



Can local organizations act as middle actors in energy support? Exploring their functions, motivations, challenges, and needs

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Abstract Energy efficiency is vital for energy transitions, and energy-poor, vulnerable, and hard-to-reach groups are at risk of being left behind. In this context, local middle actors have been suggested as partners in deploying targeted energy support. Nevertheless, scarce research has engaged with them to assess if they are willing and capable of contributing, if they can reach households, and if they have unmet needs. In this research, we draw on the mapping of 198 local organizations and 34 semi-structured interviews conducted after deploying a pilot energy support service in Setúbal, Portugal. Interviews characterized the organizations and target audiences, assessed energy literacy, explored potential collaborative roles, and recognized drivers, barriers, and solutions. Results show that most organizations are willing to disseminate activities, forward citizens, facilitate contacts, co-organize events, and participate in training. Half can identify vulnerable families for proactive support. Drivers include environmental concerns, community participation, and social support. However, few seem able to conduct energy support, hire/redirect staff, or participate in coordination. Scarce human resources, lack of time, other priorities, and financing concerns severely constrain

local organizations. This case study finds some potential for local organizations to act as intermediaries in energy support, building on their communication channels and trusted relationships to fulfill specific roles. However, they are often hard-to-reach themselves and burdened with demanding activities. Thus, we suggest that fostering collaborations with local organizations is challenging but possible. It requires dedicated funding, time, and resources to empower, capacitate, and reward middle actors for their contributions in delivering energy support.

Keywords Energy efficiency · One-stop shop · Vulnerable households · Energy poverty · Intermediaries · Portugal

Introduction

Energy transitions are urgently needed to mitigate the worst effects of climate change. One critical factor for their success is the involvement of all citizens, who are needed to unleash the two major pillars of energy systems' transformation: energy efficiency and renewable energy (IEA, 2023).

Buildings currently use 42% of the European Union's (EU) final energy (Eurostat, 2023a). Thus, the sector is a crucial arena for action, including through the Renovation Wave strategy published by the European Commission (2020). This proposed deep renovation of the EU building stock is framed

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by the European Green Deal's principles of fairness and inclusivity, putting people first and ensuring no one is left behind (European Commission, 2019).

In this context, the concept of hard-to-reach energy users is receiving growing attention, being defined as those that are "either hard-to-reach physically, underserved, or hard to engage or motivate in behavior change, energy efficiency, and demand response interventions" (Mundaca et al., 2023; Rotmann et al., 2020). Sequeira et al. (2024) described in detail several profiles of residential hard-to-reach energy users and ascertained that these groups represent a significant share of the population in the EU and its Member States. These authors argue for targeted and tailored interventions to identify and engage hard-to-reach energy users.

Hard-to-reach energy users include vulnerable households, representing a significant share of the population whose engagement requires greater attention (Ashby et al., 2020). Vulnerable households are also more susceptible to energy poverty, defined by the EU's Energy Efficiency Directive (Directive (EU) 2023/1791) as the "lack of access to essential energy services [...] caused by a combination of factors, including at least non-affordability, insufficient disposable income, high energy expenditure and poor energy efficiency of homes". Research in the Global North suggests that demographic and socio-economic variables – such as age, income, gender, education, employment, household composition, health and disabilities, migratory status, and ethnicity – can aggravate the risk of energy poverty and may signal a hard-to-reach profile (Middlemiss, 2022; Sequeira et al., 2024; Simcock et al., 2021).

Vulnerable households should be prioritized for the uptake of energy efficiency measures that can address the root causes of energy poverty. In its latest recommendation on energy poverty, the European Commission (2023) urges Member States to "ensure an enhanced governance with a holistic approach to tackle energy poverty, including cross-departmental and vertical collaboration across national, regional, and local governance structures, involving closer engagement with vulnerable households and relevant energy and social partners and stakeholders". Furthermore, this document proposes to "step up energy efficiency information campaigns targeting households affected by energy poverty, to ensure that those population groups

receive tailor-made information and advice while using all the potential of energy advisory networks and one-stop shops". In addition, the EU's Energy Poverty Advisory Hub (2024) provides technical assistance for local governments to diagnose energy poverty in their territories and to implement mitigation actions in collaboration with other local stakeholders.

In contrast to one-size-fits-all approaches, local solutions can recognize unique realities and address communities' needs (Elmallah et al., 2022; Middlemiss & Parrish, 2010). Examples of local energy support activities include the setup of energy cafes, collective assemblies, and one-stop shops to inform households about energy savings, funding opportunities, renewable energy sharing, and possibilities to switch providers (Hanke et al., 2021; Martiskainen et al., 2018; Ortiz et al., 2021). While some of these models are still underdeveloped (e.g., energy sharing), others, such as physical and digital one-stop shops, have been the object of recent research and empirical projects which could pave the way for their mainstreaming across EU countries (Bertoldi et al., 2021; Kwon & Mlecnik, 2021; Kwon et al., 2021).

A key question is how to provide on-the-ground, well-targeted interventions that meet vulnerable groups' needs, encourage wider social integration, and enact the multiple benefits of energy transitions (Gillard et al., 2017). Recent studies have suggested that local-scale approaches coupled with the active enrolment of middle actors and intermediaries can successfully fulfill this aim (e.g., Frick et al., 2017; Horta et al., 2019; Kivimaa & Martiskainen, 2018). Any organization between two or more actors can be considered an intermediary, while middle actors can be broadly defined as those with their own activities that may include but always go beyond the intermediation role (Parag & Janda, 2014). The European Commission (2023) highlights the role of these middle actors, stating that "when designing measures and actions that tackle energy poverty, [Member States] pay particular attention to targeted and tailored communication that builds trust among beneficiaries of relevant schemes and avoids stigmatizing vulnerable groups" and that "Member States should make use of qualified front line workers [...] to help identify and advise households in energy poverty."

However, comprehensive research on the role of middle actors in energy transitions is still lacking, as reported for the United Kingdom by Bouzarovski et al. (2022) and Australia by Willand et al. (2023). Furthermore, scarce scientific research has directly engaged with local stakeholders to critically assess their willingness to enroll in energy support, the contributions they can realistically provide, and their needs to potentially unlock deeper collaboration. Most previous research has considered middle actors homogeneous or focused on pre-established typologies (e.g., Ramsden, 2020, focuses on charities; McMaster et al., 2024, research remote Indigenous communities). Thus, the perspectives of local organizations, including non-profit and community-based organizations, have not been fully integrated into energy policies and interventions (Elmallah et al., 2022; Willand et al., 2023).

In this research, we address this gap by drawing from a case study analysis, including a stakeholder mapping exercise and semi-structured exploratory interviews, conducted after deploying an energy efficiency one-stop shop pilot project in the Setúbal Municipality in Portugal. We ask the following research questions: i) are local organizations willing, capable, and impactful enough to act as middle actors in energy support?, ii) what are the roles that local organizations might assign to themselves?, and iii) if a collaboration is to be enabled, what are the unmet needs of local organizations?. It should be clearly stated that this research does not intend to assess the effectiveness of collaborating with local middle actors in energy support. Instead, the novelty of this work lies in the empiric exploration of potential collaborative roles of diverse typologies of local organizations in delivering energy support to vulnerable audiences while recognizing the major challenges obstructing this approach and the pressing needs that this endeavor entails. Although the results are case-specific, the applied methodology and critical insights are relevant for local-scale energy support interventions elsewhere.

This work is structured as follows: Sect. "Literature review" provides a literature review on middle actors in energy transitions, Sect. "Methods" details the methods used to accomplish the research goals, Sect. "Results and discussion" outlines and discusses the results obtained, and Sect. "Conclusions" concludes with insights and recommendations for future research and practitioners.

Literature review

Middle actors in energy transitions

Researchers in Global North countries have started looking at "middle-out" mechanisms – whereby middle actors exercise their agency and capacity to influence other bottom, middle, or top actors – as a relevant tool to accelerate energy transitions (Parag & Janda, 2014). Middle actors and intermediaries have been suggested as relevant stakeholders for the deployment of community energy in Ireland (Boyle et al., 2021), heat pumps in Belgium (Decuyper et al., 2022), battery storage in Australia (Page & Fuller, 2021), electric vehicles in Israel and Sweden (Eriksson & Olsson, 2022; Zohar et al., 2021), solar photovoltaic systems in Israel (Zohar et al., 2021), and energy efficiency in the United States (Reames, 2016), among others. The definition of middle actors is broad, and these studies include a myriad of public and private organizations, such as local governments and other public authorities, industry and market players, non-governmental organizations and grassroots initiatives, energy advisors, building professionals, and technical experts, among others.

Local middle actors have been considered of interest to facilitate, mediate, and accelerate technology adoption and behavior change in the energy sector (Mundaca et al., 2023). They may be able to overcome barriers to participation by creating institutional capabilities for increased recognition of specific needs in their communities and by facilitating alternative solutions (Frick et al., 2017; Kivimaa & Martiskainen, 2018; Reames, 2016). One of such solutions are one-stop shops, which have emerged as a relevant approach to facilitate the uptake of building renovation and energy efficiency and overcome persistent barriers (European Commission, 2020). These can consolidate information mechanisms and advisory services under one single roof, providing full-value-chain technical, financial, and legal support to households (Bertoldi et al., 2021).

Several business models are being tested across Europe, including from private and public initiatives, through digital platforms and physical spaces, and with varying levels of support delivered to the end users (Kwon et al., 2021; Pardalis et al., 2022; Sequeira & Gouveia, 2022). Success factors of one-stop shops include their local nature and connection with

stakeholders in the building renovation ecosystem (Bertoldi et al., 2020). One-stop shops are already reaching vulnerable households, providing support, bridging financial and capacity gaps, and collaborating with intermediaries to combat energy poverty (Bertoldi et al., 2021).

Besides fostering participation among the general population, some middle actors may indeed be strategically placed to facilitate engagement with hard-to-reach groups, such as vulnerable households, benefiting from a pre-existing relationship of trust that may be transposed to the energy field (Lacey-Barnacle & Bird, 2018; Ramsden, 2020). For instance, Mundaca et al. (2023) analyzed 19 case studies across eight Global North countries that entailed energy efficiency and climate mitigation interventions focused on hard-to-reach energy users, finding that the engagement of stakeholders and, particularly of local middle actors was a relevant feature in a significant number of cases. Rotmann (2024) also highlighted middle-out solutions with the involvement of community representatives and frontline workers as a way to reach vulnerable groups and indigenous populations in New Zealand.

Trust and impartiality have been highlighted by the European Commission (2023) as key elements to successfully identify, reach out, and engage energy-poor households. This is critical in disadvantaged communities who often lack access to information about support programs and where barriers are severe, including competing priorities, and pervasive distrust and fear of authorities and market actors (Lacey-Barnacle & Bird, 2018; Reames, 2016; Willand et al., 2023). In addition, peer effects may be unlocked, where individuals and organizations influence each other by observation and communication, driving participation and uptake of sustainable energy solutions (Balta-Ozkan et al., 2021; Palm, 2016). These can be enhanced over time, as households may reinforce behaviors through continuous and deeper engagement (Donnelly, 2014).

Large companies have traditionally dominated the energy sector, but civil society organizations seem to be increasingly entering this sphere (Lacey-Barnacle & Bird, 2018; Martiskainen et al., 2018). However, while some middle actors can support the energy transition, others may act against it to pursue their own goals (Parag & Janda, 2014; Zohar et al., 2021). Furthermore, some authors alert against overly optimistic

interpretations of the role of middle actors in energy transitions and signal a positivity bias, which can lead to false expectations (Boyle et al., 2021; Shaw et al., 2018). More research is still needed to comprehend the range of roles different middle actors can play in energy transitions and leverage their potential contributions toward a decarbonized energy system.

