A NEW WAY TO MITIGATE ENERGY POVERTY: LESSONS FROM THE TRANSITION POINT 'ONE-STOP SHOP' PILOT

CALOUSTE GULBENKIAN FOUNDATION

• PONTO DE TRANSIÇÃO

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The Transition Point one-stop shop in Palmela (Setúbal District), Portugal. November 2022 © Márcia Lessa


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Foreword

The climate is changing, here in Portugal as in the rest of the world. The challenge is how we respond to this: how we stop further warming and adapt to the change that has already happened. There is still time, if we act now, and together. Action for climate – and for nature – is necessary for our health and prosperity, for our future and our children's future. It's also an opportunity to improve conditions in the present: cleaner air, greener neighbourhoods, more comfortable and cost-effective ways of living.

Energy poverty is a serious issue in Portugal. In 2022, around 1.7 million people were unable to heat their homes to a comfortable temperature in winter. Statistics show that more than a third of the population live in houses that are not comfortably cooled in summer, the second highest in the EU. 70% of households have been classed as energy inefficient.

The Calouste Gulbenkian Foundation developed Transition Point as a local-scale response to alleviating energy poverty and reducing climate impacts. The pilot tested a 'one-stop-shop' approach, providing energy advice for local people from a mobile shipping container, sited in different locations and backgrounds in the Setúbal region. It also provided capacity building for Transition Agents, local citizens who were trained to carry out free energy assessments in the home.

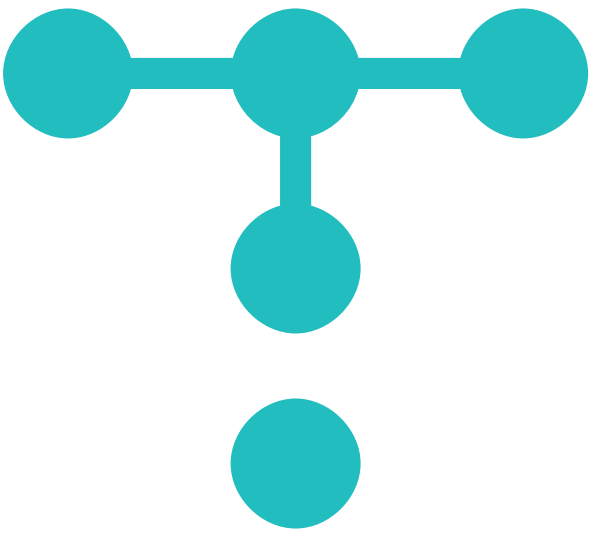
The project worked hard to reach out to those most in need. Robust data collection and partnership-working with public, private and civil society organisations were key. The Transition Point container offered a 'living laboratory' to assess the effectiveness of policies and approaches, responsive to local people in real time. It highlighted the importance of tailormade engagement for the most vulnerable households, ensuring that support is accessible for and accessed by those who need it most.

We are delighted that Transition Point has attracted attention from the private sector and that we are seeing some initiatives already replicating the Transition Point approach. Even more so that the government's new National Long-Term Energy Poverty Mitigation Strategy 2023-2050 cites Transition Point as a model of best practice, and includes plans for establishing a network of local 'energy support spaces' by 2025. At the Foundation, we will continue to champion effective approaches to tackling energy poverty. More broadly, we are taking lessons from Transition Point forward into our Sustainability programme

overall. This promotes participation in climate and ocean action in Portugal and the UK, and shares what works nationally and internationally. We know that broad public support is essential, if we are to keep within the targets for a 1.50C world. Transition Point confirms the power of operating at local municipality level to involve everyone in the climate transition and to ensure it is fair.

The success of this initiative would not have been possible without our close partnership with the Energy and Environment Agency of Arrábida (ENA), FCT- NOVA University of Lisbon's Center for Environmental and Sustainability Research (CENSE), and the Association of National Energy and Environment Agencies (RNAE). A huge thank you to them all. Thank you also to all those behind the scenes who have contributed to the project and to this report, with a special mention for Cátia Cavaco and Sara Pais who conceived the Transition Point pilot and have shaped the initiative at every stage.

Louisa Hooper
Sustainability Programme Director, Calouste Gulbenkian Foundation



Executive Summary

The Transition Point pilot project is an initiative of the Calouste Gulbenkian Foundation in Portugal. Operating from a reused shipping container, Transition Point is a 'one-stop shop' that offers services to local populations, including advice on electricity and gas, information and support for home energy efficiency, and free energy assessments.

It was implemented in the district of Setúbal, between 2022 and 2023, in partnership with three other Portuguese organisations: the Energy and Environment Agency of Arrábida (ENA), FCT- NOVA University of Lisbon's Center for Environmental and Sustainability Research (CENSE), and the Association of Energy and Environment Agencies (RNAE).

Findings at a glance

Mobile 'one-stop shops' – bringing advice to the heart of communities under one roof – can improve living conditions for vulnerable households, increase their resilience, and underpin a just energy transition which leaves no one behind as we all adapt to climate change. Transition Point modelled an innovative local response to alleviating energy poverty – from problem diagnosis and solution design to direct citizen support and community engagement. The project shows that:

- Vulnerable households require tailor-made engagement and support; one-stop shops can frame this effectively through early multidisciplinary collaboration and continuing close partnership with local authorities and social support institutions.
- Robust and varied data collection allows projects to fine-tune support in real-time in response to what local people need.
- A well-aligned local action framework has impact, but vulnerable households may be unable to implement advice without considerable and stable financial support.
- One-stop shops can act as a bridge between (sometimes complex) financial support programmes and vulnerable individuals.

The pilot's experience provides valuable pointers for projects working with hard-to-reach or vulnerable communities on energy issues. This report summarises the project's set-up, impact and key takeaways.

Part I: The Project and its Findings

1. Introduction

The impacts of climate change and the energy crisis have seen the numbers living in energy poverty rise rapidly. 'Energy poverty' describes people's inability to guarantee essential energy services within their home. It is a complex phenomenon affecting millions in Europe [1], seriously impacting not just their finances but their health and wellbeing [7]. And, with extreme heat events forecast to become more frequent and more intense, households need information and support services that improve not only their home energy-efficiency but also their energy-resilience and their understanding of the role we can all play as we adapt to climate change.

Leading causes of energy poverty are high energy prices, energy-inefficient buildings in poor condition, equipment with low energy-efficiency, and low incomes. Many other factors – social characteristics, household composition, climate, literacy, culture – can make people more vulnerable to energy poverty. Circumstances which leave people with greater energy problems often also make them harder to reach with effective mitigation measures. Such contexts include: low education level; gender; identification as an ethnic minority; being in receipt of social support; living in social housing; living in households containing people with disabilities, single parents or pensioners; student renters; those with respiratory or cardiovascular diseases; indicators of social stigma and isolation; and low energy literacy [2-4].

Energy-poor households urgently require a specific focus through local approaches if they are to avoid being left behind in a just energy transition.

A year-long project, Transition Point has piloted such an approach in different locations in three municipalities in Portugal (via a single 'one-stop shop' that switched sites). It models an innovative, locally based response to alleviating energy poverty, from problem diagnosis and solution design to direct citizen support and community engagement.

The pilot's experience provides valuable pointers for projects working with hard-to-reach or vulnerable communities on energy issues. This report presents the key findings and takeaways from the pilot, from setting up to scaling impact and catalysing change.

2. The policy context in Europe and Portugal

Energy poverty is a political priority for the European Union (EU). Buildings account for around 36% of emissions, while consuming 42% of final energy across the EU [5]. About 75% of the EU building stock is energy-inefficient. However, current building renovation rates are very low, at around 1% per year. Several political strategies and legislative frameworks on energy and climate refer to the pressing need for its mitigation. These include:

- The **European Green Deal**, which aims to transform the EU into a modern, resource-efficient, and competitive economy, ensuring net-zero emissions of greenhouse gases by 2050 with no person or place left behind.
- The **European Renovation Wave** strategy, which sets out to double the annual building renovation rate within the EU by 2030 [6].
- **The European Commission issued a recommendation on energy poverty** for Member States in 2023 [8], which underlines the importance of addressing energy poverty and building stock renovation. Deeply renovating European buildings is essential for both decarbonisation and eradicating energy poverty, and will generate multiple social, environmental, and economic benefits.

Portugal, where the Transition Point pilot took place, presents a particularly concerning situation regarding energy poverty. Around 1.7 million people reported being unable to heat their homes to a comfortable temperature in the winter in 2022; in 2020, 3.1 million lived in homes in deteriorating condition [9]. The central administration has recently placed energy poverty as a major topic in the energy policy agenda, having published the National Long-Term Energy Poverty Mitigation Strategy 2023-2050 in early 2024. This strategy defines four key areas of intervention, promoting i) energy and environmental sustainability of the building stock, ii) universal access to essential energy services, iii) integrated territorial action, and iv) knowledge and informed action. In its third area, it highlights the need for reinforcing local networks that already provide support to citizens, foreseeing the deployment of local energy support spaces until 2025.

Portugal has also set plans and goals for reducing energy poverty as the country takes up a leadership role in climate change mitigation. Key targets for 2030 are a 55% cut in greenhouse gas emissions and a 35% reduction in primary energy use. There are several barriers to increasing domestic energy-efficiency and improving thermal comfort. Across the country, the residential building stock needs deep renovation, as around one-third is inefficient compared with today's standards. Energy illiteracy is high and ingrained in cultural behaviour: Portuguese people often believe it is normal to feel cold or hot at home in the winter and summer, respectively [20].

Engaging households is critical to increasing building renovation rates, reducing greenhouse gas emissions, and alleviating energy poverty. However, throughout the Portuguese population there is a lack of awareness and information regarding possible measures and behaviours that can be adopted to improve their homes' energy performance and thermal

comfort [26]. Taking measures can be complex and time-consuming. There are multiple challenges once awareness of a problem in one's home has been raised: identifying the best solutions, finding certified providers, evaluating budgets and technical offers, applying to support schemes, supervising renovation works, and monitoring the after-effects. Moreover, government financing schemes are often bureaucratic, leading to low levels of engagement, especially among energy-poor and hard-to-reach households with a lack of digital skills. Providing citizens with the correct information and knowledge is paramount. Nevertheless, it represents a significant challenge as various vulnerabilities, circumstances, and characteristics make a substantial share of Portuguese households hard to reach [27, 28].

Central policies in Portugal emphasise the potential, and increasingly influential, role of initiatives and efforts at the regional and local scale for producing significant impact (see Appendix 2 for more detail on the Portuguese context). Local governments and organisations have closer interactions with their local population, bring experience and information regarding local communities and a relationship of greater trust. They can assume a crucial role both in identifying the most vulnerable regions, localities and people, and in developing strategies for objective measures with significant practical impacts on people's lives.

