also the opportunity to assess the energy efficiency of their homes by answering an online survey (3). The survey is fully explained in Appendix 1. As some detailed (and private) data is asked, this survey is hosted in the EUSurvey platform ensure data protection is granted. On the other hand, a dedicated Privacy Policy was formulated in order to detail and clarify how data is being managed.

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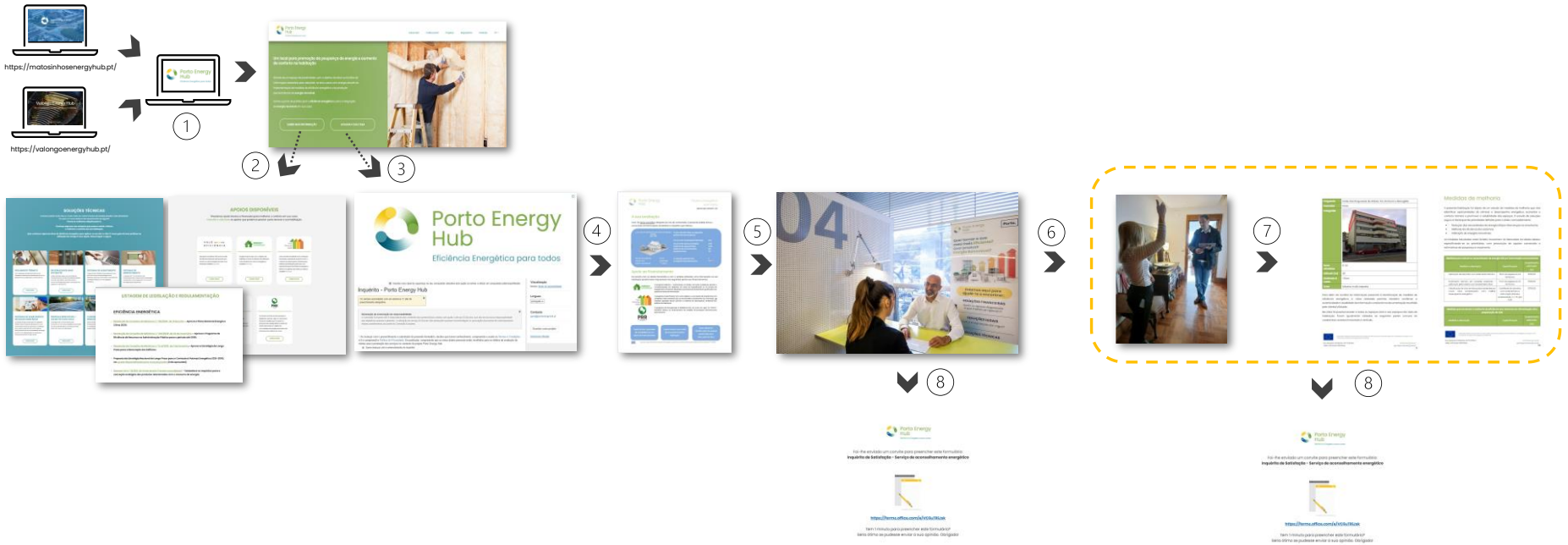

Figure 3 – PEH operating process.

To ensure the service reaches everyone and to give it more visibility, some local municipalities were presented with the concept and agreed to pilot the implementation of physical desks. The discussion with local authorities on this new service revealed to be beneficial as it allowed to fine-tune important aspects of the implementation resulting in a model which can be easily replicated. Taking advantage of this collaboration with local municipalities, physical desks are being created in city facilities where citizens are already used to go to solve other daily issues (e.g., licensing and permitting issues, etc.). These spaces are also clearly identified in the project website (https://portoenergyhub.pt/sobre-nos/).

In Energy Hub desks, municipal staff trained about the objectives and services of the OSS can:

- direct citizens to the information on the project's webpage;
- share the project communication materials;
- schedule technical meetings with the project technical staff. This technical meeting is only indicated for citizens who want to proceed with the implementation process of energy efficiency measures in their homes or have doubts on specific questions (funding, legal, etc.). Previously to these meetings, citizens are recommended to complete the diagnosis survey available in the project's webpage and which allows to a more appropriate technical follow-up.