Portuguese energy policy context

Portugal is in Southern Europe and is an EU Member State. The country has a National Climate Law (Portuguese Government, 2019), a Roadmap for Climate Neutrality by 2050 (Portuguese Government, 2021a), and is currently reviewing its National Energy and Climate Plan 2030 (Portuguese Government, 2023). Buildings account for 32% of final energy consumption, with the domestic sector representing 19% (DGEG, 2023). Buildings are inefficient compared with current standards, with existing energy performance certificates suggesting that around two-thirds are C-class or below (ADENE, 2024). Portugal has a National Long-Term Building Renovation Strategy that recognizes the structural problems in the building stock. It foresees that most buildings will need major renovations by 2050 (Portuguese Government, 2021b). This endeavor's costs are tremendous, estimated at a minimum of 40 to 72 thousand million euro to bring the current building stock up to regulation standards (Melo et al., 2021; Palma et al., 2022).

Energy poverty is a key concern, with Portugal performing amongst the worst EU Member States in several proxy indicators – e.g., 17.5% of the population reports an inability to keep their home adequately warm, and 25.2% of the population lives in dwellings with leaks, damp, or rot (Gouveia et al., 2022; Eurostat, 2023b, c). In 2024, the Portuguese Government published the National Long-Term Energy Poverty Combat Strategy 2023–2025, mimicking the European Commission's definition and identifying that up to 29% of the population – around three million people – may suffer from different facets of energy poverty (Portuguese Government, 2024). This strategy highlights the need to reinforce local citizen support networks, including by establishing advisory and support services for sustainable energy practices: “citizen support spaces are structures usually of local initiative, which correspond to a physical and/or virtual location, anchored in municipal spaces or

other nearby local structures and organizations which are close to citizens, which offer a range of energy services to residents”. Local governments, energy and environmental agencies, and non-governmental organizations from the social economy are referenced as relevant stakeholders for energy support. Still, there are few practical examples of successful implementation in the country (Portuguese Government, 2024).

Methods

Case-study: transition point one-stop-shop in Setúbal, Portugal

The Transition Point mobile one-stop shop pilot project was launched in the beginning of 2022 in Setúbal, Portugal, to develop and test an integrated approach of providing energy support at a local scale (Fig. 1) (CGF, 2024). The Setúbal municipality is in the southern part of the Lisbon Metropolitan Area. For administrative purposes, it is divided into five civil parishes. Data from the Portuguese Census of 2021 paint a picture of the demographic, socio-economic, and buildings factors that may affect energy poverty vulnerability at the local scale (INE, 2023). Mainly urban, Setúbal hosts a population of 123 000 people, 53% women. Buildings are energy inefficient, as 49% were built before 1980 when thermal regulations were non-existent (country average: 38%).

25% of households rent their dwelling (country average: 22%). 51% of the population has a high school diploma (country average: 46%), and the unemployment rate is 9% (country average: 8%). 7% have foreign citizenship (country average: 5%). 23% are over 65 years old (country average: 23%).

In the energy poverty vulnerability index developed by Gouveia et al. (2019) (which brings together buildings’ energy performance, climate characteristics, heating and cooling technologies with an evaluation of the adaptive capacity of the population based on socio-economic indicators at the municipal and sub-municipal scale in Portugal), the Setúbal municipality ranks 296 and 257 out of 308 municipalities for winter and summer, respectively, showcasing a relatively low vulnerability in the national scenario. While useful for a national-scale analysis, this index is not suitable to detect the presence of energy poverty hotspots within the municipalities.

In this context, Transition Point was innovatively located in a mobile container, providing the following free in-person services: i) energy efficiency advice, ii) energy tariffs optimization, iii) support on application to national energy efficiency funding schemes, and iv) free home energy audits. These types of energy support services are commonly mentioned in the literature (Simcock & Bouzarovski, 2023). The regional energy agency carried out the project’s on-the-ground activities. In its pilot phase, it operated for one year and three months, served four locations and three municipalities, and supported over 500 people

Fig. 1 Transition point mobile one-stop shop in Setúbal



(Gouveia et al., 2024). From February 2022 to September 2022, the container was in the Setúbal municipality, half the time in a vulnerable neighborhood and half the time downtown.

The one-stop shop attempted to foster direct collaboration with local organizations, seeking to increase engagement from the general population and vulnerable families. Overall, the results of this effort were mixed. The energy agency contacted local governments in the territory, disseminated the project in local media, and provided training to 17 local youth. However, only around 5% of energy support beneficiaries reported being forwarded by community-level organizations or by their local government, with the remaining being attracted by the physical container itself, by flyers and online dissemination, and by word-of-mouth (Gouveia et al., 2024).

In this context, the research adheres to the methodological approach shown in Fig. 2, which is explained in detail in the following subsections.

Stakeholder mapping

After the Transition Point pilot phase in Setúbal, a deeper analysis and engagement of local organizations was performed to assess challenges and collaboration opportunities seeking to increase the project's impact and better reach vulnerable families. The relevance of mapping stakeholders for improved project management is well-established in the literature; in this work, we followed the guidelines of the Project Management Institute (2013). Likewise, some authors have used stakeholder mapping and consultation in the context of energy efficiency and energy poverty research (e.g., Papantonis et al., 2022; Mahoney et al., 2024). Kivimaa and Martiskainen (2018) consider that middle actors for building renovation can be public or private organizations, including local

governments. In our study, local organizations are explored as middle actors that have their own *raison d'être* which can include but is not limited to bridging the gap between citizens and energy companies, funding agencies, and policymakers (a similar definition was used by Parag & Janda, 2014, and Frick et al., 2017).

In September 2022, following three data collection approaches, a systematic stakeholder mapping exercise focused on local organizations was performed for the Setúbal municipality. First, these were collected from the publicly available list of organizations participating in the Local Social Action Council of Setúbal, a network of around 80 organizations managed by the Setúbal City Council. Second, from the publicly available lists of organizations participating in the Civil Parish Social Committees, a mechanism like the social action council but operating at the civil parish scale (only available for two civil parishes in Setúbal). Third, from the websites of local governments, namely from the pages listing local associations.

Data on the organization's name, e-mail, website, and social media were collected. Based on the publicly available information, mapped organizations were classified according to their primary type of activity: local government (*i.e.* official administrative units managing the territory across various sectors), energy and environmental agency (*i.e.* non-profit organization conducting activities from awareness raising to direct consumer support), community and education (*i.e.* mainly non-profit associations organizing local events, fostering sustainability-oriented projects, providing training to different groups, and occasionally integrating social support and inclusion of vulnerable groups), social support and health (*i.e.* mainly non-profit associations or institutions focusing almost exclusively on providing essential support services, mentoring, and advice to vulnerable and marginalized groups through domiciliary care, a network of infrastructures, and preventive action with awareness-raising campaigns), arts and sports (*i.e.* mainly non-profit associations or clubs dedicated to specific activities related to artistic expression, for instance, theatre and dance, and to sports practice, for example, canoeing and basketball), religion (*i.e.* mostly churches), and others. Frick et al. (2017) follow a similar classification. The "others" category encompasses local organizations that were too diverse to

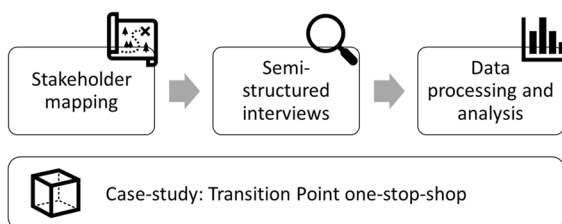


Fig. 2 Methodological approach followed by the research

be grouped. The original list of mapped stakeholders was refined by erasing duplicates and those without an active e-mail, resulting in 198 local organizations as the study universe.

Semi-structured exploratory interviews with local stakeholders

All 198 mapped stakeholders were contacted by e-mail with a general presentation of the Transition Point one-stop shop and an invitation to participate in a research activity consisting of a single one-on-one interview. This invite was sent to all organizations on three separate occasions: September 2022, November 2022, and April 2023. In total, it was possible to obtain an answer from 47 stakeholders, of which 34 were available to participate in semi-structured exploratory interviews (representing 17% of the study universe). All interviews were conducted from October 2022 to May 2023. Stakeholder interviews are a well-established research approach in the energy field, being able to provide detailed case-specific information on the relationship between the energy system, the organizations on the ground, the vulnerable consumers, and the population at large (e.g., Hargreaves et al., 2013; Magnani & Osti, 2016; Willand et al., 2023).

The interviews were performed online (26 out of 34) or by telephone (8 out of 34) when the interviewee lacked digital skills, following a four-section script. The full interview script can be found in Appendix A.

The first section characterized current goals, activities, legal structure, resources, geographical scope, and target audiences (12 open-answer questions). The second assessed the knowledge base on energy topics (four open-answer questions). The third explored potential roles as intermediaries in energy-related support (one closed question with 16 options where interviewees answered yes/no/maybe to each option and were invited to comment on their answers; options for “prefer not to answer” and “other” were also provided); the design of these options was inspired by several studies and empiric case studies that describe or suggest different roles for stakeholders in energy support (e.g., Parag & Janda, 2014; Kivimaa & Martiskainen, 2018; Sequeira & Gouveia, 2022). Finally, the fourth section identified drivers, barriers, and solutions for collaboration (three closed

questions with seven options each, where interviewees chose a maximum of two options and were invited to comment on their choices; options for “prefer not to answer” and “other” were also provided). These options were designed based on existing literature analyzing participation in local-scale energy initiatives (e.g., Ornetzeder & Rohrer, 2013; Kivimaa & Martiskainen, 2018; Koch & Christ, 2018; Koirala et al., 2018).

Data processing and analysis

The transcripts of the interviews were manually processed, including quantitative and qualitative outputs. The former includes data analysis on the organization’s human resources, their potential collaborative roles in energy support, and their choice of drivers, barriers, and solutions to collaboration. The latter includes a thematic analysis with the extraction of direct citations from the interviewees to illustrate their perspectives (translated from Portuguese to English by the authors). These results are shown for each type of organization defined before.

Furthermore, an attempt is made to pinpoint key local organizations (“overachievers”) based on three dimensions, namely i) capability (defined as having several full-time employees or volunteers 50% above the median of the interviewed sample), ii) willingness (defined as being willing to perform a number of tasks 50% above the median), and iii) reach (broadly defined as reporting to be able to reach “hundreds” of persons per year, as quantitative responses were scarce on this topic). This is an exploratory exercise, and the limits considered for each component are essentially arbitrary. Parag and Janda (2014) also assess the behavior of middle actors based on agency – as the willingness of actors to make their own choices – and capability – as the ability of actors to perform these choices – with change being more likely to happen when both are high for a specific action.

The interviewed sample does not intend to be representative of the study universe, nor do the results seek to be statistically meaningful (although theoretical saturation appears to have been reached, at least for some types of organizations). Instead, it aims to critically explore the potential to integrate local organizations in energy support by testing a collaborative methodology and analyzing results

in a real-world case study. Galvin (2015) describes the limitations of interview-based approaches in the energy field and advises caution when using small samples to make inferences and transfer these to broader populations. It should be noted that interviews were conducted with the organizations that agreed to participate, which may reveal a preexisting willingness to collaborate. Thus, the results are likely to be inherently biased towards positive answers compared to the universe of stakeholders. A similar bias is reported by Schneider et al. (2023) regarding households' recruitment.