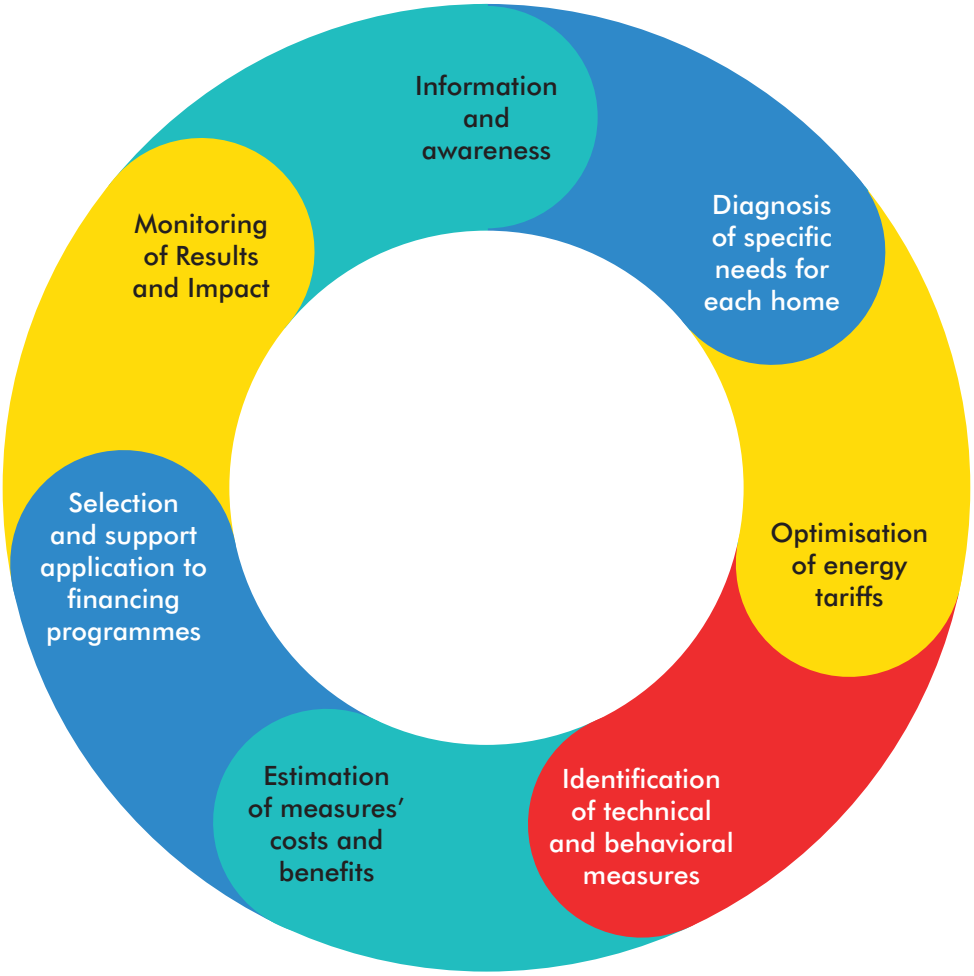
3. About the Transition Point project

In this context, in 2022, the Calouste Gulbenkian Foundation brought together a multidisciplinary partnership, including environmental scientists and energy experts, to bring forward Transition Point [Ponto de Transição] (see more about how the project was set up in Appendix 1).
The project piloted a new approach to mitigating energy poverty and contributing to a just energy transition. This local-scale initiative tested an innovative mobile 'one-stop shop' model to help families improve their energy-efficiency. The model provided support and advice to individuals on increasing the energy-efficiency of their home and reducing their vulnerability to energy poverty, while more broadly promoting energy literacy and the empowerment of local communities.

What are one-stop shops?

One-stop shops offer a promising solution to several challenges of energy poverty. Energy poverty one-stop shops bring all phases of project support under one roof (Figure 1). Based in the community, they deliver tailored technical advice and financing solutions and support households throughout their energy-related projects [6]. This approach turns a complex customer journey into a single-entry and customer-friendly one, promoting direct contact between people and experts to address barriers such as a lack of knowledge, information, and technological capabilities [29]. One-stop shops can be virtual and/or physical while providing services adapted to the local context and target audiences [30]. These models are still underdeveloped in most European countries, but the concept is gaining momentum, with a diverse set of exploratory examples deployed across Europe [31]. In Portugal, they are still emerging, and pilot experiences are urgently needed to test approaches and upscale the concept, which is considered fundamental by the recently published National Energy Poverty Strategy.

Figure 1. 'One-stop shops' integrated support framework.



The Transition Point approach

Transition Point comprised a mobile office – the 'one-stop shop' – operating in a renovated shipping container, transformed into an attractive space for in-person energy-related support. The refurbished container offered a mobile, flexible, low-cost and visually appealing way to engage with local communities. The container was equipped with air conditioning, comfortable furniture, IT, and several information panels. One dedicated full-time technical expert welcomed visitors and guided them towards one or more types of energy-related support.

The Transition Point one-stop shop in central Setúbal, Portugal. July 2022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JÁ USUFRUIU DO "VALE EFICIÊNCIA"?
ENTRE E FALE CONNOSCO
NÓS AJUDAMOS A SELECIONAR AS MELHORES SOLUÇÕES DE EFICIÊNCIA ENERGÉTICA PARA A SUA HABITAÇÃO E A PREENCHER A CANDIDATURA PARA ESTE FINANCIAMENTO PÚBLICO

Transition Point provided diverse support to individuals, explicitly focusing on energy-poor families. The project aimed to supply consumers with useful information to improve their energy literacy and increase their homes' energy-efficiency and thermal comfort. Although energy-poor families were the key target audience, the shop was open daily and available freely to everyone. After the collection of information for analysis, through a dedicated survey, Transition Point provided the following services to the local population:

– Guidance on energy efficiency measures
– Advice on electricity and gas tariffs
– Information and support on public funding schemes for home renovation
– Free home energy audits

The project also raised awareness on energy-related issues, empowered the local community and fostered green jobs by training local people – 'Transition Agents' – to perform home energy audits and engage with local organisations and individuals. The work of these Transition Agents was pooled with the inputs of local authorities and social support services. The project ran in four locations of three municipalities in the coastal region of Setúbal, in Portugal.

+500
visitors

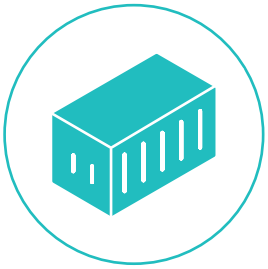
+75
people supported
in applications for funding

51 local stakeholders
directly engaged:
12 local authorities,
11 social support institutions and
18 NGOs

+125
energy audits
&
+1150
recommended energy-related interventions

4. Key stages and takeaways

This analysis examines four key stages identified by the pilot project, and the key takeaways from each: setting up; providing multilevel tailored support; engaging the community; and, building and scaling impact.



1
reused shipping container

14
months of customer service

1
full-time job

4.1 Setting up

Transition Point provided a holistic interactive response, integrating several types of services to address fundamental barriers to home renovation, increase energy-efficiency and support a higher number of people. The project was conceived, funded and coordinated by a philanthropic organisation with the collaboration of three organisations with multidisciplinary expertise. Together they brought a broad range of experience and knowledge, at both theoretical and practical levels, on the topic of energy poverty mitigation to implement the pilot.

Siting the shop

The aim was to reach the broadest possible extent of the energy-poor population within the overall region. Locations were chosen based on up-to-date research on energy poverty and input from local partners. The starting point was an area-based energy poverty vulnerability assessment conducted by CENSE, FCT-NOVA. This identified and characterised the most vulnerable regions at the municipality and civil parish level.

Levels of energy poverty in both summer and winter were then assessed for the different municipalities to be covered by the pilot. This assessment was based on the Energy Poverty Vulnerability Index (IVPE) [16], representing the level of vulnerability to energy poverty from 1 (low) to 20 (high) at the parish spatial scale.

Specific sites were selected by engaging with local government about the socioeconomic characteristics of the local population and the suitability of local conditions. The main criteria were proximity to those in need of support, alongside accessibility which might encourage greater involvement and participation from the general population. (See Appendix 3 for more on the specific sites and who visited them.)

Highly frequented and accessible public areas, with considerable visibility, did attract more people to the initiative. However, the container was mobile and stayed in each location for a limited period only (three months). Arguably, the time in each site was insufficient to reap the benefits of the full dissemination campaign or allow follow-up visits. Furthermore, there was uncertainty regarding the duration of the stay in each location and information on a change of location was given at short notice, since there was a limited timeline for piloting the experience. These were potentially barriers to faster adhesion and a higher number of visits to the container at each location. However, extended opening hours did mean that the service successfully reached people with different work schedules.

17

recruited and trained Transition Agents

12

hours of training

Services offered

Every visitor to the container had a conversation about general energy-efficiency advice. This could be followed up by a more detailed and personalised home visit, conducted by a Transition Agent.

The project offered four different types of energy-related support, aiming to provide multidimensional assistance that would be valuable for a wider demographic:

- Raising awareness: Providing guidance on improving energy-efficiency, adopting renewable energy, and enhancing thermal comfort.
- Electricity and gas bill optimisation: Analysing current contracts and exploring more cost-effective alternatives.
- Information and assistance on finance: Supporting applications for government funding programmes.
- Free home energy audits: Evaluating current energy consumption and home problems and identifying opportunities for improvement.

Collecting and managing information

The one-stop shop developed its own data collection and information management tools and equipment, for example, household characterisation surveys, data processing software, template energy audit reports, and measurement equipment for the energy audits. This facilitated the standardisation of services and ensured data protection (an essential consideration in management and training).

Two household characterisation surveys were central to collect data, diagnose households' needs, and select the type of support to be provided. All collected data was stored in a database via a single information management system which aggregated all the information and possible data functionalities. The data processing tool generated weekly reports on the indicators' evolution, allowing services to be developed and optimised in real time.

The information management tool also processed over 100 indicators into one energy audit report. The Transition Point technician analysed this report before sharing it with the household. The report provides key recommendations to improve energy performance and comfort, with eight topics under three main categories:

- Existing equipment use: Identifying best practices for use; identifying inappropriate uses; options for more efficient equipment.
- Identifying alternative solutions: estimated cost of the solution; estimated payback time on investment; notes on use of equipment to be replaced.
- Passive energy-efficiency strategies: Identifying inadequate situations and presenting solutions; notes on the use of solutions.

The standardised set of tools meant the same initial assessment and subsequent support could be given to families in different locations and by different technicians. The goal was to systematise services so the project could be replicated and scaled elsewhere.

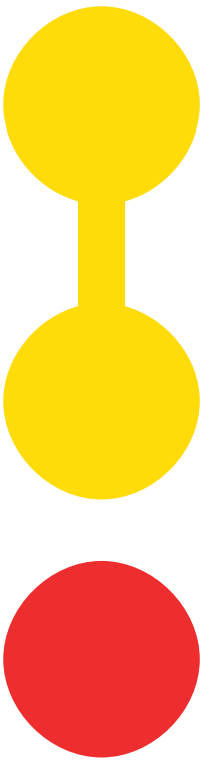
For more detail on the methodologies used, see Appendix 4.

Training the Transition Agents

One of Transition Point's main objectives was to contribute to increasing knowledge and empowering individuals to promote long-lasting impacts within each community. This capacity building was achieved through training local people to be advisers on energy-related topics, known as Transition Agents. These were recruited at four different points throughout the project. All agents had to be over 18 years old and have at least a middle school degree (9th grade completed). A total of 17 people were selected to be Transition Agents. There were ten women and seven men, aged 18 to 44 years old; most were students and some were unemployed at the time.