After answering the survey, users receive an email with a tailored one-pager (4) which identifies energy efficiency potential, existing (and applicable) funding opportunities and enables to carry on with the technical support, if required. The rationale behind this simplified one-pager is to provide basic information to users who showed interest in the project, even if they are not willing to continue the support process. This initial assessment of potential can, if desired by the user, advance to schedule of a technical meeting (either physically or online) (5).

When a technical meeting is scheduled (on dates specifically defined by the Consortium) and in-person sessions are preferred (online meetings are also possible), PEER's technical staff travel to the corresponding Energy Hub desk and carry out the technical appointment, advising citizens on potential energy efficiency measures, available funding programs or issues related to the regulatory framework (Fig. 4).

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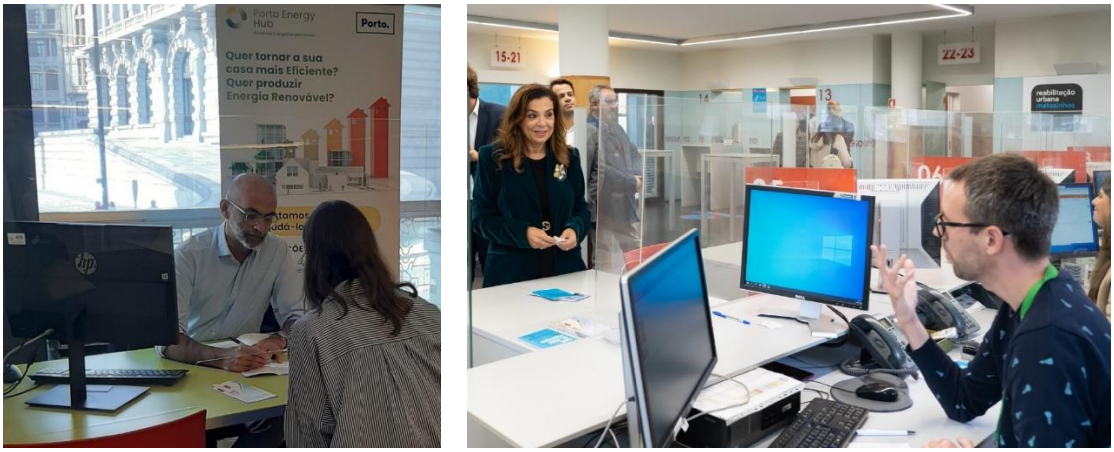

Figure 4 – Technical meetings.

During these meetings, the most common help provided is related to technical requirements: PEH staff advise on technologies, systems, and suppliers/service providers. In this setting, PEH staff provides technical recommendations and directs users to national public databases of recognised service providers. Such databases[3] are managed by the public entities responsible for public funding programs, and the use of the providers listed in such platforms is mandatory for funding access. Also, PEH staff is prepared to support citizens in funding applications. In this setting, PEH staff help users throughout the whole application process by validating technical requirements, confirming eligibility conditions, and supporting the application itself.

When necessary, technical meetings can lead to site visits carried out by building experts for a more detailed survey of needs and identification of concrete improvement measures (6). Such visits result in a detailed report on the energy and thermal behaviour of houses which allows for the prescription of concrete implementation measures and cost estimates, allowing citizens to have a very clear idea of the type of intervention and associated costs (7).

The implementation and inclusion of this activity (which involves costs) in the business model of Porto Energy Hub has been evaluated and meetings with entities that own qualified expert selection and recruitment platforms have been promoted to understand how a similar activity could be operationalised within the project scope. Additionally, to ensure uniformity and the quality of

[3] https://casaeficiente2020.pt/diretorio-de-empresas/; https://portalcasamais.pt/directorio/; https://www.classemais.pt/

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site visits, detailed procedures and report templates were developed. The site visit is expected to provide further technical support to renovation measures implementation and technical solutions prescription. Therefore, site visits are expected to offer an additional support to the one provided in the first step of the advising service concerning the provision of information and preliminary diagnosis (given at the physical hubs or through the project website).