Results and discussion

Characterization – goals and activities

The 198 mapped local organizations in the Setúbal Municipality are shown in Table 1 by their primary type of activity. The territory encompasses one municipality and five civil parishes. A single energy agency is active in the Setúbal municipality and two adjacent municipalities. Many other local stakeholders are active in Setúbal, providing various activities and services. In our interviewed sample, social support and health institutions are overrepresented compared with the universe of mapped organizations. At the same time, arts and sports clubs are underrepresented, suggesting that the former may have more interest in the topic than the latter. It was not possible to interview religious organizations (congregations are mentioned as relevant middle actors by Parag & Janda, 2014, due to their moral authority over their members) while “others” were too diverse for a meaningful analysis.

The first step in the interviews was to identify self-reported goals and activities. The complete coded list of interviewed organizations is presented in Appendix B, including their self-reported goals and activities. These goals offer insights into the organizations' core values that may be articulated with the long-term benefits of local energy transitions (McMaster et al., 2024). The wide array of activities reflects the dynamics of the territory and the services available to the population. A promising avenue could be to find synergistic goals between an energy support service and the interviewed organizations, looking for common ground that can foster collaborations.

For instance, local governments focus on managing the territory across various sectors, including housing and health, closely matching energy efficiency improvement and energy poverty mitigation. The energy agency seeks to raise awareness and directly support consumers on energy topics which is one of the core goals of a one-stop shop. Community and education organizations have the role of building, dynamizing and improving their local community's sustainability and well-being, including through events, training, and projects, which seems well-aligned with purpose of the energy support services.

Social support and health institutions focus almost exclusively on aiding vulnerable and marginalized groups, including poor households, elderly people, disabled and chronically ill, migrants, disadvantaged youth, persons in homeless situation, persons with HIV/AIDS, persons with substance abuse problems, sex workers, and ex-convicts, among others. They provide essential support services, mentoring, and advice mostly through domiciliary care, a network of infrastructures, and preventive action with

Table 1 Local organizations mapped and interviewed in Setúbal according to their type of activity

Type of organization	No. mapped	No. answered	No. interviewed
Local government	6	3	2
Energy agency	1	1	1
Community and education	39	8	8
Social support and health	52	20	15
Arts and sports	86	14	8
Religion	7	1	0
Other	7	0	0
Total	198	47	34

awareness-raising campaigns. This overall ambition of improving health and well-being in the most vulnerable groups may be synergetic with the one-stop shop's goal of reducing energy poverty and its well-researched impacts on public health (Pan et al., 2021). Arts and sports clubs are dedicated to specific goals activities related to artistic expression and to sports practice; these may indicate that this type of organization has less common ground with energy support services.

Most interviewed organizations are legally established as non-profit associations (17 out of 34) or private institutions for social solidarity (11 out of 34). Other legal structures, e.g., cooperatives, mutualist associations, and non-governmental humanitarian institutions, are less common in our sample. Only six stakeholders stated that they were a local delegation of a larger national or regional organization, with the remaining (28 out of 34) being fully autonomous. The median year of foundation is 2003, but the range is vast, with the oldest dating back to 1860 and the newest from 2021; Parag and Janda (2014) also report on a wide range of lifespans for local organizations. Regarding their geographical scope, most report operating at the regional (13 out of 34) or municipal (14 out of 34) level, while fewer are focused only on the civil parish (5 out of 34) or neighborhood (2 out of 34) scale. In their study, Hargreaves et al. (2013) also reported a prevalent heterogeneity in grassroots movements, including in their organizational forms, goals, and activities.

The relatively low rate of responses from the mapped stakeholders shows the inherent difficulty in engaging with local organizations unfamiliar with energy topics. In addition, it might also be a lingering effect of the COVID-19 pandemic as a challenging time that tested the resilience of many local organizations. Virtually all interviewees mentioned relevant changes to their activities due to lockdowns, with around half stating that it caused long-term halts in their activities, for instance:

“We stopped completely. Stagnated. But then we were able to start again.” [Com1]

Still, the other half carried on in some way, including to provide essential aid to vulnerable populations, as illustrated by a social support and health organization:

“[COVID-19] was very bad. Some of our beneficiaries suffered deeply from isolation and mental health. Some lost income. We saw an increase in demand for our social canteen and food baskets. We never stopped working.” [Soc6]

Most interviewees state that they were able to restart their activities after the COVID-19 pandemic; however, it is possible that some of the mapped organizations did not pass this stress test. This is exemplified by an organization's struggles:

“We closed the door. We were afraid. We did not want to put people's lives at risk. After, we reopened, but we lost one-third of our members [...] it is still a challenge.” [Com8]

Capability – resources and knowledge

Regarding human resources, a significant share of the interviewed organizations (10 out of 34) entirely depends on volunteers, while an additional 15 have between one and ten persons employed full-time. Except for the municipality, all organizations (8 out of 34) have less than 100 full-time employees. This dependence on a handful of key members accentuates vulnerabilities to external and internal shocks, such as diminishing funds, loss of employees or volunteers, and changing priorities (Hargreaves et al., 2013). Figure 3 shows the number of full-time employees per main type of organization.

A wide gap in available resources exists between the municipality and civil parish levels of government. The former reports over 1700 employees, and the latter between 81 and 100 employees. The energy agency has seven full-time employees. Notably, half of community and education organizations and half of arts and sports clubs rely only on volunteer work, with the maximum self-reported number of full-time employees being 15 for the former and five for the latter. For instance, one arts and sports club reports:

“The only ones that have contracts are the four coaches. All others are volunteers. Around seven since two do not have the availability they once had.” [Art7]

Social support and health institutions seem better equipped with full-time human resources; one-third of the interviewed sample has over ten employees.

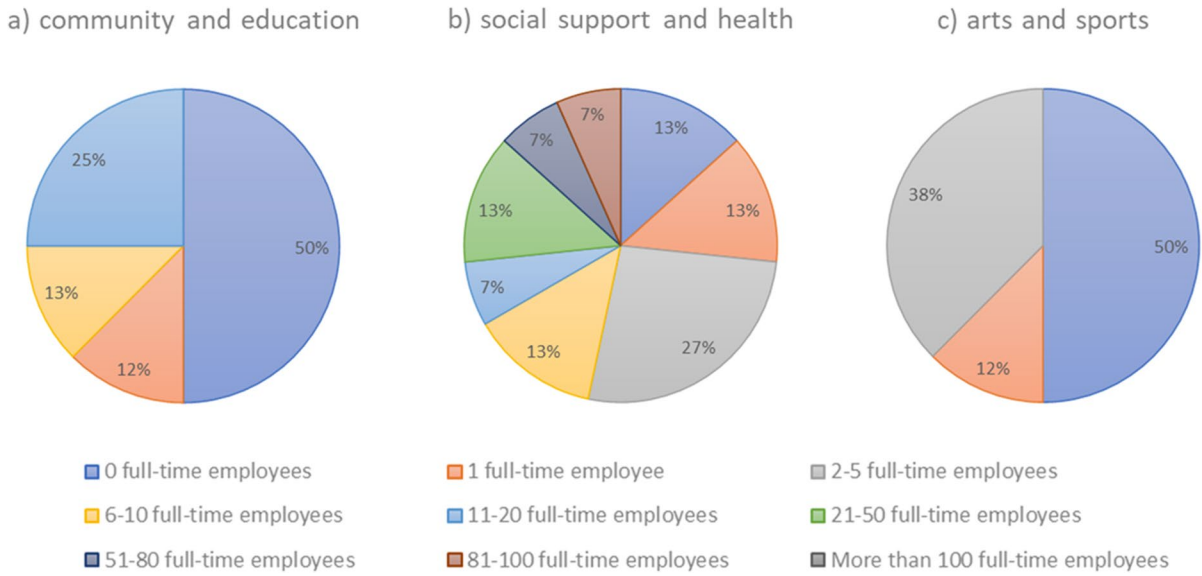


Fig. 3 Self-reported number of full-time employees by type of organization: **a** community and education, **b** social support and health, and **c** arts and sports

A prominent example is an organization with several infrastructures and social responses:

“We have around 80 people full-time. Our nursery and kindergarten employ the most resources, and we also have a canteen and storage. We only work with volunteers to distribute

food baskets and for other occasional activities.” [Soc2]

In our interviewed sample, most organizations (23 out of 34) rely on volunteers to perform at least some tasks. Figure 4 shows the self-reported number of volunteers by type of organization, with no significant

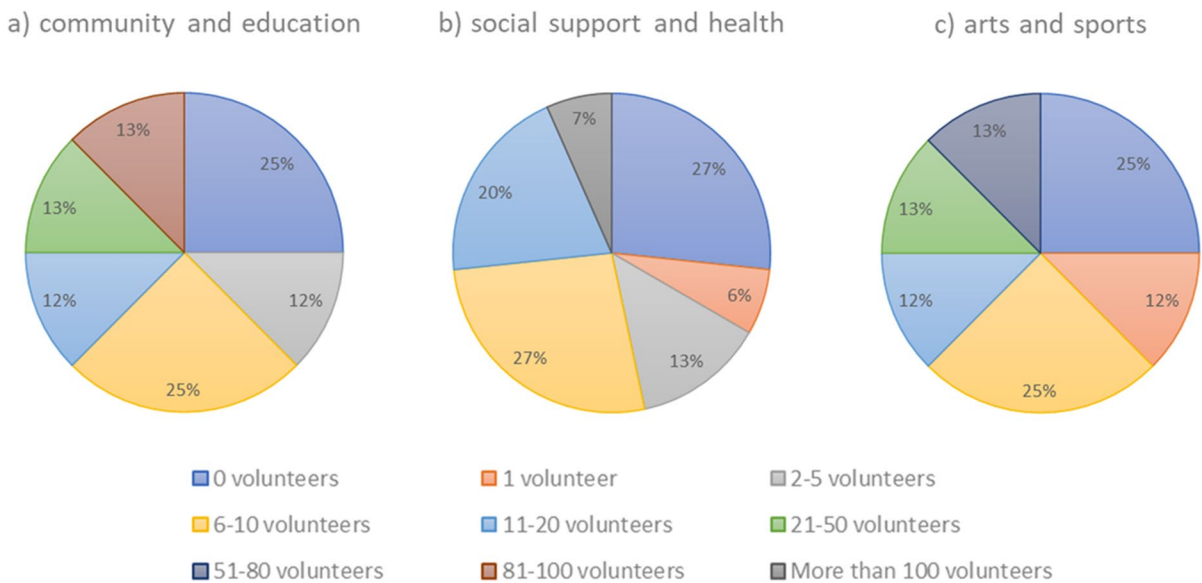


Fig. 4 Self-reported number of volunteers by type of organization: **a** community and education, **b** social support and health, and **c** arts and sports

differences. Between two-thirds and three-quarters rely on up to ten volunteers, and the remaining rely on more than ten. The two local governments and the energy agency do not use volunteer work.