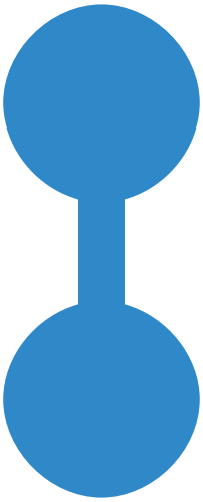
Selected candidates were given specific training materials covering the necessary technical knowledge, for instance, on energy-consuming equipment and energy-efficiency measures, and the data collection methods used by the project. A training session of 12 hours was prepared, divided into three parts – on the project's context and security issues, basic concepts of energy and energy-efficiency in households, and the data collection process during energy audits.

Each Transition Agent received a home energy audit diagnosis kit. This included all necessary materials to perform the service, such as a tablet, an app for data logging, a distance measuring device, and one electric scooter for travelling to the locations. During the visit, all necessary data and information were collected on the information management tool app on the tablet. The Transition Agents received a training certificate issued by the project, were remunerated for their work and were covered by insurance. They were part of the community and became active references for advising the population on energy issues.



"The service provided by the technician was extremely friendly and … provide[d] all the information necessary to improve our energy consumption habits. Careful, easily intelligible explanation and availability to visit our house, which … helped us a lot to understand how we could be more comfortable and energy efficient."

Transition Point visitor



Main takeaways for setting-up

- The first step to developing a collaborative and robust approach is bringing together a multidisciplinary team with scientific, technical, and empirical expertise on energy poverty, while partnering with local governments and other local organisations with in-depth knowledge of the area concerned.
- Combining a variety of data, indicators and the lived experience and knowledge of local partners is key to understanding complex local needs and designing effective one-stop shop service.
- The innovative use of a shipping container offers a flexible way to deliver face-to-face support to local communities. It could be complemented by digital services and online platforms to expand its reach.
- Selecting strategic locations, based on up-to-date scientific data on energy poverty and input from local partners, is critical in engaging local people.
- Regular impact monitoring of the project by the team meant all aspects of the pilot (including locations and engagement) could be optimised as it evolved.
- Extended daily opening is crucial to reach people with different work schedules, while an adequate stay at each location fosters continued support.
- Having one full-time technician in the container with adequate technical knowledge and communication skills was essential.
- The training programme for Transition Agents needs to balance content depth and delivery speed; this trade-off may impact the services' quality, replicability, and comprehensiveness.

4.2 Providing multilevel tailored support

Transition Point aimed to reach a large number of people and respond to their different energy-related problems. Its comprehensive and diversified approach – composed of advice on energy bills, help with energy-efficiency funding applications, home energy audits, and active local champions as the Transition Agents – was developed to address energy-efficiency in homes, the lack of energy literacy and situations of energy poverty. These activities had distinct levels of reach and impact related to the characteristics of the support and the needs of those who visited the container. The visit to the container marked the start of the support.

The energy problems identified

Figure 2 highlights the energy vulnerabilities experienced by people surveyed during their visit to the one-stop shop. Almost half of the visitors stated that they take measures to combat cold/heat that don't require using energy instead of turning on equipment.

Figure 2. Energy and thermal comfort vulnerabilities identified through Transition Point

I avoid switching on heating and/or cooling equipment so as not to increase the bills.

Almost never	18,3%
Few times	6,6%
Sometimes	19,2%
Frequently	29,6%
Always	26,3%

I take measures other than turning on appliances for thermal confort.

Almost never	7,7%
Few times	6,4%
Sometimes	15,0%
Frequently	28,6%
Always	42,3%

I feel that discomfort at home affects health.

Almost never	36,5%
Few times	19,2%
Sometimes	19,6%
Frequently	11,0%
Always	13,7%

I suffer with the outside noise.

Almost never	30,9%
Few times	21,8%
Sometimes	20,0%
Frequently	15,0%
Always	12,3%

I feel hot at home in the summer.

Almost never	18,4%
Few times	16,6%
Sometimes	31,8%
Frequently	18,8%
Always	14,3%

I get cold at home in the winter.

Almost never	12,1%
Few times	8,9%
Sometimes	21,4%
Frequently	27,2%
Always	30,4%

Paying energy bills limits my ability to purchase other goods/ services.

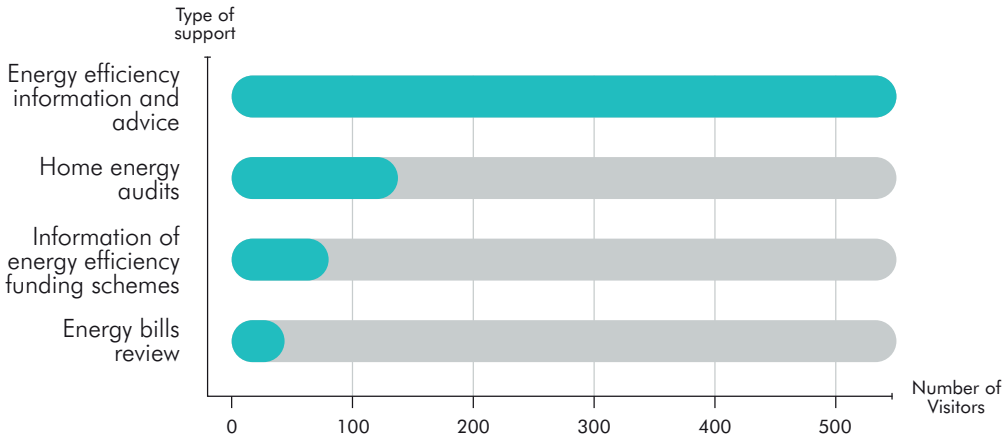
Almost never	60,5%
Few times	10,0%
Sometimes	10,0%
Frequently	9,1%
Always	10,5%

I have difficulty paying my energy bills.

Almost never	53,2%
Few times	13,1%
Sometimes	13,1%
Frequently	11,3%
Always	9,5%

After 14 months, the container had received 544 visitors that were offered several types of support (see Figure 3). Advice on energy-efficiency had the largest reach: every single visitor to the container received information and recommendations on this topic. The second most popular type of support was the home energy audits.

Figure 3. Support provided to Transition Point visitors



Home energy audits

Free home energy audits are an essential part of the Transition Point approach. They allow detailed data collection, the identification of problems and inefficiencies, and personalised advice – given by the Transition Agents – on housing conditions, possible renovations, energy use and efficiency improvements. These home visits complement the community location of the one-stop shop and extend its impact. The Transition Agents identified the need for 34 different types of energy-related interventions in all the audits carried out (a total of 1,141 recommendations across 124 households) (see Figure 4). If implemented, these measures can significantly reduce energy and water consumption and costs, decrease greenhouse gas emissions, and improve thermal comfort.

"Dealing with the community has been a very rewarding experience. People have doubts and are confused by the amount of information they receive, sometimes contradictory or complex. I believe we are doing something important and much needed."

Transition Point container technician

Figure 4 (a). Recommended energy-related interventions

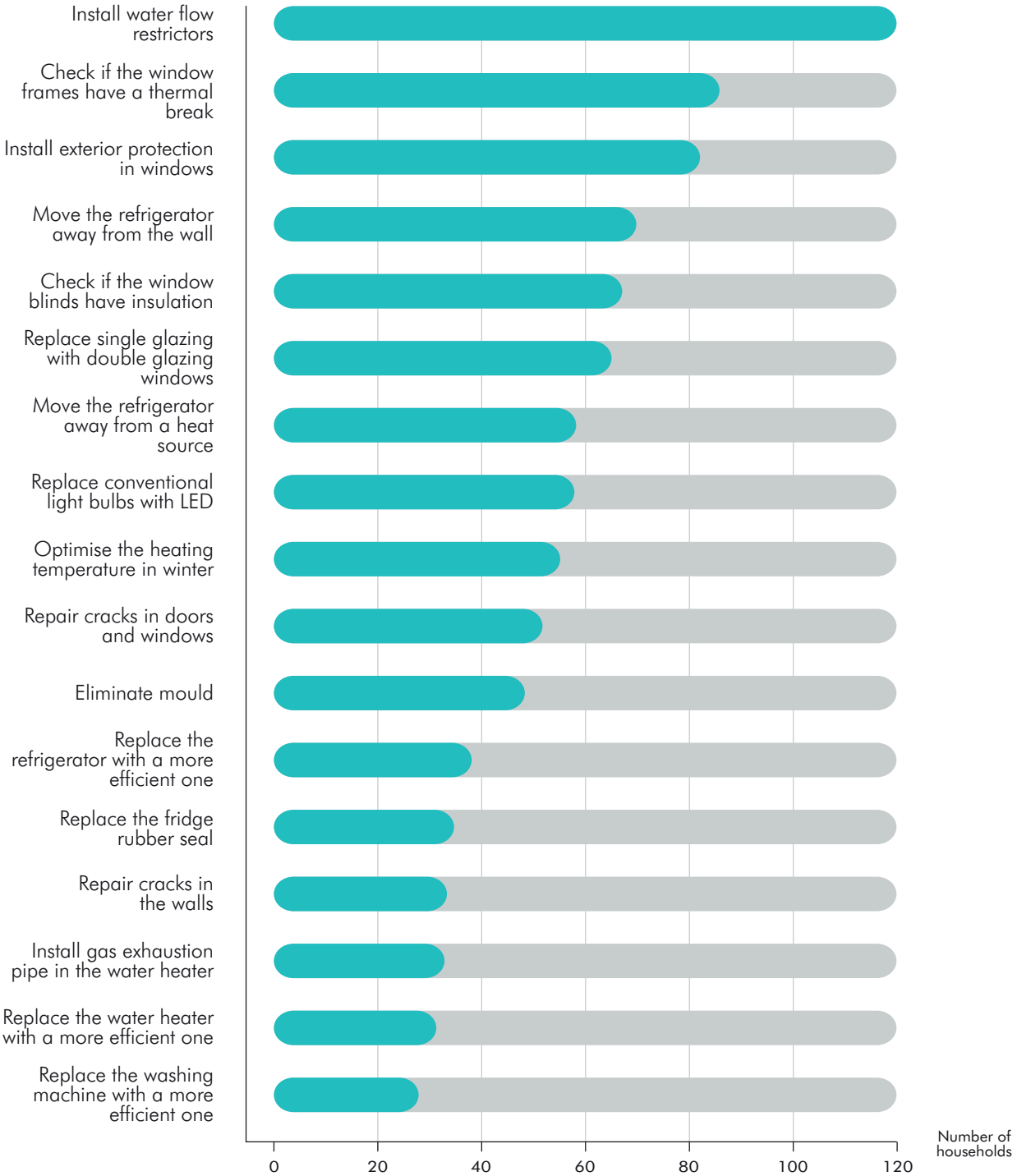
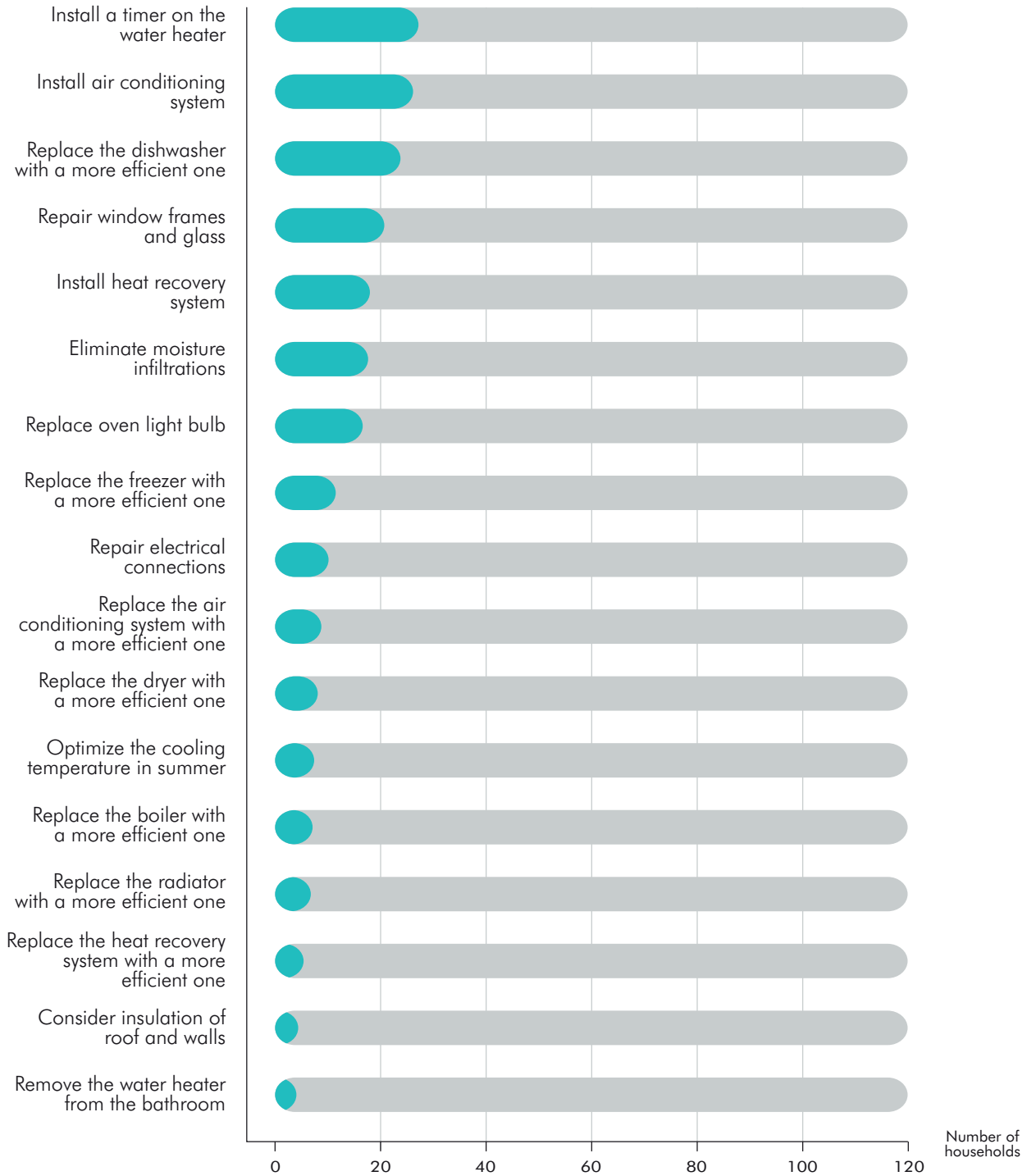