To test this service, one site visit performed by a building expert was carried out. This visit was scheduled by request of a citizen who completed all the steps of the process (survey and preliminary technical meeting) and is, in fact, performing renovation works at home. The tested expert recruitment procedure as well as the template developed to assist the site visits proved to be adequate to operationalise this service within the PEH range of services. From this process, a quite detailed and prescriptive report was developed, effectively helping this citizen to take decisions on the energy efficiency measures to implement. However, as experts' visits imply costs (about EUR 150 per visit), during PEER lifetime, this kind of support will be constrained and, when needed, carried out by the project technical team.

If users decide to proceed with interventions, the PEER technical team may continue to follow the process which was designed considering the users will proceed with the interventions. This follow-up allows to assess the effective impact of interventions. Regardless of the extent of the provided support, PEH users are asked to fill in a satisfaction survey regarding the service, which will allow drawing conclusions regarding adjustments and improvements (8).

To keep a record of the support provided, an internal database was created. The main objective of this repository is, in addition to quantifying the project's KPIs, to constitute an archive of contacts for sending relevant information whenever needed (e.g., opening of funding opportunities), assuring GDPR compliance. By August 2023, this log already gathers more than 180 entries including the several types of support provided (physical meetings, online meetings, email answers, etc.).

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3. Experience so far and lessons learned

The PEH concept was first presented to two municipalities – Porto and Matosinhos – which agreed to pilot this new service. In September 2022, Porto municipality launched the Porto Energy Hub and on the beginning of November, Matosinhos opened Matosinhos Energy Hub. After these ones, the municipality of Valongo launched the Valongo Energy Hub service in March 2023 and Trofa inaugurated the Trofa Energy Hub in July 2023. The municipality of Maia will officially launch the fifth Energy Hub in September 2023 (Fig. 5).

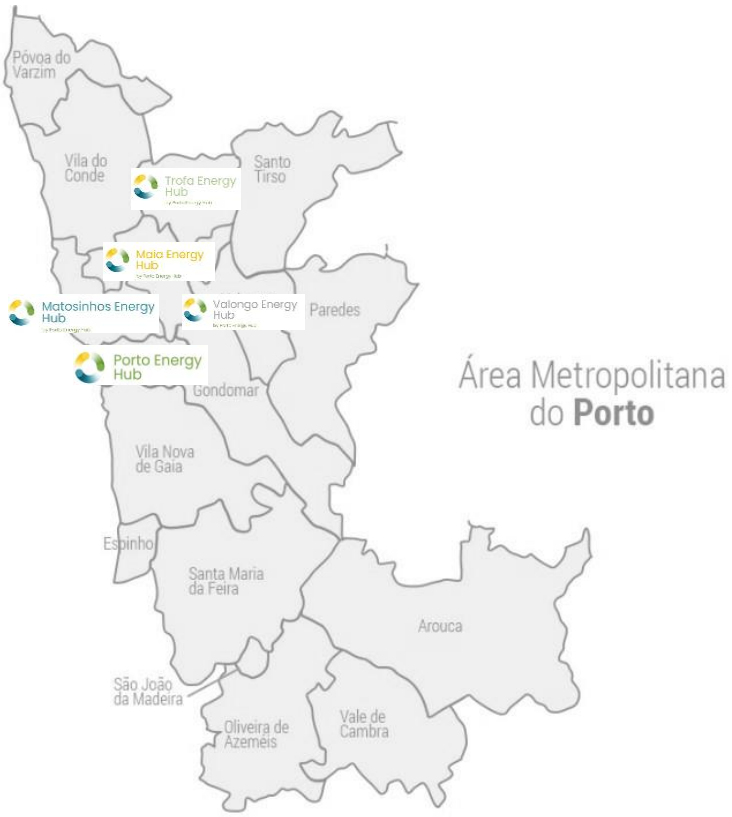

Figure 5 – PEH OSS by August 2023.