The number of volunteers varies from just a few to several hundreds of citizens, with around one-third of the organizations being able to recruit more than 20 volunteers on a regular basis. This capability to mobilize many volunteers is reported by a community and education organization with a citizenship center:

“[Volunteering] is a way for people to reinforce their self-esteem, develop skills, and socialize. We have had hundreds of volunteers that we know we can mobilize.” [Com6]

However, volunteer work can present specific challenges that hinder the capabilities of local organizations, including hostility from local people, funding difficulties, and burnout (Middlemiss & Parrish, 2010). This was a recurring theme during the interviews, for instance, with volunteers’ age also being reported as a significant factor by two organizations:

“We have around 20 volunteers, but it is hard to keep their commitment. They are young, and these activities are very time-consuming.” [Com1]

“We are only 13 people, all volunteers, and we are all already old, all 70 years old or close to that...” [Soc12]

Only six out of 34 interviewed claimed to have a person specifically dedicated to environmental and/or energy issues, namely four community and education organizations, the local energy agency, and the municipality. Notably, neither the social support and health institutions nor the arts and sports clubs seem to have resources allocated to these topics while reporting a prevalent lack of knowledge on energy issues. This may hinder the capabilities of these organizations to act as middle actors in energy support. Similar results were obtained by Willand et al. (2023) when interviewing frontline support staff. This is also in line with the perspective of the energy agency:

“There is a widespread lack of energy literacy. Energy is hard to understand; we do not see or touch it, and we often lose track of it.” [Ene1]

Nevertheless, when asked if their beneficiaries suffer from energy poverty – framed as thermal discomfort or difficulty in paying energy bills – most interviewees emphatically acknowledged the problem by mentioning their lived experiences of interacting with vulnerable households. It is possible that by conducting this research the interviewees became more alert to energy poverty in their communities, as also acknowledged by Martiskainen et al. (2018) and Willand et al. (2023). This empirical knowledge is aligned with scientific research on energy poverty in Portugal (Gouveia et al., 2017; Horta et al., 2019). It is exemplified by two organizations:

“Yes, our houses are not in good condition; they were not built in a proper manner. We hear everything our neighbour says. We feel cold at home. Horrible heat. The windows and blinds are degraded. The paint has fallen off the walls.” [Com4]

“In winter, we visited the house of one of our beneficiaries. He did not have heating; it was like walking into a freezer. There were children and elderly there. Even if we gave them equipment, they would not use it; they cannot afford their bills.” [Soc9]

Reach – target audiences

The target audiences of the interviewed organizations were assessed in qualitative and quantitative terms. First, their self-reported target audiences are shown in Fig. 5, according to the type of organization. The target audiences were coded based on the profiling of residential hard-to-reach energy users performed by Rotmann et al. (2020), Ashby et al. (2020), and Sequeira et al. (2024).

While some types of organizations focus primarily on the general population and on their own members, e.g., those performing artistic and sports activities, there is still overlap in many target audiences. Local governments participate in support activities for a few vulnerable groups, but often only in a supportive role to other local stakeholders. Community and education organizations take a whole-community approach, but some also dedicate special attention to specific vulnerable groups.

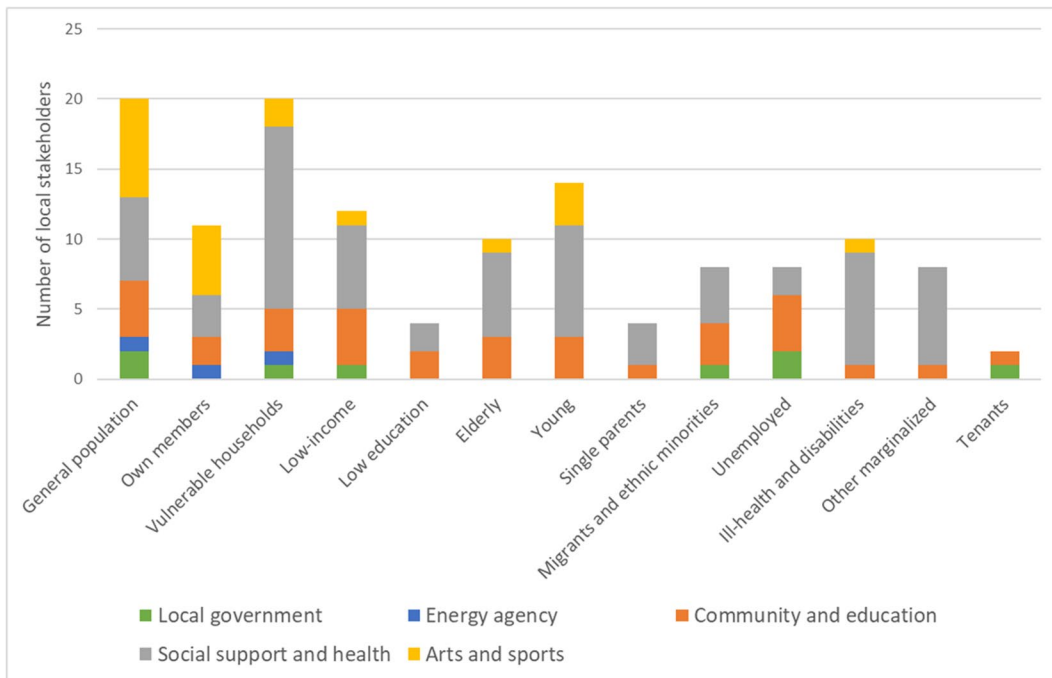


Fig. 5 Self-reported target audiences according to the type of stakeholder

Notably, there is significant coverage across profiles pointing towards the possibility of building a complete and coherent energy support structure that manages to identify and engage even those that are harder-to-reach (Warbroek et al., 2018). Mainly, social support and health organizations provide essential aid to the most marginalized groups, such as homeless persons, persons with substance abuse problems, persons infected with HIV/AIDS, sex workers, and people living in inadequate housing conditions. Following Chard and Walker’s (2016) argument for a “making every contact count” approach, these organizations can also be alert and active on energy topics. This is particularly important since Darby (2017) found that households resorting to energy advice services needed not only information but also interpretation, advocacy, and confidence-building, which can better be provided by trusted middle actors. It is fundamental that energy advisors act in the interest of their beneficiaries, including by being able to assist people with disabilities, ill-health, or other impairments (Forster et al., 2019).

The quantitative assessment of audiences was complex since most interviewees could only mention rounded numbers and often grouped different

profiles. Local governments see the entire population in their territory as their target audience. The energy agency has 13 collective members but also targets the general population and vulnerable households through its multiple projects. Table 2 shows examples of local organizations’ self-reported quantitative assessment of target audiences. Some contacts seem to occur regularly, for instance, through continued support to a specific family. In contrast, others are sporadic and time-limited, for example, through awareness-raising campaigns. Double counting is also present, even within the same organization, as some persons receive several types of support. From these results, local organizations seem able to engage and mobilize a significant number of persons in their territory, including groups usually referred to as being hard-to-reach, which might hold some potential for synergies in delivering targeted and tailored energy support.

Finally, it is also relevant to understand these organizations’ approaches to making first contact and maintaining a relationship with their target audience. These include an active presence on social media, use of emails and direct messaging, forwarding from partner organizations, participation in local events

Table 2 Self-reported quantitative descriptions of target audiences of the interviewed organizations

Type of organization	Examples of self-reported quantitative descriptions of target audiences
Community and education	20–50 youths per activity; hundreds of migrants and hundreds of unemployed persons per year; 120 unemployed persons per year; 60 teachers per year and 16 unemployed persons per year; 1000 people per year in their activities; 40 members on a regular basis; 105 elderly persons on a regular basis
Social support and health	80 partners on a regular basis; almost 1000 vulnerable families per year; 770 people per year in their activities; 200–250 persons with VIH/AIDS per year; 40 elderly or disabled persons on a regular basis; 400 families with a disabled person per year; 150–200 people per month (illegal migrants, sex workers, homeless, substance abuse problems, VIH/AIDS); 650 vulnerable persons per year; 450 vulnerable persons on a regular basis; 350–400 unstable families per year and 24 youth on a regular basis; 1300 associates, 85 elderly, 70 people with chronic ill-health, and 10 unemployed or homeless persons on a regular basis; 90 families with children at risk per year; 3000–3500 people per year in their activities and 15–20 beneficiaries per week (sex workers, ex-convicts, VIH/AIDS, disabled); 3000 hospitalized children per year; 27 vulnerable households on a regular basis
Arts and sports	15–30 persons per show and 180 children per year; 60–120 persons per show and 20 youth on a regular basis; 600 people per annual festival and 300–500 youth per year; 60 associates on a regular basis; 200 athletes on a regular basis; 5000 people per year in their activities and 180 associates on a regular basis; 20–30 athletes on a regular basis; 30–35 members on a regular basis

and local media, dissemination of materials such as flyers and posters, domiciliary visits, services in own facilities, and word-of-mouth. The relative importance conferred to attracting new members and the preferred communication channels varies according to organization and target audience, as demonstrated through two examples:

“We have an online communication strategy through our social media, website, and mailing list. We promote our activities in the local media and municipality. We have direct protocols with schools and other organizations. There is a large community of participants, and word-of-mouth is one of our strongest communication tools.” [Art3]

“We are very bad at marketing; it is not a concern. Our ‘product’ sells by itself. Most people come to us through word-of-mouth, from community networks and family members. Some are forwarded from social security and health centers.” [Soc6]

Frick et al. (2017) found that local governments communicate through mail, advertising, newspapers, and events; however, these mainly attract individuals who are already engaged in the topic at hand. The same authors assert that middle actors have more personal and frequent contact with the population than authorities, using diverse means and relying on face-to-face and word-of-mouth. In the United States, Donnelly (2014) also highlighted a crucial role of

word-of-mouth in driving residential energy efficiency uptake. The importance of these communication methods is exemplified by a social support and health organization that provides aid to marginalized groups:

“Our mobile team [providing essential aid to the homeless, drug addicts, and sex workers] already exists for a long time. It has a well-established audience that grows on word-of-mouth among ‘the guys’, as they say it.” [Soc13]

Willingness – functions in energy support

Results from the interviews show areas where collaboration between local organizations and energy support projects seems possible. These are shown for specific types of organizations in Fig. 6.

A large share of the organizations provided positive answers for the roles of physical and online project dissemination, forwarding citizens to energy-related support, facilitating contacts with other local partners, organize community events, and participating in short training sessions. Local organizations seem able to aid in the setup of communication campaigns, which are considered by the European Commission (2023) as a critical aspect of energy poverty mitigation, aiming to build trust in the energy support services while avoiding stigmatization of vulnerable groups. Arts and sports clubs may collaborate in