Figure 4 (b). Recommended energy-related interventions



Particularly concerning were multiple safety and sanitary problems identified in more than 40% of the homes audited. These include cracks in doors, windows and walls; mould; damp; inadequate gas ventilation; and hazardous electrical connections.

The 34 different types of energy-related interventions were grouped into eight categories – space heating and cooling, household appliances, insulation, lighting, sanitary and/or safety concerns, water saving, water heating, and windows and glazing. The most common proposed category of interventions (see Figure 5) focused on household appliances, replacing windows and glazing, and sanitary and safety concerns, accounting for 64% of the total. Measures on heating and cooling and water-saving also represent a relevant share (20%). The remaining 16% relate to insulation, water heating and lighting.

The interventions were also divided according to their type, namely in installation of new equipment, repair of existing equipment, replacement of existing equipment by another solution, and quick wins (see Figure 6). The most common type of measures recommended (38%) were quick wins – such as changing the lightbulbs to LED or installing water flow restrictors – that can be implemented fast and cost little. Replacing existing equipment with more efficient solutions is the next most common (26%). Repairing existing equipment and construction elements was also an important recommendation, particularly looking at poorly insulated windows and malfunctioning equipment. However, notably absent are measures such as roof insulation and installing solar photovoltaic systems; these are complex interventions requiring a more professional energy auditing approach.

Figure 5. Recommended home interventions by category

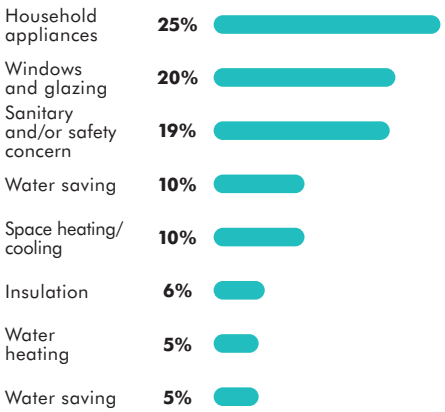
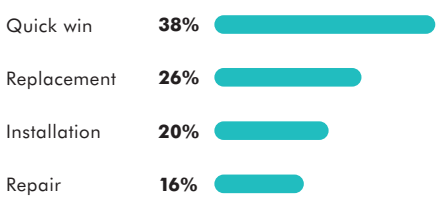


Figure 6. Recommended home interventions by type



"People were very interested in listening to practical tips to improve the thermal comfort of their homes and reduce electricity costs, and it was very rewarding for me to be able to help."

Transition Agent

About one-third of the recommended interventions listed in Figure 4 enabled an impact evaluation based on the estimated investment needed and the corresponding annual energy, water, cost, and CO_2 savings.[1] This evaluation gives households key information on which to base their decisions. It wasn't possible to evaluate all the interventions in this way due to lack of data, hard to estimate savings, and the intangible impacts of some interventions whose primary benefits are improving comfort and ensuring safety and sanitation. Considering an average useful lifetime of 15 years (and excluding double glazing which accounts for a large part of the investment while producing mostly intangible benefits instead of monetary savings), the average return on investment for the intervention package would be obtained in around seven years for the audited households.

The interventions recommended by the Transition Agents suggest an energy-saving potential of up to 21% of current electricity consumption. This saving potential stands within the expected values from previous scientific research [39]. Higher energy savings could be achieved by considering a wider range of energy-efficiency, home renovation, and renewable energy measures.

While annual savings are a relevant metric for households, the tangible impact of the recommended interventions on energy, water, cost, and CO_2 savings is felt far beyond the project's duration.

Support with energy-efficiency public funding

The project also provided citizens with advice on the availability of public energy-efficiency funding programmes and offered support in applying for them. Like advice on bills, this could require ongoing assistance and more than one visit to the shop. Most interactions in the container regarding energy-efficiency funding were questions about the availability of public Environmental Fund ("Fundo Ambiental") programmes derived from the Recovery and Resilience Plan.

Yet most visitors could not benefit from any of these funding programmes because: i) they were not homeowners and hence not eligible; ii) the programmes were not active at the time; or iii) they were not interested in applying – only a few of the interactions actually resulted in support for applications. Some visitors to the Transition Point container did not have the necessary internet access, email or skills to use online services, but were helped to make an application they would not otherwise have been able to.

[1] Interventions included in impact evaluation: Install water flow restrictors, Replace single glazing with double glazing windows, Replace conventional light bulbs with LED, Replace the refrigerator with a more efficient one, Replace the water heater with a more efficient one, Replace the washing machine with a more efficient one, Replace the dishwasher with a more efficient one, Replace the freezer with a more efficient one. Estimates were made based on data provided by ENA and with the calculation tools developed by CENSE, FCT-NOVA, in the context of the Menu de Renovação Verde online platform (www.menurenovacaoverde.pt).

Many visitors stated that excessive bureaucracy around public funding programmes not only makes the application process more difficult and time-consuming but also contributes to applications being uncompleted or unsuccessful. This fed into feelings of distrust and a lack of credibility regarding funding programmes.

Reducing energy bills

A simulator was used to identify the lowest available energy prices for each family and estimate potential cost savings. Most visitors to the one-stop shop didn't know about this free online tool. Only one person (out of 33 who had their energy bills reviewed) already had the best possible rate. The average household had potential annual savings of €290, around €25 per month.

Getting this help did require people to share their energy bills, and this usually meant more than one visit to the one-stop shop. However, several did not return for a second visit with the required documents, which reduced the numbers benefiting from this advice.

Main takeaways for multilevel tailored support

- Trained one-stop shop personnel can support citizens in applying for energy-efficiency funding and help untangle confusing or problematic situations in the application process.
- Conducting a short survey during each first visit is a quick and cost-effective way of gathering useful data to diagnose the situation and personalise proposals.
- Personnel need both technical knowledge and good communication skills.
- The high percentage not returning for a second in-person visit shows a need for a proactive follow-up strategy, for instance, by continuing support by telephone or online.
- Home energy audits proved a key service, allowing the collection of detailed data, identification of safety and sanitary problems, and personalised advice on energy efficiency and renewable energy measures.
- Home energy audits have not only confirmed the low energy-efficiency of local housing stock but have also revealed its poor state of conservation. Serious issues regarding safety and sanitary conditions should be a priority in any renovation.
- Measures proposed in the energy audits offer considerable potential for reducing energy and water use and CO2 emissions. However, implementing these would require significant financial investment.
- There is considerable potential for one-stop shops to bridge national programmes and communities, leveraging their local expertise to galvanise participation and targeting hard-to-reach and vulnerable people.

4.3 Engaging the community

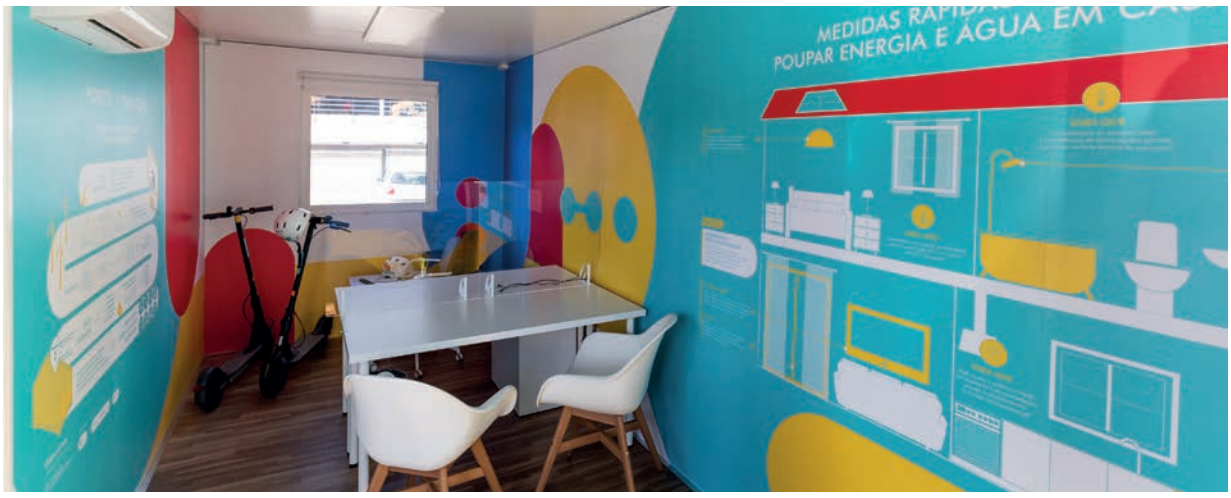
The one-stop shop was set up in a range of neighbourhoods. When it was located in vulnerable neighbourhoods, this brought to light the difficulty of effectively engaging households characterised by multiple and intersecting vulnerabilities, such as precarious financial situations and rented or illegal accommodation. The project took a range of approaches to promoting the service, building trust and getting support to those who needed it most.