Although the OSS pilots are still quite recent, the data retrieved from the survey completion allows for preliminary insights, namely regarding the characterisation of users of the OSS service, as well as of the housing conditions.

Data analysis indicates that there is a balanced distribution between male and female users of the service. It is also important to highlight that only 7% of the

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applicants responding to the survey benefit from the social tariff, a discount available for lower income citizens regarding energy bills, which allows to infer that people concerned about energy efficiency and looking for support are not the most socially vulnerable ones.

From the over 150 reports that were generated from the survey, 65% of the dwellings are more than 30 years old, with 47% of those being apartments, 50% houses and the remaining are condominiums. Figure 6 displays the most common housing characteristics (the full information collected can be seen on Appendix 1), including:

- Heating and cooling equipment;
- Constructive characteristics.

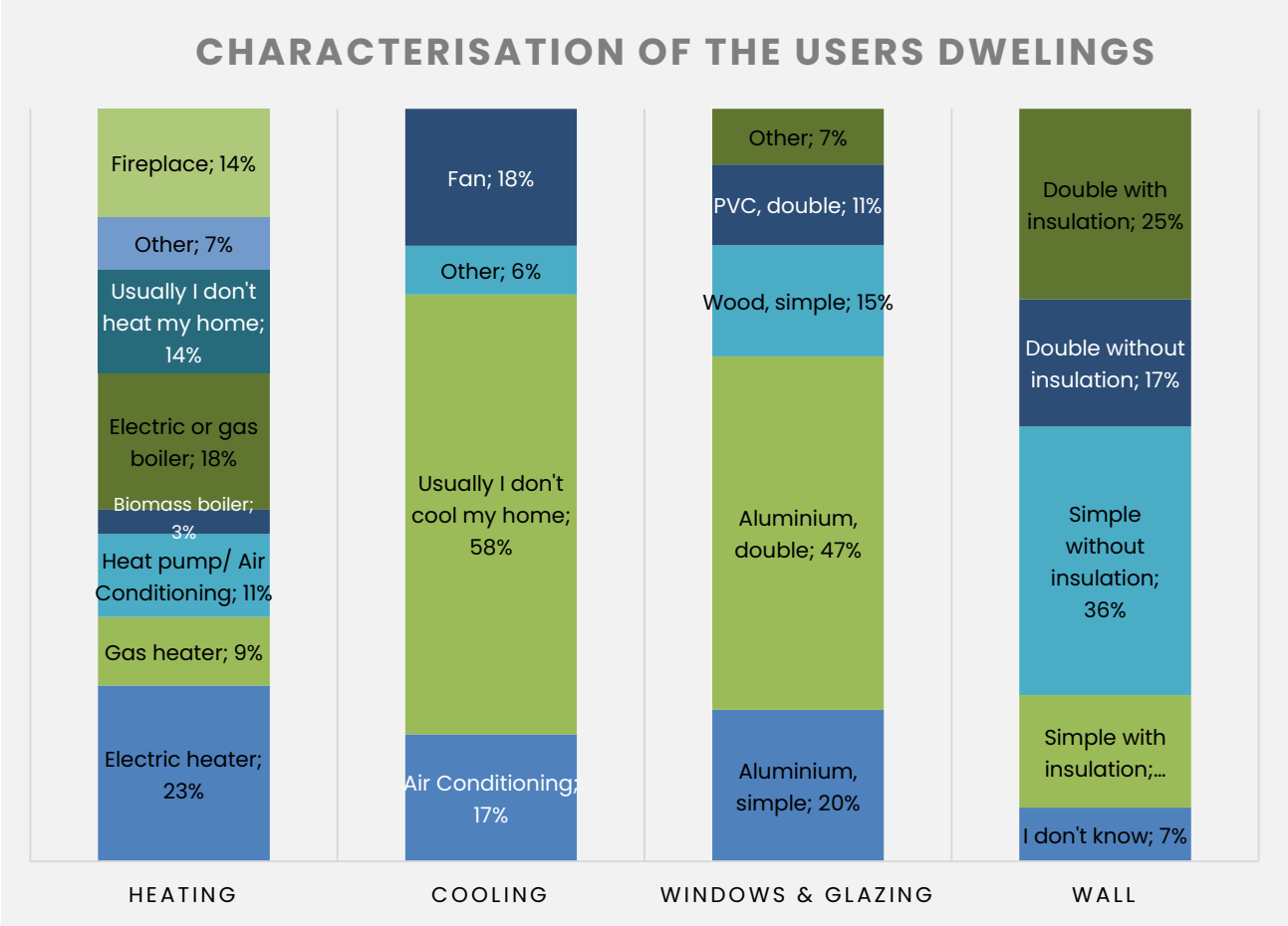

Figure 6 - Characterization of the users' dwellings, including the type of heating and cooling equipment, windows & glazing and the wall structure.

It is worth mentioning that most of the consultations so far, regarded replacement of windows (34%), followed by questions and doubts on renewable production (about 15%). There is also a clear predominance of consultations (65%) related with existing

or prospective financial incentives that can support the investment of technical measures.

As follows some conclusions are possible to unveil:

- Most of the users that filled the survey either usually do nothing to cool off their homes (58%) or opt to use very simple and low efficient methods, as a fan (18%).
- More than half of the dwellings (51%) have an envelope constituted by a single layer brick wall, from which 36% do not have insulation.
- Only 11% of applicants use potentially high-efficient heating equipment while 14% state that do not usually use any method to heat up their homes.
- 47% indicates having double glazing aluminium windows.

From the results of the simulations concerning energy savings potential, it is possible to highlight that:

- There is an average of 60% of identified savings potential for heating energy needs;
- Using only houses rooftop areas, an average of 18 kWp of potential RES installation per house, was identified.