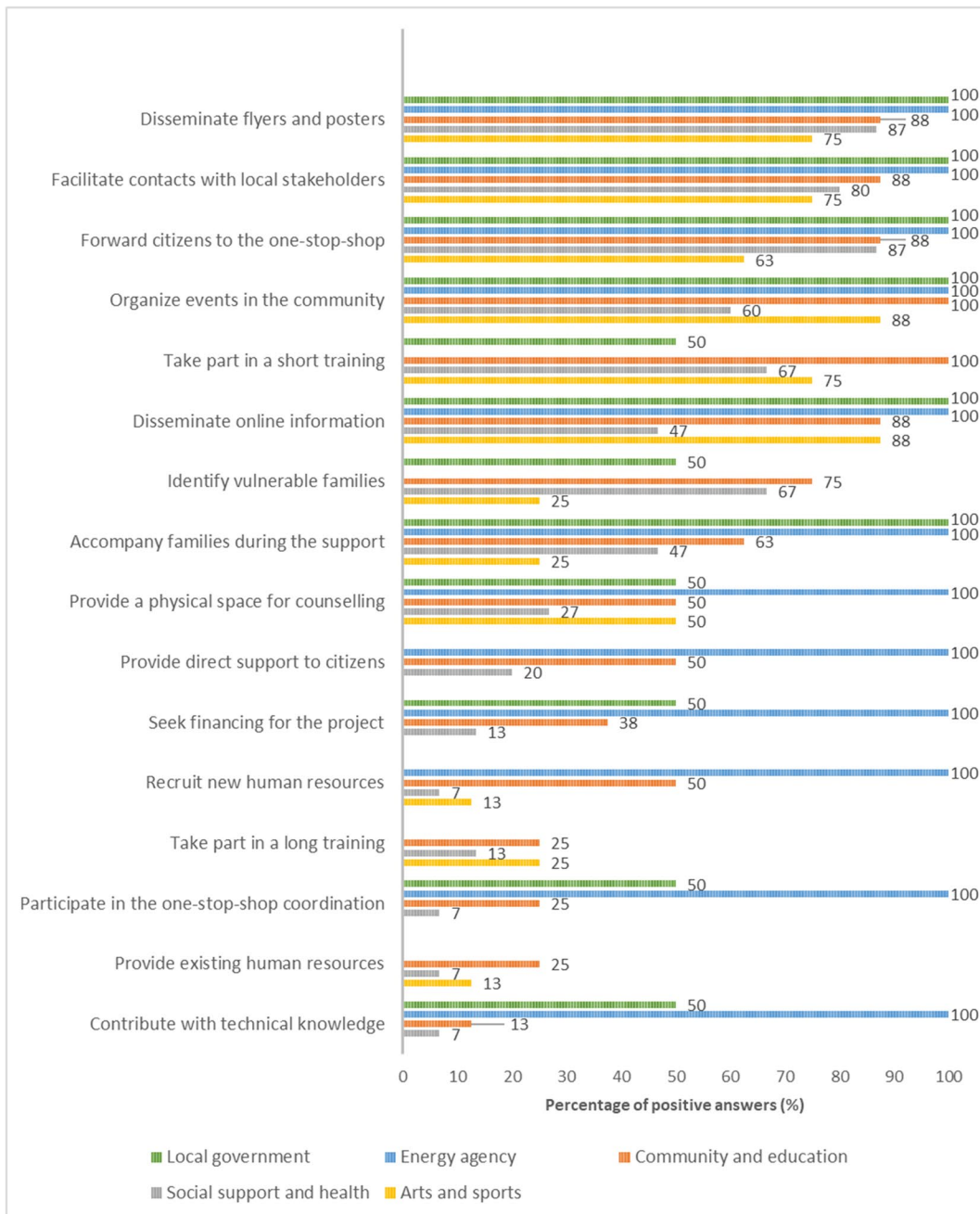


Fig. 6 Positive answers to potential collaborative roles from the interviewed organizations

short-term dissemination activities but seem to struggle in more specialized functions:

“Yes, we can inform people of the energy support service, for example, during our shows. We can also have the flyers in our stall or the ticket office.” [Art1]

Organizations focused on community and education seem particularly well-placed for communication tasks and citizen mobilization through local events. These findings concur with Sequeira and Melo (2020), who conducted energy audits in small businesses through a community-based approach in Portugal, and

Balta-Ozkan et al. (2021), who analyzed the role of charities in fostering solar photovoltaic uptake in the United Kingdom. This willingness to organize local events or to add energy support to existing events is stated by a community and education association:

“Yes, we can collaborate in organizing local events; we already organize community events with a strong ecological component.” [Com7]

All types of organizations are willing to act as intermediaries with other local organizations, exploring their existing network of partners, as also reported by Parag and Janda (2014). This is exemplified by a social support and health institution which mentioned having over 80 partners in the territory:

“We have a network of partners built over the years. So yes, we can share the energy support with our contacts. To strengthen the network and share resources.” [Soc1]

Community and education associations and social support and health institutions seem able to forward their beneficiaries to energy support, for instance, by communicating face-to-face the advantages of these services while conducting their usual activities. According to a few other studies (e.g., Mould & Baker, 2017), the referral of vulnerable households via local organizations can be a key recruitment mechanism. This type of collaboration can be particularly crucial in marginalized populations, where Forster et al. (2019) recommend obtaining previous permission and being introduced by local leaders before conducting interventions.

Around half of the interviewees can identify vulnerable families and pass on that information to the coordinators of the energy support for their proactive contact, with an emphasis on community and education associations and social support and health institutions, where this percentage rises to around 70%. These results suggest collaboration with these middle actors can provide synergies in addressing intersecting vulnerabilities and enable better access to vulnerable families, as Ramsden (2020) also suggests based on a charity-led energy project in the United Kingdom. This should be a bi-directional flow whereby energy advisors can also provide information and reference beneficiaries to other organizations if needed (Simcock & Bouzarovski, 2023; Willand et al., 2023).

The European Commission (2023) recognizes this potential role of social, health, and other frontline workers who are in regular contact with vulnerable groups, ascertaining that these should have the skills to identify energy poverty and provide advice: “front-line workers addressed in those programmes should include health and social care workers or other professionals who can help identify households affected by energy poverty and provide them directly with advice and information on solutions to reduce energy consumption and access more affordable and innovative sources of energy.”. This is also considered necessary by one of the social support and health institutions interviewed:

“Yes, we think it’s important to have a training on this. Our response to problems with energy is not well-structured, and our personnel could be more alert. The energy technician could also accompany our social workers during domiciliary support since we have beneficiaries who are not able to leave their homes.” [Soc3]

Willand et al. (2023) state that middle actors can help identify and remedy hidden energy poverty situations that are not captured by traditional indicators or do not request help. Nevertheless, in marginalized groups (e.g., persons with HIV/AIDS, homeless, unstable families, and persons living in informal housing), the urgency of basic health, social, or housing support may be so dire that energy is far from being a primary concern. In some cases, providing energy support might even be seen as a distraction to dealing with the broader challenges affecting vulnerable groups (Willand, 2022). Willand et al. (2023) and Simcock and Bouzarovski (2023) report a feeling of powerlessness from energy advisors when supporting highly vulnerable groups; these already ration their energy use and are often not eligible for energy efficiency funding. Furthermore, our research also finds that confidentiality and fear of breaking trust can be impediments since local organizations have worked hard to build long-term relationships, as reported by one organization:

“If our beneficiaries are interested, yes, we can flag situations of vulnerability. But they may not want to be identified, it aggravates stigma and may have other unintended consequences.” [Soc10]

If a logic of decentralized energy support were to be employed, as suggested by Gouveia et al. (2024), a relevant share of organizations state that they can provide a physical space for the services. Community and education organizations and arts and sports clubs seem more adept to offer their space, probably due to lower occupation rates, than social and health institutions for whom their physical infrastructure is entirely devoted to aid vulnerable groups.

Notably, few local organizations seem able to provide direct energy support to citizens, redirect existing staff, hire new personnel, contribute with technical knowledge, provide or seek financing, or take part in the coordination of the support (*i.e.*, less than 25% of positive answers from the total sample). However, collaboration in these areas may be possible with a few community and education associations whose goals are aligned with the engagement of citizens in environmental and social issues. Social support and health institutions and arts and sports clubs seem even less willing to provide these functions.

Finally, the interviews suggest that energy agencies and local governments may be uniquely positioned to take up leadership roles in energy support and fill the previously mentioned void in human resources, technical knowledge, coordination, and funding. Other authors (*e.g.*, Kivimaa & Martiskainen, 2018; Rose et al., 2021; Eriksson & Olsson, 2022; Economidou et al., 2023) also see a key role for local authorities, including through local energy plans, financing schemes for energy-poor households, communication amongst stakeholders, and influencing political decisions at a national level. In parallel, the energy agency can also provide several of these tasks:

“We can provide planning and tools and share knowledge. For instance, we can act directly on the ground by developing pilots showing that energy support works and then bringing on board other organizations.” [Ene1]

However, they may not be able to do this alone: technical and institutional capability is not necessarily coupled with the intimate acquaintance of the community and the trust required to engage vulnerable families. Frick et al. (2017) show this through an empirical case where households’ willingness to participate in energy conservation campaigns was increased when messages came from formal social groups (*e.g.*, sports clubs and neighborhood

associations) than when they came from city governments; this suggests an enhanced feeling of legitimacy and ownership when multiple local organizations are involved. Furthermore, energy agencies and local governments may not be able to identify vulnerable families, having to rely on other organizations to fulfill this role – this is mentioned by the civil parish level of government in our case study:

“In our civil parish, we do not provide social support directly to the vulnerable population; the local associations play that role.” [Gov2]

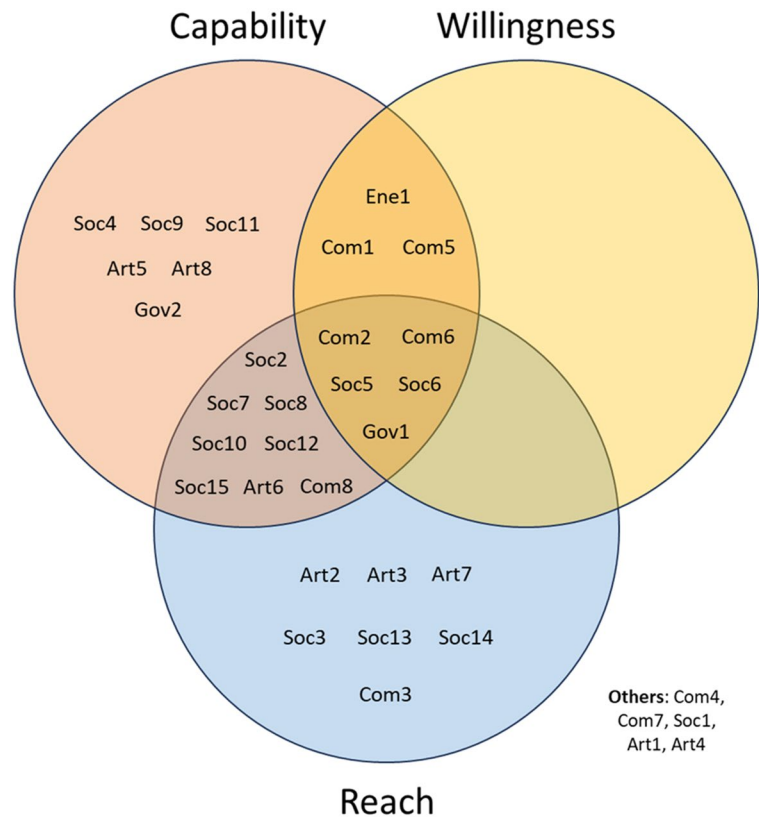
Overachievers – pinpointing key local organizations

Based on the previous results, we conducted an exploratory exercise to pinpoint local organizations for which involvement in energy support seems possible – the “overachievers”. McMaster et al. (2024) also highlight the need for “local champions” that can enable innovation. We attempted to identify these stakeholders based on three dimensions – capability, willingness, and reach – adding the latter to the framework defined by Parag and Janda (2014). The results of this exercise are shown in Fig. 7 as a Venn diagram; these findings are highly exploratory, and the reality on the ground may differ with organizations scoring lower potentially being able to provide meaningful collaboration, and vice versa.

Some organizations may already have enough capabilities based on their employees or volunteers (22 out of 34) and already reach hundreds of persons in their target audiences (20 out of 34). Still, the willingness for more extensive collaboration seems lower (8 out of 34). Only five organizations score high on all three dimensions, namely two community and education associations (which organize events and activities and provide training and support to several population segments), two social support and health institutions (which support vulnerable groups in social, health, food, and other areas), and the local municipality. This mismatch between capabilities, willingness, and reach decreases the likelihood of local organizations providing impactful contributions to energy support (as also suggested by Parag & Janda, 2014).