Getting the message out

Various dissemination strategies were used, such as newspaper advertisements and articles, online marketing tools and word-of-mouth. Different types of printed material were developed to disseminate the project and attract people to the container. The project also had a digital presence on all project partners' websites and social media.

Since increasing energy literacy was one of the project's main objectives, the key messages that made up the visual identity of Transition Point were based on the support the one-stop shop provided rather than the problems it was trying to solve. The goal was to engage with local citizens using positive messaging, avoiding overly technical jargon or expressions that potentially carry stigma or judgement. Thus, concepts such as 'energy poverty' and 'energy vulnerability' were avoided, in favour of 'increased energy-efficiency', 'free advice' and 'lower energy bills' – a straightforward and positive narrative anchored in ideas that trigger action, directly linked to the effective scope of the project.

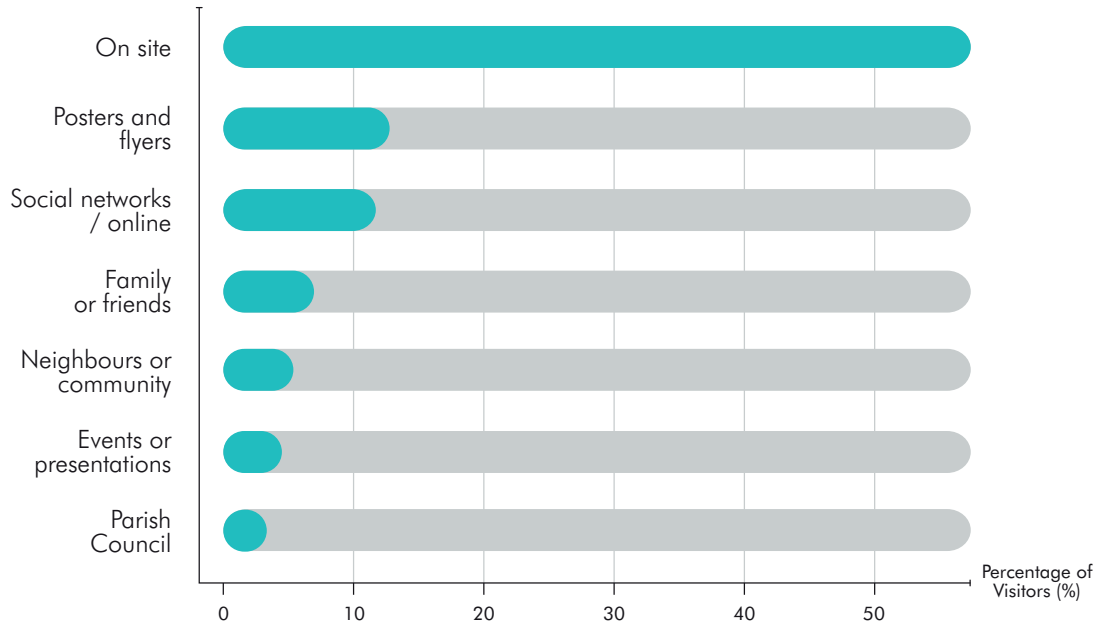
Three infographics inside the container provided visitors with more detailed information about the project, some simple tips to increase energy efficiency and savings at home, and a digital animation on the concept, causes and characteristics of energy poverty.



Inside view of the container

All these strategies aimed to increase awareness of the project and ultimately encourage more people to visit the container. Visitors surveyed reported that they got to know about the project from advertisements, news articles or messages displayed on the exterior. Most said that the eye-catching theme and location of the mobile unit were the main reasons they came in (see Figure 7).

Figure 7. How people got to know about Transition Point



Transition Point also approached people outside the physical location of the container. As the project progressed, and changed locations, more proactive approaches were tested to overcome barriers of stigma and shyness, such as the Transition Agents carrying out a door-to-door leaflet drop over some weeks. The leaflets contained more detailed information about the project and the services it provides, with a particular focus on the free home audits. Although it was sometimes challenging to access mailboxes inside buildings, the leaflet distribution resulted in a significant amount of new requests for home audits.

Another tested doorstep approach consisted of coordinating social action technicians' visits to deprived families, some living in illegal dwellings, with the home energy audits provided by the project. In another location, Transition Point worked closely with the social action office of the municipal council, which was responsible for the recruitment of Transition Agents and project dissemination amongst local organisations, distributing material such as posters and flyers.

Different contact methods, such as, telephone or email, helped reach those unable to visit the container in person.

Building trust

To build trust and reward people for engaging with the project, visitors were presented with small gifts that enable modest energy and water-efficiency improvements at home, such as LED light bulbs. Different strategies and offers were tested in different municipalities, such as offering a water flow reducer to any family that welcomed a Transition Agent during a home visit. The personalised support delivered by the Transition Agents itself contributed to increasing trust; visiting people's homes connected households with the project's approach and aims.

Building on local networks

A critical component of the pilot was the promotion of partnerships with local stakeholders to leverage impact and foster engagement. Local organisations are active in social support and have already identified vulnerable families in their area; this well-established relationship of trust can be carried over into work around energy matters. Previous research has highlighted the role of local stakeholders as intermediaries between local people and energy-related support [20, 28, 34].

The **active involvement of local authorities**, such as municipalities and civil parishes, was crucial for deploying the Transition Point mobile container in adequate locations and for building trust with the local community.	**Two-way collaboration with social support departments and institutions** provided synergies in addressing intersecting vulnerabilities and enabled better identification and access to vulnerable and energy-poor families.	**Municipal social services, social solidarity associations and youth associations** played an important role in identifying and recruiting Transition Agents to be trained to carry out home energy audits.	Other local stakeholders, such as **non-profit associations focused on a range of cultural, sports, community, and other topics**, were relevant partners with the capability to communicate with a wider spectrum of the population.

Figure 8. Summary of the key roles of local stakeholders in Transition Point

Partnerships with local stakeholders were fundamental for several reasons (see Figure 8). Partnerships with local governments and with community organisations – such as social support institutions and local community, sports, and arts associations – can provide well-established communication channels and engage vulnerable populations through solid, trusted relationships. Leveraging existing local dynamics and trusted relationships enables better access to the population, particularly vulnerable families. Furthermore, diverse local partners provide different contributions to the one-stop shop.

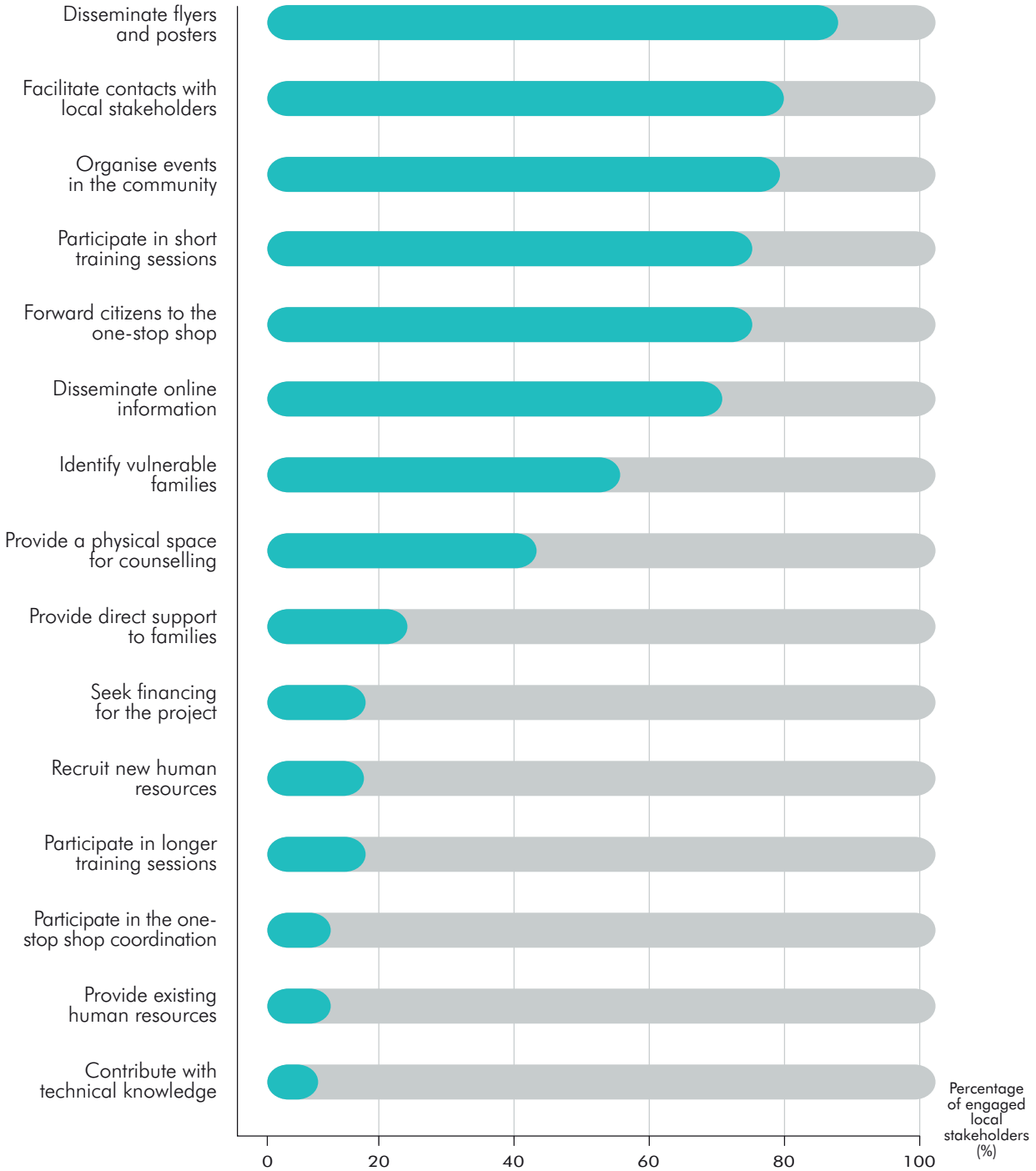
Besides enabling and brokering contact with the population, local governments can also contribute with logistic support and dissemination, for instance, the use of public spaces to publicise the project and install banners or posters. Engaging with local stakeholders on different tasks of the pilot project already proved to greatly amplify its impacts. Aiming to further boost synergies, a wider group of local stakeholders was informed about the project and asked about specific tasks where collaboration could be fruitful for future stages. Over 70% of local stakeholders were available to disseminate the project, facilitate contacts with local partners, organise community events, participate in short training sessions, and forward people to Transition Point services. Around half of the engaged stakeholders could identify vulnerable families to receive dedicated support on energy poverty mitigation, emphasising the role of social support institutions. However, notably, few local stakeholders had the technical knowledge, human resources, and financing capability for deeper engagement in other project tasks, such as providing direct support to individuals, redirecting existing staff or hiring new personnel for one-stop-shop tasks, and taking part in the coordination of the project itself. This is a gap that local energy agencies and local governments are well positioned to fill as leaders of one-stop shop initiatives.