As for lessons learned from the experience of developing an OSS, an aspect which proved to be key for a successful implementation was the win-win collaboration with local authorities. Municipalities are trusted entities by citizens and their participation and sponsorship to PEH gives it credibility and security, in addition to allowing a much larger dissemination of the project to other local entities and citizens. Also, the participation of municipalities in the discussion and implementation process of these kind of initiatives builds capacity on their staff and promotes awareness of local authorities regarding the energy topic and funding options. From the project perspective, the collaboration with municipalities allows to split the effort and costs of the service.

In turn, the replication process is being facilitated by the enabling framework created by the current energy and climate neutrality awareness installed in most European countries. This framework raises the interest of local entities on providing differentiated services to their citizens boosting private investment in home renovation and raising energy literacy.

Appendix 1 – Diagnosis survey

The survey is divided into several sections, each one aimed to gather relevant information regarding the existing conditions and the needs of the users. Each section is presented as follows.

Data	Explanation
Name **Phone/Email** **Municipality** **Address**	*The first section is aimed at gathering the user information. This information is required to provide the diagnosis result and to continue the support, if agreed by the user. Thus, data on the name, phone or email, municipality (for the scheduling of technical meetings in physical sites, only residents of the energy hub municipalities can use those spaces. Other residents can still contact the project virtually), and address.*
For us to provide the best possible help, please answer the questions bellow: **Characterization of basic housing conditions**	
Housing context* **The house where you live is:**	□ Your own □ Rented □ Social housing
Type of housing* **Your house is:**	□ Apartment □ Detached house □ Townhouse □ Semi-detached house □ Condominium
How can we help? *	*[Multiple choice]* □ I want advice on how to improve the energy efficiency of my home [Fill out the entire survey] □ I want to know how I can get support in financing improvement measures [Fill out the entire survey] □ I want to know how I can produce renewable energy in my home [Fill only the questions marked with RE] □ Other. Specify:
Typology **Your house is:**	□ T0 □ T1 □T2 □T3 □T4 □T5 □T6 □>T7 □ I don't know
Number of floors **How many floors does your house have?**	□ 1 □ 2 □ 3 or more *[Do not fill in if social housing]* *[Do not fill in if only RE]*