Three organizations have the capabilities and willingness to engage but lack the necessary reach to

Fig. 7 Interviewed organizations according to capability, willingness, and reach



wider audiences, namely the energy agency and two community and education associations. Eight organizations have the capabilities and the reach potential but may lack the willingness to participate, namely six social support and health institutions, one arts and sports club, and one community and education association; this might be due to the barriers of lack of time, other priorities, and low receptivity in their target audiences. Only five organizations seem to fall short in all the dimensions and are probably wholly unsuitable to contribute in local efforts to deliver energy support.

These results are not static in time, and these organizations may increase or reduce their capabilities, reach broader or smaller audiences, and be more or less willing to actively engage in the future (Parag & Janda, 2014; Warbroek et al., 2018). Finally, a few authors argue that stakeholders should be involved throughout the entire energy support chain – from the services’ design to implementation – to leverage their extensive expertise in the target audiences and territory (Cattino & Reckien, 2021; Gillard et al., 2017; Mundaca et al., 2023).

Motivations – drivers for collaboration

During the interviews, the organizations were asked about their motivations to collaborate in local-scale energy support by selecting a maximum of two options from a defined set of drivers and then commenting on their choice (Fig. 8).

While energy issues are not a core activity for all organizations interviewed, except for the energy agency, most still expressed interest in becoming more involved as a component of their goals to improve their communities’ environmental, social, and economic sustainability. In the United States, Elmallah et al. (2022) also highlighted the need to consider organizations’ perspectives that, while not having an explicit energy focus, hold knowledge of their communities’ needs and may already engage in energy topics indirectly.

When asked about the critical drivers of collaboration, interviewed stakeholders most frequently mentioned environmental concerns, participation in the community, and social support to vulnerable populations. Factors such as the improvement of local economic conditions, the possibility of obtaining

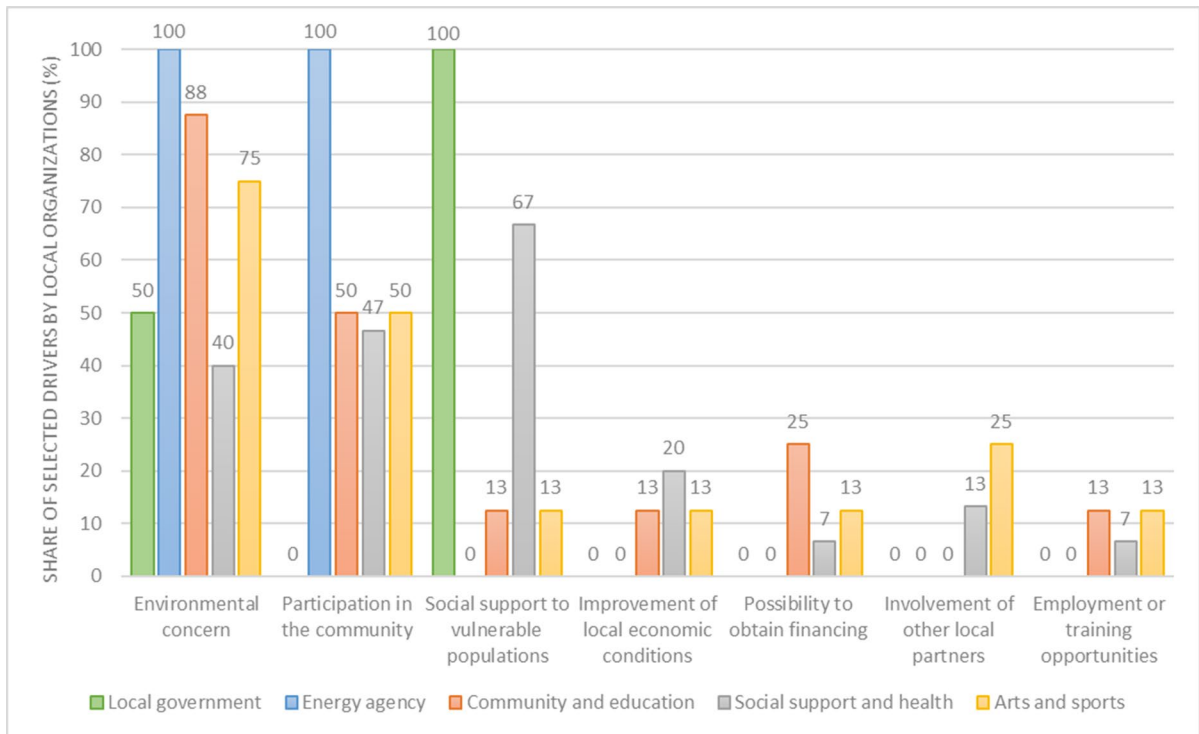


Fig. 8 Drivers for local stakeholders' collaboration in energy projects

financing, involvement of other local partners, and employment or training opportunities generally seem less important to the interviewees. Other authors (e.g., Ornetzeder & Rohrer, 2013; Kivimaa & Martiskainen, 2018; Koch & Christ, 2018) also identify environmental sustainability, participation in local actions, and social equality as key motivations for engagement; financial reasons seem more relevant in some cases than in others. This combination of critical drivers is exemplified by three of the interviewees:

“We work with children, so environmental topics are a must. We try to empower our community; we give them tools, and then good things can happen.” [Com7]

“We always try to be present in our community. We meet with citizens' groups and with the local government. We strive for proximity.” [Soc5]

“Energy poverty is very severe in our population. We should ensure that the ecological transition is just and that the most vulnerable do not shoulder the burden.” [Soc1]

A few differences between types of local organizations are noteworthy. Environmental concerns are the predominant driver in community and education organizations but are less relevant for social support and health institutions. On the other hand, support for vulnerable populations is the primary driver for social support and health institutions but is less relevant for community and education organizations and arts and sports clubs. This difference between priority drivers may derive from the recognition of the lived experience of energy poverty and its health and well-being impacts, which naturally occurs through the day-to-day work of the former type of organization, as also mentioned by Willand et al. (2023). Furthermore, community and education organizations seem particularly keen on the possibility of obtaining financing. At the same time, arts and sports clubs would be more persuaded to participate if other local partners were already involved. The energy agency sees environmental concerns and participation in the community as their main drivers, while local governments

mentioned environmental concerns and the provision of support to vulnerable citizens.

Challenges – barriers hindering collaboration

Most interviewed local organizations seem willing and motivated to collaborate in energy support – a topic they see as relevant. However, this potential collaboration is hindered by several challenges that may jeopardize their involvement and limit the effectiveness of their collaboration. These were discussed in the interviews through predefined options where organizations selected a maximum of two barriers and commented on their choice (Fig. 9).

Most notably, interviewed organizations mentioned scarce human resources, lack of time and other priorities, concerns about financing and infrastructure, and low receptivity to energy-related issues in their target audiences. Two organizations exemplify these pressing barriers:

“We have between 350 and 400 beneficiaries. Our services are unique in Setúbal. We have a

waiting list. We are already working above our capacity.” [Soc8]

“We work in a social housing neighborhood; most people have low education levels, work many hours, and have other concerns. We struggle to find volunteers”. [Com7]

These findings align with Magnani and Osti (2016), who recognize the importance of civil society in transforming the Italian energy system but underline that it requires time and specialized knowledge that cannot be provided on a frail foundation of voluntary work. Other research has also highlighted that local organizations have limited power, resources, and capabilities, which may hinder more comprehensive collaboration (Lacey-Barnacle & Bird, 2018; Middlemiss & Parrish, 2010). Most local organizations did not identify a lack of institutional alignment, lack of energy knowledge, and doubts about impacts as significant barriers.

Community and education associations struggle with human resources, being highly dependent on low-reliability volunteer work, and with financing and infrastructure, often relying on ad-hoc funding and rented spaces.

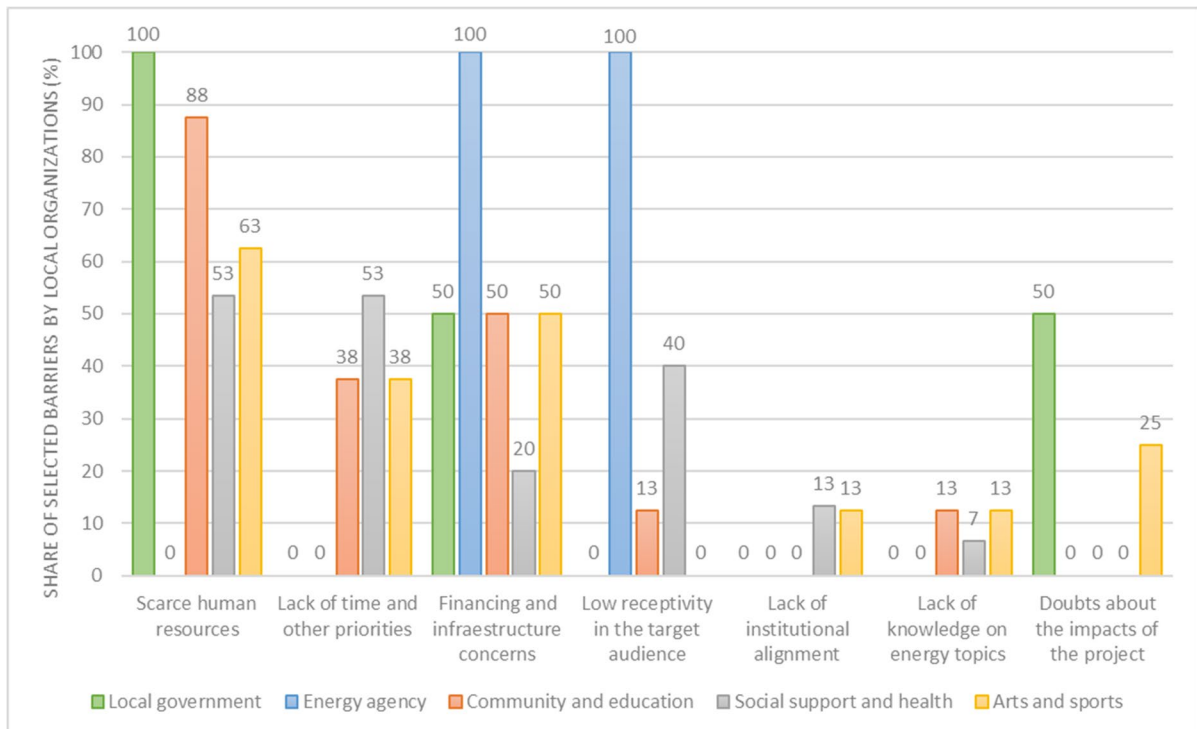


Fig. 9 Barriers to local stakeholders’ collaboration in energy projects

Social support and health institutions perform better on these dimensions, likely due to long-term partnerships with public authorities who depend on them to guarantee essential social services. However, social support institutions argue that lack of time, other priorities, and low receptivity in their target audience to energy issues can be significant barriers. This was also recognized by Willand (2022) who explored stakeholders' perception on the integration of energy assistance with health services in Australian in-home aged care services. This is better explained through the lived experience of one social support and health organization:

“We understand the importance of these topics. But it is not easy; we must be creative. When you talk about raising awareness, that is quite pretty, but there are other concerns. Our families need support that goes way above the energy area. Some live in houses that do not have the minimum conditions; some are illegal. Some have illegal connections; they do not pay for electricity. When a family comes to us asking for support on energy bills, it is an extreme situation and too late for proper responses.” [Soc2]

Arts and sports clubs also mention the same obstacles of scarce human resources, financing and infrastructure concerns, and lack of time and other priorities; notably, doubts about the practical impacts of this type of energy support also emerge for one-quarter of the interviewed. The former might point to what Parag and Janda (2014) see as the risk of middle actors promoting values and norms contradicting the ones encouraged by energy policies. Other research has identified similar difficulties, with Hargreaves et al. (2013) bluntly stating that grassroots movements struggle to survive and are far from being effective at substantially influencing wider systems.