When asked why they participated in Transition Point, engaged stakeholders most frequently mentioned environmental concerns (62%), participation in the community (47%), and social support to vulnerable populations (41%). However, this willingness is hindered by barriers, most notably scarce human resources (68%), lack of time and other priorities (41%), concerns around financing and infrastructures (38%), and low receptivity to energy-related issues in their target audiences (21%). Proposed solutions to overcome these barriers include dedicated financing (71%), integration in a wider local network (39%), additional human resources (29%), and support from local governments (23%).

Introducing the project to the local community

There were several meetings with local organisations – such as residents' associations, social solidarity associations, and local governments (civil parishes) – to present the project and discuss its direct impact on the local community and organisations' involvement. These meetings were also possible due to the municipality's support, which established the contacts. In the meetings, each body was represented by a spokesperson. This was an essential step for the local community to know, accept and welcome

Figure 9. Tasks for local stakeholders to support delivery of a one-stop shop [40]



the project, as well as fostering active participation for a greater impact. It was important to select the most direct stakeholders and conduct meetings to explain the project's purpose, how it would affect them, and their potential involvement and role in its development. In one municipality, for example, the social action office referred vulnerable citizens to Transition Point's container for support – a good practice for future initiatives.

Main takeaways for engaging the community

- The visually appealing design of the container increased curiosity and engagement in the project, driving people to approach and ask questions.
- Clear, positive messaging helped to reach the local population. Poverty is a sensitive issue, and any associated stigma may hinder effective communications.
- Diverse communication materials and engagement initiatives were vital components of local outreach and audience widening.
- Being proactive in approaching people and initiating the conversation is key to increasing engagement: feelings of shyness, stigma, mistrust, and even lack of problem recognition can keep them away from the project.
- Energy-poor and vulnerable households will often be hard to reach. Proactive efforts should be made to engage with them, working closely with other social support initiatives.
- Small but useful gifts can help to build trust with visitors, encouraging them to prolong their stay.
- Diverse local partners provide different contributions, including well-established communication channels, existing local dynamics and trusted relationships that organically increase a project's network and enable better access to the population, particularly vulnerable families.
- At the beginning of a one-stop shop project, it can be useful to map local organisations and to establish a first contact. Providing them with dissemination materials and setting up meetings can help spark curiosity and allow space to explore opportunities for collaboration.
- Transition Agents are a key component of the community engagement strategy, as they visit homes and deliver a personalised type of support that contributes to increasing trust in the project and connecting people with its approach and aims.

"This type of support should exist in greater numbers within the community so that there is more information and follow-up for everyone."

Transition Point visitor

4.4 Building and scaling impact

The community-based location and direct collaboration with municipal departments were the main ways for Transition Point to better access communities and vulnerable families and to scale up its impact. Wider dissemination and outreach activities were also complementary tools for building up the project and increasing its impact in the target region and beyond. The pilot's novel approach attracted the attention and interest of both public and private energy market players aiming to learn from this experience and/or contribute to its deployment. Collaboration between Transition Point, local governments and other stakeholders was vital in unlocking future opportunities for continuing the project, broadening its scope of support and even extending or replicating the approach.

Regional replication within Portugal

A short online questionnaire was targeted at local energy and environment agencies on the subject of one-stop shops and energy poverty (for more detail see Appendix 2). The mission of these agencies is contributing to sustainable development, through the development of projects, methods, practices and knowledge dedicated to preserving the environment and increasing efficiency of energy and resources use.

About 35% of energy agencies surveyed reported knowing about one-stop shops, and half of them mentioned that they have considered developing a similar project in their jurisdiction. The most mentioned advantages were its role as a measure to tackle energy poverty, provide community support and increase energy literacy. Two-thirds of the surveyed agencies were willing to receive Transition Point in their area. However, several obstacles were also mentioned: the operation model, the willingness of municipalities to support the measure, and the lack of funding. The most cited obstacle was the lack of human resources. In the future, it would be essential to hold a face-to-face exploratory meeting where the project is presented for devising potential strategies to extend this concept to other areas with distinct needs and resources.

Promotion through news and social media

Due to the project's novelty and strong and diverse dissemination efforts, it has had considerable visibility in the media, with multiple references in national and regional media outlets since its beginning. This has contributed to spreading the word on the project, showcasing it to a larger national audience, creating a broader community aware of its activities and potentially increasing the number of visitors to the container. Articles in local and regional media were found to more easily reach the local population and prompt them to visit Transition Point.

There was also a strong focus on dissemination via social media. Close to 100 posts about the project have been published on Facebook, Twitter, LinkedIn and Instagram by the consortium partners and associated local authorities since its inception, reaching over 50,000 people.

National and international dissemination

The project team made a significant effort to showcase the project in external events, such as roundtables, conferences, summits, university classes, science fairs, workshops and others. In total, between 2022 and 2023, Transition Point has been presented and discussed in over 30 national events and sessions in Portugal; this has helped increase its reach and impacts, establishing it as a flagship project and potentially opening doors for its future replication.

Building on its partners' international networks, Transition Point has also been disseminated internationally, mainly via the European Commission's leading energy poverty initiative – the EU Energy Poverty Advisory Hub (EPAH). Transition Point has also been presented internationally in different events including a European Parliament session, international conferences, and university meetings in Brazil, Turkey and Mexico.

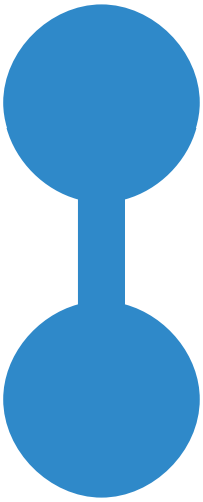
Leveraging private funding and strategic partnerships

Public and private bodies have expressed an interest in more information about the development and impact of the project, and in potentially replicating it, establishing a partnership with the promoters of the project, or even supporting it. For example, one organisation decided to provide financial support to the project as part of their corporate social responsibility strategy, which allowed for continuing the project after its pilot phase and creating synergies with other funding opportunities for replication initiatives.

Main takeaways for building and scaling impact

- With its broad dissemination strategy and support services, Transition Point has raised awareness of the chronic problem of energy poverty across local communities.
- Effective dissemination and outreach strategies – including a diverse range of platforms such as social networks, national and local media, conferences, events, and databases – are essential to increase the one-stop shop's visibility, leverage synergies, and scale impact.
- Local and regional energy agencies have limited practical knowledge of one-stop shops but are aware of the advantages of this approach. Most are open to implementing similar approaches. There is, nevertheless, concern about barriers such as financing constraints and a lack of necessary human resources.
- The novel approach of the one-stop shop model has attracted the attention of private market players aiming to make more of their social responsibility impact. This can unlock future funding avenues for broadening the scope of support and extending or replicating the project.

5. Insights for catalysing change



An important aim of the Transition Point project is to catalyse change in the energy ecosystem. The project's experience provides key insights and calls to action for future replication and enhancement of energy-efficiency one-stop shops, and also for similar community-facing approaches to tackling energy poverty.

Expanding community-level impacts

Fostering neighbourhood dynamics and proactively engaging citizens have yielded positive results and could be further expanded to support more people. An early and strong strategy to involve local stakeholders in the entire one-stop shop process – from design to implementation – can contribute to building a solid network of partners that develop collaborative work. To ensure meaningful and effective collaboration, adequate funding, resources and time should be allocated to map, engage, and work with local partners.

A dissemination strategy based on diverse mediums, leveraging both physical and digital channels, has proven effective in bringing a considerable number of people to the one-stop shop. However, to provide relevant energy-related support to disadvantaged communities, an approach like Transition Point should focus on assembling a stronger engagement strategy for hard-to-reach population groups. This should always work in synergy with other social support services that are already in place. Future initiatives could expand on the transformation of local young people into Transitions Agents by providing them with certified training and employment opportunities. The Transition Agent role was an essential component of community engagement and there is untapped potential to increase their training and responsibility in one-stop shop projects.

Deepening support to vulnerable families

Transition Point provided both general and tailored advice to citizens, focusing on a wide array of behavioural, soft, and technical energy-efficiency measures. However, vulnerable families often have limited capability to change their situation by their own means and cannot implement measures that incur significant costs. Future initiatives can enhance positive impacts on vulnerable families by going beyond providing advice to directly supporting the actual implementation of tangible measures, such as installing insulation, replacing energy-inefficient equipment, integrating renewable energy systems, and repairing safety and sanitary hazards. The financing and implementation of these measures in vulnerable households would effectively reduce their vulnerability to energy poverty.

There is also potential to increase further the flexibility of support provided for future initiatives, extending the range of services and increasing their geographical coverage. The Transition Point approach was mainly based on centralised on-site support through a mobile physical space, although the flexibility of the team allowed for interactions via other means. A greater focus on other methods to deliver support, namely through

digital services and decentralised physical spaces, could help reach and support a higher number of people, including those whose mobility is limited. One possibility would be to create partnerships with existing online one-stop shops or platforms that could complement or expand the provided services, adding this digital component.

Fostering replication and policy integration

Transition Point's replicability and lessons are relevant to expanding its geographical scope and increasing its long-term impacts. They are in line with the European legislation and recommendations on energy efficiency and energy poverty, and with the Portuguese energy poverty strategy that plans to reinforce the local structures on energy poverty mitigation through the development of citizen energy support spaces. This replication can be partial, using segments of the approach mixed with other methods, or complete, with more refurbished containers installed in different regions or even countries, and a full reproduction of the approaches deployed. Replicability can also be based on partnerships with the private sector, creating different business models; this might even expand the range of possibilities for meeting people's diverse needs. Another avenue would be participating in future national and international projects in collaboration with other bodies.

One-stop shops can also use their impact to establish and consolidate long-term political will and commitment by their relevant local governments. Their services and dissemination strategies can be integrated into local energy and climate policies, helping to redefine these for increased effectiveness. Finally, one-stop shops can bring energy-poor and hard-to-reach households to the forefront of local energy strategies and measures promoting their inclusion in local energy transitions.

Bridging the funding gap

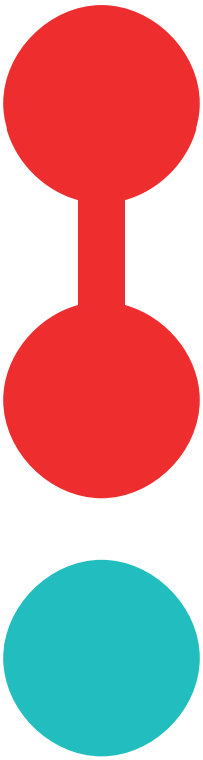
One of Transition Point's main contributions is serving as a bridge for knowledge. The project has highlighted the difficulty of reaching and supporting the most vulnerable groups, both through the existing national energy-efficiency policies and funding schemes and through the local-scale services offered by one-stop shops set within the community. For example, two of the most prominent funding schemes in Portugal that were in place for some of the time this pilot was being developed had eligibility criteria which ruled out tenants, although they are often at increased risk of energy poverty (see Appendix 2). Many people are unaware of what benefits they might be eligible for.