House age*	□ Before 1990 □ 1990 – 2010 □ 2010 forward □ I don't know
When does your house was built?	*[Do not fill in if social housing]*
	[Do not fill in if only RE]
	□ I don't know □ No □ No, but needs intervention □ Yes, recently
	□ Yes, but needs intervention
Year of last renovation (if applicable) *	*[If yes]* Please indicate the reasons for carrying out works:
	□ Maintenance and small repairs (e.g. cracks in walls)
Has your home undergone any renovation?	□ Increased thermal comfort (e.g. installing insulation or replacing windows)
	□ Aesthetic reasons (e.g. wall painting) □ I don't know
	[Do not fill in if social housing]
	[Do not fill in if only RE]
	□ Yes □ No □ I don't know
Energy certification*	*[If yes]* What is the energy class?
	□ A+ □ A □ B □ B- □ C □ D □ E □ F □ I don't know
	[Do not fill in if social housing]
	Upload certificate (optional)
Typical use of the house	□ Permanent housing. occupation profile:
	□ permanent occupation during the day (e.g. telecommuting, retirees)
	□ occupancy mostly mornings, evenings, and weekends
	□ One-off housing/holiday home □ Other. Specify:
Constructive elements	
[Do not fill in if social housing] [If only RE, fill in coverage only]	
Number of glazing	*[Open answer]*
Type of glazing	□ Simple □ Double □ Triple □ Other. Specify:
	□ I don't know
Type of window frames	□ Wood □ Aluminum □ Double □ PVC □ Other. Specify:
	□ I don't know

Shading type	□ Curtains □ Blind outside □ Blind inside □ No shading □ Other. Specify: □ I don't know
Exterior wall type	□ Simple wall □ Simple wall with insulation form the inside □ Simple wall with insulation from the outside □ Double wall □ Double wall with insulation by the inside □ Double wall with insulation by the outside □ Other. Specify: □ I don't know
Type of coverage	□ Flat without insulation □ Flat with insulation □ Inclined with useful deviation (attic) □ Inclined without useful deviation (attic) □ Intermediate floor □ Other. Specify: □ I don't know *[If RE required]* *Coverage area?* *[Open answer]* m^2 □ *I don't know* Please indicate the solar orientation of the roof □ N/S □ E/O □ I don't know
Type of pavement	*[If RE]* *Is there any outdoor space where a renewable energy production system can be installed?* □ Yes, and I am the owner □ Yes, but I'am not the owner □ No *[If yes] Please indicate approximate area_____ m^2 (open answer)* Please indicate the solar orientation of the available outer space □ N/S □ E/W □ Don't know □ In contact with the ground □ Intermediate floor □ Other. To specify: □ I don't know
Useful floor area	*[Open answer]* m^2 □ I don't know
Do any of these situations occur in your home?*	□ Humidity □ Air intake through doors and windows □ Lack of ventilation □ Too much sun exposure □ Insufficient natural lighting □ Other. To specify: □ I don't know

Are you considering intervening in your home (eg increasing wall insulation; replacing window frames, etc.)?*	□ Yes □ Yes, depending on funding support available □ No [If so] Would you be interested in a visit by an auditor for a detailed analysis? □ Yes □ No
Equipments *[Does not fill in if only RE]*	
Domestic hot water preparation system (DHW)*	□ Heater □ Boiler □ Heat Pump □ Solar thermal system □ Other. Specify: □ Without DHW system □ I don't know Please indicate the age of the equipment _____ (open answer)
Heating system*	□ Gas or electric boiler □ Biomass boiler □ Heat Pump/ Air Conditioning □ Heat recovery/Fireplace/Salamander □ Electric heater □ Gas heater □ Other. Specify: □ I don't usually heat the house □ I don't know Please indicate the age of the equipment _____ (open answer)
Cooling system*	□ Central air conditioning □ Local air conditioning □ Fan □ Other. To specify: □ I don't know □ I don't usually cool the house Please indicate the age of the equipment _____ (open answer)
Ventilation system*	□ Centralized ventilation (ATU type) □ Local extraction □ Natural ventilation □ Don't know
Lightning system*	□ All or mostly LED □ All or mostly compact fluorescent □ All or mostly incandescent/halogen □ I don't know
Renewable energy production system	□ Thermal solar system □ Photovoltaic solar system Number of panels or installed capacity