Both levels of local government agreed on scarce human resources as a key barrier. The municipality also stressed the difficulty in allocating financial resources, and the civil parish expressed doubts about the practical impacts of energy support. Eriksson and Olsson (2022) and Economidou et al. (2023) also found resource limitations to be a challenge at this level of governance, particularly for smaller municipalities. The energy agency mentioned financing and infrastructure concerns and low receptivity in their target audience as the main barriers to deliver energy support, stating that:

“It is difficult to put things on the ground. To unlock financing. There are other priorities seen as more important. We make plans, but only a few come to be.” [Ene1]

Needs – solutions to foster collaboration

Finally, interviewed organizations were asked about their needs if deeper collaboration in the provision of energy support were to be deemed feasible, by selecting a maximum of two solutions to overcome the mentioned barriers from a predefined set and commenting on their choice (Fig. 10).

The most frequently proposed solution across the board was dedicated funding (as a basic need to solve most other barriers). The prerequisite for more funding recognizes that energy-poor households have specific needs and limited capabilities to engage in energy issues, for instance, not being able to afford upfront costs and having restricted access to information, demanding more extensive technical, social, and financial support (European Commission, 2023).

Dedicated funding was followed by integration into a comprehensive local network, additional human resources, and support from local governments. The acquisition of own infrastructure and equipment, the completion of technical training, and the internal improvement of the organization were seen as less relevant. Other authors (e.g., Reames, 2016; Lacey-Barnacle & Bird, 2018; Stewart, 2022) also mention the need to allocate funding, empower and build capacity, and dynamize partnerships and networks fostering collaborative work between stakeholders. For instance, Boyle et al. (2021) suggest that local organizations may play a networking function in the scaling up of community energy initiatives.

Regarding human resources, Gouveia et al. (2024) argue for the recruitment of peers from the target community to facilitate access and conduct locally based interventions. In the United Kingdom, Lacey-Barnacle and Bird (2018) report on using funding to create a permanent job position as fundamental to reaching out to marginalized groups. In another example, Schneider et al. (2023) assess that local volunteers trained as energy coaches can help to reduce energy consumption in Dutch households. While most stakeholders showed interest in participating in a small training to raise energy literacy and better

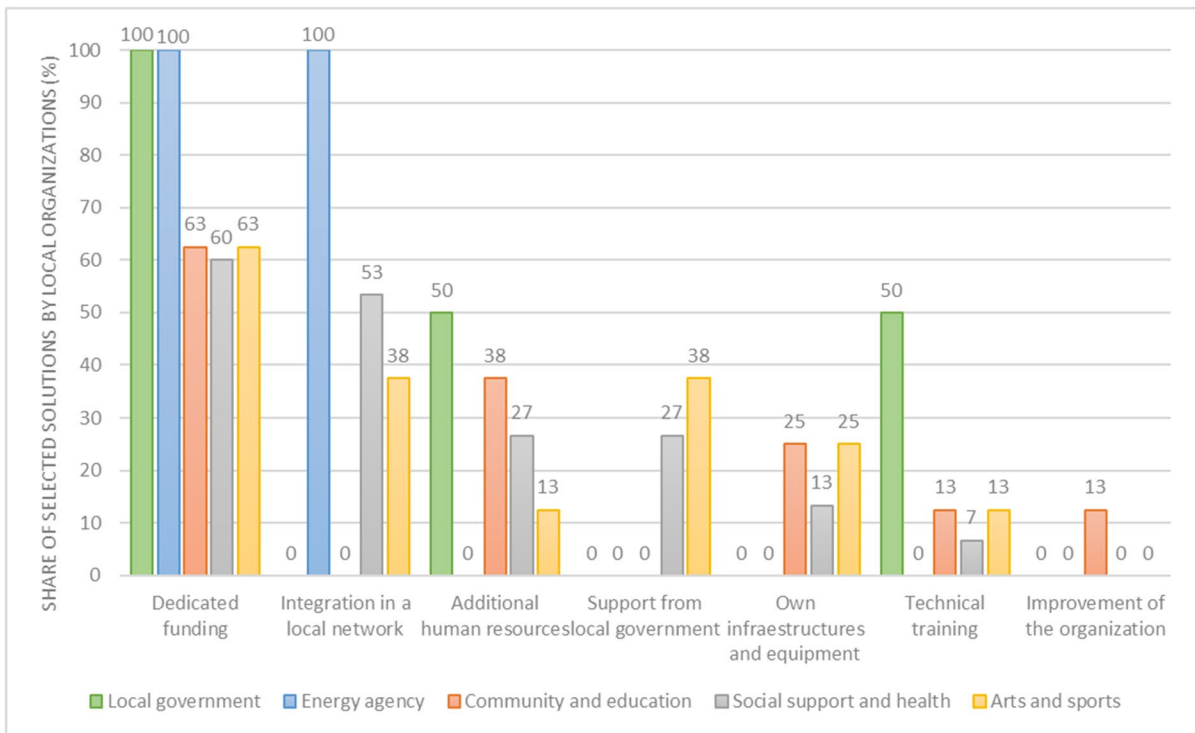


Fig. 10 Proposed solutions for local stakeholders’ collaboration in energy projects

understand the support services offered, only 12% see it as a priority. Nevertheless, this improvement of skills is considered vital by McMaster et al., 2024, who highlight youth engagement as future leaders in their communities. The need for training was justified by one of the interviewees:

“It is not only about having the energy support available, but the connection to local organizations is also important. To communicate with a series of agents, provide training, and pass on the information to the social assistants on the ground.” [Soc8]

Social support and health institutions and arts and sports clubs seem particularly keen on working integrated into a local network with support from local governments; this may reflect their acknowledgment that they can only contribute to specific functions of the energy support. The involvement of governmental authorities and agencies is also considered relevant by Decuypere et al. (2022), who assessed the role of intermediaries in the adoption of heat pumps in Belgian households. Two of these

organizations highlighted the importance of working in partnerships:

“To work as a strong network is very important for us. It has always been a need for us since we do not have our own space to organize activities.” [Art3]

“We must work together with the municipality and the civil parishes. The organizations that are on the ground must work in unison. It is a bidirectional relationship.” [Soc3]

Community and education associations already have their work well-grounded on local networks and may be more confident in their capabilities, particularly if better equipped with funding, human resources, and own infrastructure and equipment. Frick et al. (2017) suggest that local governments should engage more often with these middle actors since they seem able to successfully convey information to citizens. The energy agency mentioned dedicated funding and integration in a local network as the key solutions to leverage energy support. The interviewee emphasized these needs:

“We need to be able to provide examples and show that it can be done. If we want to work with the population, we must work with local governments. If we want to reach specific groups, we need to work with partners. Working in partnerships is in our DNA.” [Ene1]

Both levels of local government see dedicated funding as a key requirement. The municipality also seeks additional human resources, while the civil parish states the need for technical training; similar needs were mentioned by Economidou et al. (2023). This is illustrated by the local municipality statement:

“We had vibrant experiences with community workshops delivered with associations and civil parishes. But to implement the outcomes, we need funding.” [Gov1]

Conclusions

Insights to enact local-scale energy support

This case-study research contributes to an emerging literature that showcases some untapped potential for local organizations to act as middle actors in energy support. In the context of an energy efficiency one-stop shop pilot project we mapped almost 200 local stakeholders in the Setúbal municipality, Portugal, including local governments, energy agency, community and education associations, social support and health institutions, and arts and sports clubs, of which 34 agreed to participate in interviews.

Through this approach, we captured multiple dimensions across organizations, namely their goals and activities, resources and knowledge, target audiences, potential functions in energy support, and drivers, barriers and needs to unlock collaboration. It is time to bring it all together and reckon on how energy support initiatives can or cannot collaborate with local organizations. These insights are of interest to policymakers, practitioners, and researchers seeking to foster citizens' engagement in energy transitions while avoiding a positivity bias towards middle actors' capacity and agency.

First, we argue that an energy support scheme seeking to increase its impact on the population could attempt to bring together local organizations that, while working in different areas, share likeminded goals.

These already provide distinct and complementary services that guarantee essential functions of the territory and dynamize local communities. Through this research, we suggest that fostering synergies can potentially improve both the effectiveness of energy support and the comprehensiveness of other existing services.

Second, it should be recognized that not all local organizations will show interest or capability to participate in energy-related activities, which may burden their day-to-day. From the mapped universe, around 25% answered the request sent by email, and 17% agreed to participate in interviews. The aftermath of the COVID-19 pandemic was advanced as one potential explanation for this low response rate, while the short timeframe of the research activity and the engagement method itself may also have limited participation; however, it is likely that a relevant share of the organizations simply did not have the interest or availability to collaborate. Among those that showed interest, some have scarce resources, and most lack knowledge, hindering their effectiveness as partners.

Third, attracting organizations that already deal with the desired target audiences, including the general population, energy-poor households, specific hard-to-reach household profiles, or even the most marginalized groups, can be highly relevant. They may be able to reference their beneficiaries to the energy support, serve as intermediaries in the actual delivery of the services, and even provide themselves basic aid on energy issues. The interviews show that local organizations have already identified and reached out to vulnerable groups. Nevertheless, trust is hard to win and easily lost; thus, care should be given to confidentiality, stigma, and careful and empathetic messaging.

Fourth, there is a wide range of functions that local organizations may be able to fulfill, and different organizations can match different and complementary roles. In general, they can build on their well-established communication channels, existing local dynamics, and trusted relationships to foster engagement and better identify and target hard-to-reach groups. For instance, in our case study, community and education associations seem suited to raise awareness, launch communication campaigns, and forward citizens to energy support. Social support and health organizations can identify vulnerable households and act as intermediaries during in-person support. Arts and sports clubs can contribute to project dissemination but struggle to take part in other functions. The energy agency can provide

technical knowledge, and local governments can be the centerpiece, including finding funding and coordinating the energy support and the network of partners. The organizations that perform each function may naturally change according to the local context.

Fifth, the motivations expressed by the interviewees reinforce their willingness to participate in energy support, including to further pursue their own goals of environmental action, community participation, and social support. These are the drivers that should be explored when seeking to build partnerships. However, even interested, motivated, and willing organizations are susceptible to challenges hindering their participation, including scarce human resources, other priorities, lack of time, financing and infrastructure concerns, and low receptivity in their target audience. These barriers are severe and need to be recognized. Importantly, the interviews allowed an open conversation about the needs of local organizations. As a priority, energy support projects could provide dedicated funding to reward partners for their collaborative roles. This may solve other needs, such as additional human resources, infrastructure and equipment. In addition, time and resources could be allocated to embedding the energy support in already existing (or new) local networks where the participation of local governments is seen as relevant.

Sixth, through the combined approach of stakeholder mapping and one-on-one interviews, it seems possible to pinpoint “over-achievers” across all described dimensions as the key organizations to be involved in energy support. Their active participation in the whole process of designing and delivering energy support can be beneficial to ensure that the community’s needs are met.