Thus, Transition Point has identified a critical funding gap that needs to be bridged to enable households to implement concrete measures to improve energy-efficiency. This funding gap is particularly vast for energy-poor families, who require extensive financial, technical, and social support to implement recommendations from one-stop shop technical experts. Overall, existing support and funding schemes should be more stable and continuous while also tailored to the specific needs of different population groups. A vital focus should be placed on vulnerable and hard-to-reach groups, going the extra mile

to better tackle energy poverty via a strategy mainly of tailored support aiming to structurally improve the energy performance of homes.

In Portugal, there is an important argument for more lines of support and funding at the national and municipal level for the energy renovation of vulnerable households. The available funding schemes during the pilot phase of the project haven't been nearly enough nor sufficiently well-targeted to address the large number of families suffering from energy poverty. Looking beyond public funding, one-stop shop developers can also consider establishing strategic partnerships with other bodies (for example, private companies) to financially support the most extreme energy poverty situations.

If adequate funding is in place, the Transition Point one-stop shop model can act as a living lab for testing the effectiveness of these changes in real time and informing decision-makers. In Portugal, this position is supported by the government via the Plan for Recovery and Resilience update to boost participation in buildings energy efficiency schemes [41]. This could place Transition Point as a reference point for future one-stop shops across the country.



"There is online information available, but we don't always have the time and patience to research it or manage to interpret it in the best way. ... being able to talk directly with someone who enlightens us is very important. There are issues that we do not consider when we try to inform ourselves without guidance."

Transition Point visitor

"A [home energy audit] report was sent to us afterwards, as promised, as well as reiterating availability to inform us about the energy efficiency funding schemes application process."

Transition Point visitor

"Energy sustainability depends on each of our small gestures to implement energy-efficiency improvements, which, when combined, can have a significant impact on reducing energy consumption. Transition Point helped families from Palmela take these changes."

Alderman, Palmela City Council

"This project allowed us to have direct contact with the reality of energy poverty in Portugal, deepening our knowledge and involvement through the stories that are behind each case, each house."

Agency representative

Recommendations for key agents

- **National governments** should guarantee policy context and stable funding for household energy-efficiency improvements as an essential component of broader energy, climate and social strategies. They should also promote the establishment of a national network for the energy poverty ecosystem with the proactive participation of multiple stakeholders. When designing and implementing policies, measures and funding schemes, national governments and other public bodies should specifically recognise the need to target energy-poor and hard-to-reach populations.

- **Local authorities** can contribute by establishing and maintaining local one-stop shops, using their resources to engage local organisations and to identify and support the energy-poor with tailored action. They can also open funding lines (that complement existing national funding) to support families with energy efficiency. This could evolve into more integrated efforts with local stakeholders to deliver on local energy and climate goals regarding energy poverty and ensure a just transition.

- **Regional and local energy and environment agencies** can offer their technical knowledge on energy-efficiency to their local communities: they have privileged access to local governments, since they are central to energy policy at the local level. Their experience enables the development of local-scale diagnosis and tailoring of appropriate support measures, putting them in a position to take up leadership roles in one-stop shops.

- **Non-governmental and community-based organisations** can help promote one-stop shop services and identify and support vulnerable households in their energy-related struggles. Their experience engaging the local population, having well-established communication channels, and relationships with hard-to-reach audiences is valuable and important to build trust.

- **Academic institutions** can provide scientific evidence and model interventions that underpin the scale and impact of tested and evolving methodologies. They can also support diagnosis, planning and impact assessment phases.

- **Private sector bodies** can help sustain, replicate and leverage one-stop shops towards new business models, providing direct funding, volunteer support or materials under their social and environmental impact strategies.

6. Conclusion

Rising energy costs resulting from the current energy crisis have aggravated vulnerability to energy poverty and increased the number of people affected throughout Europe. This has increased households' need for information and support services that provide sustainable alternatives and pathways to reduce their vulnerability, and help them become more energy-resilient. And, with the impacts of climate change rising in severity and frequency, disadvantaged people require more assistance to overcome the persistent barriers to adopting sustainable energy solutions if we are to ensure that no one is left behind as we adapt to our changing world.

By supporting the implementation of energy poverty mitigation measures at the local scale, the Transition Point one-stop shop model provides a holistic and highly replicable approach to promote a just energy transition. With its innovative concept – piloted in the Portuguese context and closely aligned with the European Commission's goals on energy-efficiency, buildings renovation and energy poverty – Transition Point has proved to be a flagship project in delivering energy-related support to citizens and improving energy-efficiency and energy literacy in the local population.

To boost positive impacts, future initiatives are recommended to deploy participatory, proactive, and flexible approaches to target key groups requiring energy transition support and deliver multidimensional support. Approaches should be regularly evaluated and adapted to meet the needs of distinct populations and evolving contextual backgrounds.

Transition Point piloted a local-scale response to alleviating energy poverty – from problem diagnosis and design of solutions, to direct individual support and community engagement – considering Portugal's main opportunities and challenges. It has demonstrated the viability of one-stop shops and how they can positively impact the local population in energy-related matters. These initiatives can be an essential tool to put EU and other national energy and climate policy frameworks into practice, from diagnosis to planning and implementation of solutions. One stop-shops can bring national policy and related support schemes closer to people, ultimately accelerating a just and inclusive energy transition.


SAIBA COMO
AUMENTAR
O CONFORTO
TÉRMICO
DA SUA CASA
E POUPAR
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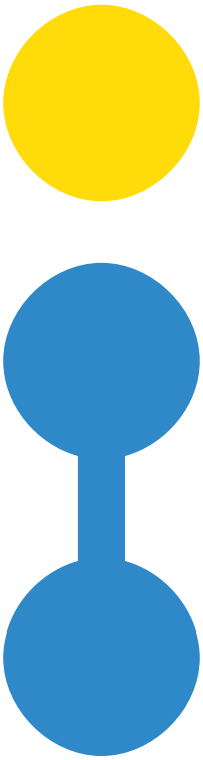
Part II: Technical Appendices



Appendix 1: About the project

This project results from a partnership between the Calouste Gulbenkian Foundation and a set of Portuguese organisations with diverse and complementary skill sets: the Energy and Environment Agency of Arrábida (ENA), the FCT-NOVA University of Lisbon's Center for Environmental and Sustainability Research (CENSE), and the Association of Energy and Environment Agencies (RNAE) in Portugal.

The Calouste Gulbenkian Foundation is an international foundation, based in Portugal, that promotes the development of individuals and organisations, through art, science, education, and charity, for a more equitable and sustainable society. The Calouste Gulbenkian Foundation promotes knowledge, scientific research, and a greater participation and engagement of citizens and civil society in building more sustainable and resilient communities.

The Energy and Environment Agency of Arrábida (ENA) is a non-profit association made up of public and private entities and citizens, created in 2006 by the municipalities of Setúbal, Palmela and Sesimbra, under the "Intelligent Energy Europe Program". It promotes energy efficiency, sustainability and good environmental practices in the Territory of Arrábida.

The Center for Environmental and Sustainability Research (CENSE, NOVA-FCT) is a center of interdisciplinary excellence and advanced education in sustainability, being inserted in the NOVA School of Science and Technology of NOVA University of Lisbon. As a scientifically recognized center, it integrates international and national networks and produces knowledge that informs multi-scale policy decisions, promoting the co-creation of solutions with society. Since 2016, it has been promoting research and support to local energy poverty entities, currently part of the EU Energy Poverty Advisory HUB coordination team.

RNAE is a private, non-profit association created in 2010 to promote the participation of the 19 Energy and Environment Agencies existing in Portugal (covering about 60% of the municipalities in the country) in wide-ranging projects, as well as to develop partnerships in the following areas of intervention: Energy Efficiency, Renewable Energies, Alternative Fuels, Sustainable Mobility, Waste Recovery, Climate Change and Combating Energy Poverty.

The partnership for the Transition Point project produced a core multidisciplinary team that represents a broad range of experience and knowledge at both theoretical and practical levels on the topic of energy poverty mitigation, including through local approaches.

The Calouste Gulbenkian Foundation is the promoter of the project and was responsible for its conception, financing and management. ENA was responsible for implementing and operating the project on site and liaising with local authorities. It also provided training for the Transition Agents. CENSE, FCT-NOVA undertook the scientific monitoring of the project, verified the model developed and produced the technical input for the impact report. RNAE assisted in identifying programmes and funding instruments applicable to the target audience and provided the link with other national energy agencies.

The project took a 'proximity approach' whereby all work is carried out within local communities, in close contact to the populations. Local entities can be crucial in identifying the most vulnerable and in-need regions, localities and people, and developing strategies that deliver on agreed objectives while leading to significant, tangible improvements to people's lives. For a successful proximity approach, the project promoted a close collaboration with local municipalities and civil parishes from the start.

Transition Point was piloted over one year (February 2022 to April 2023) in Setúbal District in the central coastal region of Portugal. The mobile one-stop shop unit was based in several sites within three different municipalities (Setúbal, Palmela, and Sesimbra), anchored for three months in each location. This allowed for a comparative assessment of the pilot activities and impacts. Sites were selected based on information collected through relevant local governments regarding the socioeconomic characteristics of the neighbourhoods' population and the suitability of local conditions. Selection also drew on a regional energy poverty vulnerability diagnosis performed by CENSE, FCT-NOVA. This combined a multidimensional set of indicators (buildings characteristics, energy consumption, climate, demographics, and socioeconomic factors) at the regional level [16]. The locations' selection was mainly motivated by the will to reach the broadest possible extent of the energy-poor population in this region.

Appendix 2: The policy context in Portugal

Energy poverty has been a serious issue for Portugal's population for decades. Portugal consistently ranks among the worst EU member states regarding energy poverty indicators and indexes, and this is closely linked to the poor thermal performance of residential buildings. Generally, Portuguese homes have low energy performance [10], exacerbating problems such as lack of thermal comfort, indoor air pollution, leakages, and damp. This is at the root of the severe and complex problem of energy poverty that significantly affects the population across Portugal [11]. In 2022, around 1.7 million people reported were unable to heat their homes to a comfortable temperature in the winter; in 2020, 3.1 million lived in homes in deteriorating condition [9].

However, although the residential sector uses 18% of total final energy [13], building renovation rates remain very low, with deep renovation estimated to occur in fewer than 0.1% of buildings annually [12]. People still mainly use inefficient space heating systems, such as fireplaces and electric heaters [13]. The multidimensionality of this problem is evident, as energy prices and low incomes also contribute significantly [14-17]. A general lack of energy literacy is also an aggravating factor [19].

- 16.4% of households are unable to keep their home adequately warm (fifth highest in the EU and above the average of 6.9% in 2021) [21] **(PT: 1.7 million households, EU: 30.8 million households)**

- 35.7% of the population live in houses that are not comfortably cooled in summer (second highest and above the EU average of 20.9% in 2012) [22] **(PT: 3.7 million households, EU: 105.3 million households)**

- 25.2% of the population live in homes with leaks, damp, or rot (second highest and above the EU average of 14.8% in 2020) [23] **(PT: 2.6 million households, EU: 66.3 million households)**

- Over 70% of households are inefficient (C class or lower), based on available energy performance certificates [10] **(2.2 million households)**

- About 20.5% of households are entitled to a social tariff to help pay electricity and natural gas bills [24, 25] **(635 thousand households)**

- Portuguese consumers scored an energy literacy index of 43 points on a scale from 0 to 100 [19].