Indicate what other equipment you have and their age:

	Equipment age
Fridge	□ 0-2 years □ 3-5 years □ 6-9 years □ More than 10 years □ I don't know
Frizer	
Electric over	

Television	
Dish washer machine	
Laundry washing machine	
Laundry washing machine and dryer (combined)	
Microwave	
Other: Specify	

Energy costs

Have you ever been late in paying energy bills (electricity and/or gas)?	□ Never □ Yes, sometimes by forgetting □ Yes, sometimes because it's too expensive □ Yes, often by forgetting □ Yes, often because it's too expensive □ I don't know
Please indicate the sources of energy consumed in the house*	□ *Electricity* □ *Natural gas* □ *Butane/propane gas (bottled)* □ *Biomass* □ *Other. To specify:*
[only if selected] **Electricity**	
Electricity social tariff*	□ Yes □ No □ I don't know
Contracted power	□ 1.15 kVA □ 2.30 kVA □ 3.45 kVA □ 4.6 kVA □ 5.75 kVA □ 6.9 kVA □ 10.35 kVA □ 13.8 kVA □ 17.25 kVA □ 20.7 kVA □ 27.6 kVA □ 34.5 kVA □ 41.4 kVA □ I don't know
Contracted tariff	□ Simple □ Bi-hourly □ Tri-hourly □ I don't know
Average monthly cost in winter*	*Indicate the range* □ Less than 20€ □ Between 20 and 40€ □ Between 40 and 60€ □ More than 60€
Average monthly cost in summer*	□ Less than 20€ □ Between 20 and 40€ □ Between 40 and 60€ □ More than 60€
[only If selected] **Natural Gas**	
Social gas tariff*	□ Yes □ No □ I don't know
Contracted level	□ 1 □ 2 □ 3 □ 4 □ I don't know

Average monthly cost in winter*	*Indicate the range* □ Less than 20€ □ Between 20 and 40€ □ Between 40 and 60€ □ More than 60€
Average monthly cost in summer*	□ Less than 20€ □ Between 20 and 40€ □ Between 40 and 60€ □ More than 60€
[only if selected] **Butane/propane gas**	□ Butane 6kg □ Butane 13kg □ Propane 11kg □ Other. To specify:
Type of gas purchased	□ I don't know
Average number of bottles purchased per year	*[Open answer]*
Average cost of purchased bottle	*[Open answer]* €

Perception of thermal comfort and behaviors

In winter, does your home usually have a comfortable temperature?	□ Yes, often □ No, sometimes it's too cold □ No, it is too cold often or almost always
On the coldest days, how would you rate your home in terms of thermal comfort (feeling too cold), if you don't use the heating system? (1 - very uncomfortable to 5 - very comfortable)*	□ 1 □ 2 □ 3 □ 4 □ 5
What do you do to heat the house?*	□ I turn on heating equipment □ I adapt my behavior (e.g., dress warmer, drink warmer drinks, etc.) and turn on heating equipment □ I adapt my behavior (e.g. warmer clothes, drink hotter drinks, etc.) but I don't turn on heating equipment because it is too expensive!
And in summer, does your home usually have a comfortable temperature? *	□ Yes, almost always □ No, sometimes it is too hot □ No, it is too hot often or almost always
On warmer days, how would you rate your home in terms of thermal comfort (feeling too hot), if you don't use the	□ 1 □ 2 □ 3 □ 4 □ 5

heating system? (1 - very uncomfortable to 5 - very comfortable)*

What do you do to cool the house?*

□ I turn on cooling equipment (e.g. fans)

□ I adapt my behavior (e.g., wear cooler clothes, open windows in the evening and morning, etc.) and turn on cooling equipment

□ I adapt my behavior (e.g. cooler clothes, drink cooler drinks, etc.) but I don't turn on cooling equipment because it's too expensive!

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