Finally, local middle actors may be able not only to tailor interventions to downstream needs but also to reason with upstream decision-makers for more systemic change. This is crucial because even if energy support can partially improve energy efficiency and ameliorate energy poverty, its impacts are limited by structural factors. Thus, it is only one piece of a holistic energy transition strategy where the perspectives of local organizations can reduce the risks of exacerbating energy injustices.

Recommendations for future work

The applied methods of mapping and interviewing local stakeholders to explore opportunities for collaboration

in delivering energy support can be replicated elsewhere. These organizations are widespread across the territory, and each location will have its own dynamics, networks, and characteristics. Our research has limitations. Namely, it draws on a single case study, a small sample of interviewed organizations, and a breath of self-reported data. Future research can continue exploring the approaches, benefits, and drawbacks of working with middle actors in energy interventions, for instance, focusing on different organizations and activities beyond energy support and providing ex-post assessments of the effectiveness of these collaborations.

From our case study, key recommendations for energy support services seeking to collaborate with local middle actors include i) map and reach out to the stakeholder universe, ii) proceed swiftly with those that show interest and availability, iii) find likeminded organizations that recognize the relevance of energy support, iv) connect with organizations that already engage with and have the trust of the desired target audiences, v) allocate the energy support roles according to the organizations’ individualities, vi) leverage on drivers related to environmental concern, community participation, and social support, health and well-being, vii) recognize the tremendous challenges that can make these middle actors hard-to-reach as they are burdened with demanding tasks performed with few resources, viii) meet the needs of local organizations so that they can be empowered to collaborate in energy support, namely by providing funding and resources, building capacity, and strengthening local networks, ix) pinpoint “overachievers” as local leaders whose engagement is crucial for the success of the energy support, and x) translate the experience and findings to policymakers to trigger systemic change.

Current energy policies and interventions are failing to engage with hard-to-reach and energy-poor households; if these are to be reached in just energy transitions, alternative approaches must be tested. We believe our work contributes to the literature on the role of middle actors in sustainable transitions. In this context, we emphasize that this potential can be fragile and will only materialize if local organizations are allowed to participate and are empowered with adequate means.

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Declarations

Conflicts of interest All authors declare that they have no conflicts of interest.

Appendix A. Interview script

1. Characterization of the organization's goals, activities, structure, human resources, geographical scope, target audiences, and COVID-19 impacts

- 1.1. What is the full name of the organization?
- 1.2. What is the organization's legal structure?
- 1.3. Is it autonomous or a local delegation of a larger organization?
- 1.4. When was the organization founded?
- 1.5. What would you say is your main goal?
- 1.6. Can you describe in detail your current activities and services?
- 1.7. How many collaborators do you have? Follow-up: are they full-time employees or volunteers?
- 1.8. What were the impacts of the COVID-19 pandemic?
- 1.9. What is the geographical scope of your organization?
- 1.10. Who are your main target audiences? Follow-up: can you describe them in detail? How many people do you currently engage?
- 1.11. What are your strategies to reach out and engage with your target audiences?
- 1.12. Do you regularly work with your local government and with other organizations?

2. Assessment of the organization's current knowledge on energy topics

- 2.1. Do you have specific person(s) working in environmental or energyrelated themes?
- 2.2. What activities have you done or are doing in relation to these topics?
- 2.3. How does the theme of sustainability link to your own goals?

2.4. Do you identify the need for energy support in your target audience?

3. Exploration of potential collaborative roles in delivering energy support

3.1. In the scope of an energy support program in your territory (one-stop shop), which delivers free in-person advice on improving efficiency, optimizing energy bills, applying to governmental funds, and conducting energy audits to the general population and vulnerable groups, what types of collaborative roles are you willing to perform? Please answer with "yes", "maybe", or "no" and justify your choice.

- a) Identify vulnerable families.
- b) Forward citizens to the one-stop shop.
- c) Accompany families during the support.
- d) Disseminate flyers and posters.
- e) Disseminate online information.
- f) Take part in a short training.
- g) Take part in a long training.
- h) Provide existing human resources.
- i) Recruit new human resources.
- j) Organise events in the community.
- k) Provide direct support to citizens.
- l) Provide a physical space for counselling.
- m) Facilitate contacts with local stakeholders.
- n) Contribute with technical knowledge.
- o) Seek financing for the project.
- p) Participate in the one-stop shop coordination.
- q) Other.
- r) Prefer not to answer.

4. Identification of drivers, barriers, and solutions for collaboration

4.1. What would motivate you to collaborate in the provision of energy support? If possible, please select two options and justify them.

- a) Environmental concern.
- b) Participation in the community.
- c) Possibility to obtain financing.
- d) Employment or training opportunities.

- e) Improvement of local economic conditions.
- f) Social support to vulnerable populations.
- g) Involvement of other local partners.
- h) Other.
- i) Prefer not to answer.

4.2. What would hinder you from collaborating in the provision of energy support? If possible, please select two options and justify them.

- a) Lack of institutional agreement.
- b) Low receptivity in the target audience.
- c) Financing and infrastructure concerns.
- d) Lack of knowledge on energy topics.
- e) Lack of time and other priorities.
- f) Scarce human resources.

- h) Other.
- i) Prefer not to answer.

- g) Doubts about the impacts of the project.
- h) Other.
- i) Prefer not to answer.

4.3. What solutions would suit your needs and enable deeper collaboration in the provision of energy support? If possible, please select two options and justify them.

- a) Dedicated funding.
- b) Additional human resources.
- c) Technical training.
- d) Improvement of the organization.
- e) Integration in a local network.
- f) Support from local government.
- g) Own infrastructures and equipment.

Appendix B. List of interviewed organizations and their self-reported goals and activities

Type of organization	Code	Self-reported goals	Self-reported activities
Local government	Gov1	To define policies to in the interest of the population in all areas of life	Broad range of activities in Environment, Culture, Citizenship, Sports, Economy, Education, Finance, Housing, International, Youth, Works, Health, Security, Social, Tourism, Urban Planning
	Gov2	To manage heritage, tradition, customs, school network, and associations	Hygiene and urban cleaning, maintenance of green spaces, civil construction works, cemetery services, job insertion, legal consultancy, dissemination of information
Energy agency	Ene1	To promote energy efficiency, renewable energy, and sustainability	Awareness raising, information dissemination, training, energy audits and certification, local energy-climate strategies, other energy-related support
Community and education	Com1	To help the youth build their future and the elderly feel safe	Training for young adults, organization of cultural events, gardening in a social housing neighborhood, intergenerational activities
	Com2	To support local businesses, independent workers, and entrepreneurs	Support and training to the local commerce and to the unemployed, job integration, legal support for migrants
	Com3	To promote the integrated development of rural, coastal, and urban areas	Support for enterprises in agriculture, tourism, and coastal sectors, support for local associations in the social economy, training for the unemployed
	Com4	To help those in need, particularly the elderly and families with children	Organization of local events, organization of neighborhood walks, dissemination of information to the residents
	Com5	To foster communities as agents of change for sustainable behaviors	Raising awareness for sustainability (schools, communities, enterprises, unemployed), training of teachers, community workshops, agro-ecology, organization of events
	Com6	To support active citizenship, and associative and cooperative spirit	Events, community workshops, gardening, language classes, training for vulnerable women, support for victims of domestic abuse, social and psychological support for vulnerable persons, integration of migrants, training for the unemployed, training for social assistants
	Com7	To prepare young people for the future in criminalized neighborhoods	Weekly meetings, nature activities for children and young adults, local events, social support for youth in difficult economic situations (basic good baskets, clothes)
	Com8	To encourage active retirement and establish bonds of friendship	Classes for the elderly on various topics, arts and cultural activities, music group, field trips, gymnastics

Type of organization	Code	Self-reported goals	Self-reported activities
Social support and health	Soc1	To contribute to a fairer society, dignified and participatory citizenship	Provision of information and training to local social support institutions and networking, organization of citizen councils on poverty
	Soc2	To support the vulnerable population of Setúbal	Domiciliary support for the elderly (hygiene, food, psychological support), daycare/kindergarten, social canteen, food aid, support for people with low pensions and social insertion income
	Soc3	To support persons with HIV/AIDS and prevent infections	HIV/AIDS screenings, clothing bank, social support, food donations, occasional financial support, psychological support, support to children of persons with HIV/AIDS, nursery
	Soc4	To provide humanitarian and social assistance to the most vulnerable	Domiciliary support services (hygiene, food), transport of urgent and non-urgent patients, events, first aid and nursing courses, transportation of disabled school children
	Soc5	To support those in need in coordination with the local churches	Community center, elderly daycare and transport, afterschool activities for children, organization of cultural events, social and psychological support, food baskets, social store, and canteen
	Soc6	To promote social justice, equality, inclusion, and opportunities for all	Afterschool activities for children, kindergarten, nursery, therapeutics for persons with substance abuse problems, support for recipients of social insertion income, canteen, community activities
	Soc7	To be a reference for people with autism and their families	Support center for disabilities, diagnosis and follow-up for children with autism, support in legal, social security and education, rehabilitation, therapeutics, training for teachers, raising awareness
	Soc8	To educate children and young people and insert them into society	Social support for children and young adults, children and young adults' institutional homes, mediation for unstable and vulnerable families
	Soc9	To defend the rights of children, especially the most vulnerable	Family support center and parental advising services, social, legal and court support for unstable and vulnerable families with children or youth at risk
	Soc10	To support to those infected by HIV/AIDS, provide training and informing	Training and raising awareness with a particular focus on youth, scientific research, intervention theatre, psychosocial support for those infected by HIV/AIDS, diagnosis and forwarding for medical appointments
	Soc11	To manage a social support facility for the residents and locally employed	Social support facility with a community center, daycare, domiciliary services, nursery, kindergarten, retirement home, activities for youth and children, social shop, ateliers, events
	Soc12	To raise awareness among the population about blood donation	Organization of monthly blood donations in rotative locations, raise awareness among the population and the youth
	Soc13	To reduce risks associated with the use of psychoactive substances	Diagnosis, medical appointments, support for people with substance abuse problems and/or infections, forwarding to other types of support, mobile team to improve consumption and sexual safety and identify those in need, food and clothes donations, education for health
	Soc14	To provide social protection and health through mutual assistance	Doctor appointments, physiotherapy, musical choirs, dance classes, daycare center, laundry, domiciliary services (food, medication, cleaning, hygiene), transport, social store, and canteen
	Soc15	To de-dramatize the hospital context for hospitalized children	Clowns that visit children admitted in hospitals, training for nurses and medical staff
Arts and sports	Art1	To contribute to culture democratization and socio-cultural dynamization	Development of cultural shows, organization of cultural events, theatre and artistic expression classes, organization of activities for children
	Art2	To bring theatre to the local community and beyond	Theatre, organization of cultural events, artistic residences, theatre classes and workshops, outdoor talks, national tours
	Art3	To promote active youth engagement through art and culture	Organization of cultural events and workshops, training for youth, international exchange programs for youth
	Art4	To maintain and show the local traditions across the country and abroad	Dance classes and performances, event organization, national and international exchanges
	Art5	To bring together fans and support the local football club	Organization of events and travels for sports fans, collection of goods for vulnerable families, entertainment in elderly institutions
	Art6	To provide young people with sports activities	Male and female basketball teams for all ages, practice for disabled persons, promotion of social inclusion for disadvantaged athletes, extracurricular activities for children
	Art7	To promote water sports and especially canoeing in its various forms	Practice of canoeing for children and adults, competition, nautical tourism and leisure canoeing, organization of canoeing events
	Art8	To encourage the population to practice sports outdoors	Practice of canoeing and triathlon for children and adults, summer activities for children

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