These worrying numbers, highlighted by academia and civil society, have attracted increased attention from the media and policymakers. Portugal's central administration has recently placed energy poverty as a major topic in the energy policy agenda, setting plans and goals for its reduction as the country takes up a leadership role in climate change mitigation. Portugal has set key targets of a 55% cut in greenhouse gas emissions and a 35% reduction in primary energy use by 2030. The National Energy and Climate Plan 2030 has established a dedicated line of action to combat energy poverty and better protect vulnerable consumers. Additional efforts are needed to attain the goals of the Portuguese Long-term Building Renovation Strategy; this aims to renovate virtually 100% of the existing stock by 2050 [14]. The estimated minimum investment needed for this endeavour is €71.7bn; existing funding falls short by several orders of magnitude [15].

The Portuguese government has also recently published the Long-term National Strategy for Energy Poverty Mitigation 2023-2050. This strategy proposes definitions for energy poverty and vulnerable consumers, a diagnosis and characterisation of the problem, a follow-up and monitoring strategy, the establishment of reduction goals, and a proposal for specific measures

to achieve these goals. The proposed actions focus on energy-efficiency, bill reduction, consumer protection, information, knowledge, education, and training [18].

Transition Point has also highlighted specific shortcomings with two current funding schemes in Portugal:

- **Programa Edifícios + Sustentáveis II** (More Sustainable Buildings Programme II). Currently the most successful energy-efficiency funding scheme, this mainly catered to the needs of home-owning middle-class families. Now in its third instalment, access to this public support is highly unequal, leaving out hard-to-reach segments of the population, such as low-income households, vulnerable families, and tenants, who often suffer from several hardships, including increased risk of energy poverty, to participate and benefit from this support.

- **Vale Eficiência** (Efficiency Voucher Programme). This public funding energy-efficiency programme targeted energy-poor households but was largely unsuccessful at the national scale with low awareness and adhesion rates. For instance, within the energy-poor group, many people are unaware that they could benefit from the energy social tariff, which is a crucial eligibility criterion. The new version, launched in October 2023, addresses some of the identified shortcomings, by changing the eligibility criteria to include tenants, increasing the amount of financial support, and involving regional energy agencies to better support the population in need. However, it still relies solely on the economic dimension of the problem (i.e. income) for the criterion for eligibility, which leaves out a part of the energy-poor population. The early phase of the programme prevents an analysis of the effect of these changes, as results are still not available.

Regional willingness to replicate the project

The project also attempted to evaluate how much local energy and environment agencies knew about one-stop shops and energy poverty. A short online questionnaire was developed by the Association of Energy and Environment Agencies (RNAE) in Portugal. These agencies have the mission of contributing to sustainable development, through the development of projects, methods, practices and knowledge dedicated to preserving the environment and increasing efficiency of energy and resources use.

The questionnaire asked agencies: what they know about one-stop shops as a way to tackle energy poverty; if they have considered implementing this type of approach in their areas; what obstacles and advantages they would foresee; and if they would be interested in having Transition Point in their areas. The questionnaire was directed to 14 of the 17 agencies that were operating at that moment - the three agencies ENA, AdePorto and AREANATejo were excluded because they already have this type of infrastructure in their territories.

Of the 14 agencies surveyed, 12 agencies responded to the questionnaire: 1) AREA Alto Minho, 2) Energaia, 3) AREAC, 4) Enerdura, 5) Médiotejo21, 6) OesteSustentável, 7) Lisboa E-Nova, 8) AGENEAL, 9) AMESEIXAL, 10) S.ENERGIA, 11) AREAL, 12) AREAM.

The questionnaire was intended as a preliminary sounding-out of the willingness of Portuguese energy agencies to take up the Transition Point project or consider replicating it. Five agencies reported knowing about one-stop shops, and two said they had mastered the subject. Seven mentioned that they have considered developing a similar project in their jurisdiction.

Several obstacles were mentioned – the operation model, the willingness of municipalities to support the measure, and the lack of funding; the most referred one was the lack of human resources. The most mentioned advantages are its role as a measure to combat energy poverty, provide community support and as a measure to increase energy literacy. Most agencies were willing to consider Transition Point in their area. To progress this, it would be essential to hold a face-to-face exploratory meeting to present the project and devise potential strategies to extend the concept to other areas with distinct needs and resources.

Appendix 3: About the location and users of the one-stop shop

Selection of the container's locations was based on up-to-date scientific research and data on energy poverty and input from local partners. It started with an area-based vulnerability assessment conducted by CENSE, FCT-NOVA: this identified and characterised the most vulnerable regions at the municipality and civil parish level.

An analysis of the level of energy poverty in summer and winter was performed for the different parishes of the region where the Energy and Environment Agency of Arrábida (ENA) operates (Setúbal, Palmela and Sesimbra municipalities). The analysis focused on energy services related to space heating and cooling of the dwellings in these municipalities. It is based on the Energy Poverty Vulnerability Index (IVPE) [16], representing the level of vulnerability to energy poverty from 1 (low) to 20 (high) at the parish spatial scale. This analysis combines the calculation of the thermal discomfort gap – carried out using data on the building characteristics and heating and cooling equipment of the building, municipal energy consumption in the domestic sector, climatic variables – and the adaptive capacity of the population to thermal discomfort – calculated through socioeconomic indicators such as income, age of the population, unemployment rate, education level, housing tenure rate, and state of conservation of the buildings.

The results were cross-analysed with the number of social housing units and social tariff beneficiaries at the municipal level. This helped to identify municipalities and respective parishes where the population is at greater risk of energy poverty and where Transition Point support might be more needed.

Who visited the container

Between February 2022 and April 2023, 544 people visited the Transition Point container. The income levels represented by visitors varied across the months of the project, influenced by the chosen location for the container and the engagement strategy applied. In general, affluence was higher when the container was placed in busier thoroughfares (due to its higher visibility) and when dissemination efforts were stronger (namely after social media posts, regional articles or news pieces were published). The number of visitors was higher in the winter, possibly due to the increase in energy prices, especially the price of natural gas in the energy crisis, coupled with several weeks of cold spells and heavy rains.

Socio-demographics shown by a surveyed group

The project ran a survey of 263 people out of the total 544 visits; 216 of these were fully answered and could be used for further analysis. A total of 30 surveys were answered outside the container in one of the door-to-door campaigns. With the household data from the completed surveys, it was possible to estimate that the project reached around 591 inhabitants of the region, taking an average household size of 2.25 persons. The distribution of survey responses among the four studied locations was relatively similar, slightly higher in the municipalities where the location was placed in more frequented areas. Most individuals (46.7%) were 45-64 years old, while 26.9% were older (over 65 years old). About 45% of enquirers had a university degree, and 26.5% had not completed the 9th grade. About 14% of the surveyed were unemployed, and 29% were retired, but half had a current job (50%).

A significant portion (15.7%) preferred not to disclose their household income, which highlights the sensitivity of this type of data. Among those who did, the distribution across income categories was relatively homogeneous, with almost half of the surveyed population under €1,800 per month (see Figure 10). Taking the household median gross monthly income with taxes deducted in 2020 (about €1,000) [35], at least 29.5% of the surveys were in a household with an income lower than the median.

In Portugal, families who are economically vulnerable – that is, who benefit from any social benefit or have an income equal to or below €6,273, increased by 50% with each non-employed household member – can benefit from the social tariff for electricity. For natural gas, being in receipt of social benefits is the only qualifying condition. Although several users reported having economic difficulties, only 12.8% of the respondents already benefited from this tariff for electricity (see Figure 11).

Most surveyed residents owned their homes (82.3%); 5.7% were tenants. Most enquirers reported their homes as not having an energy certification (69%); the other 31% did, with 24.5% reporting having D rating or lower, a low energy-efficiency level and below the regulation requirement. Approximately 48% of those enquiring lived in homes built before

Figure 10. Household income

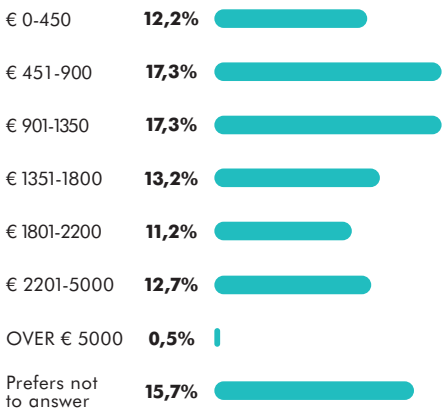


Figure 11. Users that benefit from social tariff

the 1990s, before any energy regulation was implemented in Portugal, and 25% were built in the 1990s when construction was still not entirely up to current thermal comfort regulation standards.

Appendix 4: Analytical methodology

The project developed a standardised set of analytical tools for the one-stop shop. The goal was to systematise and homogenise the services to be provided to families in different locations and by different technicians, enabling the replicability and scalability of the project.

Two household characterisation surveys were central: these were designed to collect data, diagnose households' needs, and select the type of support to be provided. The survey development was based on previous work by the CENSE, FCT-NOVA team [16, 28, 33, 34] on energy poverty indicators framed by the EU Energy Poverty Advisory Hub [9] and on surveys of European projects in the same thematic scope (for example, ASSIST2GETHER, POWERPOOR, NUDGE). The first survey was conducted mainly inside the container, although some visitors also did it outside. People could also respond remotely by phone, email and even on their own doorstep. The survey aimed to collect general socio-demographic information about the household, diagnose situations of energy poverty, and assess current energy needs and costs. The second survey was conducted during the home visit. It collected data regarding energy use in the home, to provide personalised recommendations for energy-efficiency improvements.

The two surveys, validated by all partners, included 109 questions divided into the following 15 categories: supported person identification (11 questions), thermal comfort and energy poverty (11 questions), household and housing identification (12 questions), energy consumption (14 questions), housing construction characteristics (8 questions), domestic hot water

production (9 questions), air conditioning (3 questions), lighting (3 questions), appliances (15 questions), pathologies (4 questions), phantom and stand-by consumption (2 questions), ventilation (1 question), renewable energy (1 question), home visit scheduling (8 questions), impact assessment and monitoring (7 questions). In this survey version, 73 questions were placed in the first phase (container visit) and 56 in the second phase (home visit).

All the collected data is stored in a database via one information management system aggregating all the information and possible data functionalities. The data processing tool generated weekly reports on how the indicators evolved throughout the pilot.
Support regarding energy bills optimisation was based on a well-established public online simulator managed by ERSE,[2] the national energy services regulator; this provides updated information on the prices for electricity and natural gas from multiple suppliers. Regarding the financing programmes, people were given information about current initiatives.
If needed, help was provided formalising an application through the Fundo Ambiental (Environmental Fund) platform.[3]

The ERSE calculator was used to check market offers, identify the lowest available prices for each family, and estimate potential savings in energy costs. This tool was unknown to the majority of surveyed visitors. 33 energy contracts were evaluated, and online simulations were conducted on the ERSE calculator. From collected data in the simulations, most visitors had a contracted power of 4.8 kVA and a simple tariff with an average electricity cost of €0.16 per kWh (not benefiting from the cheaper off-peak rates of dual tariffs). Only one person already had the best possible rate, and the remaining consumers had an estimated potential annual savings ranging from €14 to €2,968. The average household had potential annual savings of €290, which equates to an average reduction in energy bills of around €25 per month.

[2] https://simulador.precos.erse.pt/

[3] https://www.fundoambiental.pt/home.aspx

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