

Article

Exploring Energy Literacy in Italian Social Housing: A Survey of Inhabitants Preparing the Ground for Climate Transition

Lia Marchi ^{1,*} , Licia Felicioni ² , Francesca Sabatini ¹  and Lidia Errante ³¹ Department of Architecture, University of Bologna, 40136 Bologna, Italy; f.sabatini@unibo.it² University Centre for Energy Efficient Buildings, Czech Technical University in Prague, Třinecká 1024, 273 43 Buštěhrad, Czech Republic; licia.felicioni@cvut.cz³ Department of Heritage, Architecture and Urbanism (PAU), Mediterranean University of Reggio Calabria, 89124 Reggio Calabria, Italy; lidia.errante@unirc.it

* Correspondence: lia.marchi3@unibo.it

Abstract: A low level of energy literacy can hamper the adoption of climate-responsive solutions in the built environment. This is often the case of social housing neighborhoods, where the implementation of improvement measures such as those from the EU Recovery Plan (PNRR in Italy) may become difficult because of the specific socio-cultural and economic criticalities. Here, inhabitants are more prone to misinformation as well as energy poverty. Therefore, understanding the level of knowledge and willingness to implement certain design actions at both site and building levels is of utmost importance to make the transition as effective and just as needed. The article presents a pilot survey conducted in two Italian social housing neighborhoods to assess residents' understanding and preparedness to implement climate-responsive strategies, as well as literacy gaps about energy transition and related public fundings. This can prepare the ground for developing effective solutions to improve the livability of the built environment based on local needs and features that can be combined synergistically with financial incentives. The survey results are discussed, in addition to the upscaling potential.

Keywords: environmental awareness; energy transition; Next Generation EU; environmental design; fake news; social housing



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1. Introduction

Climate change is heavily impacting people's quality of life, and relevant studies alert that its effects will be harsher in the future unless fast and effective actions are taken now, as outlined by the Sixth assessment report of the Intergovernmental Panel on Climate Change (IPCC) and the G20 Climate Risk Atlas [1,2].

The COVID-19 pandemic has exacerbated climate-related socio-economic challenges [3] while stressing the need for urgent actions beyond the health crisis, particularly addressing the built environment's overall sustainability and livability [4].

The European Union has responded to the convergence of these crises through many resources and strategic partnerships. A great emphasis has been placed on the social dimension of the transition: the European Green Deal, the EU's strategy towards a low-carbon economy, explicitly addresses the topic in one of its three pillars, which aims to ensure that "no person and no place is left behind" [5].

Within this framework, the Next Generation EU financed the recovery and resilience plans to be implemented in each Member State [6]. The Plan addresses transversal topics across the Union, which are declined in a series of strategic assets, among which the twin transition for the built environment assumed particular relevance: the ecological transition, including decarbonization and circular economy, and the digital transition, including investments in smart cities and artificial intelligence.

In Italy, the Next Generation EU has been implemented under the name of Piano Nazionale di Ripresa e Resilienza (PNRR) (in English: National Recovery and Resilience Plan) [7]. Since its launch, several reflections have been shared on this topic, and extraordinary incentives have been programmed for building retrofitting and the renovation of collective/public spaces. In either private or public interventions, climate responsiveness was understood as a key requirement.

If properly exploited, the EU 806.9-billion-euro support represents an unprecedented chance to deeply change the region's economy, as well as the quality of life of its inhabitants. To this end, despite a large amount of technical and managing tools available to support the transition, the EU stresses that it is vital to engage and empower citizens in order to make the process effective, pervasive and equal [8].

In fact, energy transition through technical investments and the adoption of pro-environmental behaviors in the built environment strongly rely on people's level of awareness, understanding, and willingness to change. As in a mutually informing movement, changes in the built environment contribute to raising awareness and producing behavioral change, and in turn, behavioral change elicits the sustainable transformation of the built environment (e.g., the weight of sustainable choices in shaping the market for low-carbon products) [9].

However, decision-making processes and citizen participation in the transition to a green, digital economy and energy transition are dependent on adequate participatory strategies, which have so far been mostly applied to sociocultural challenges more than to sustainability challenges [10]; in contrast, it is also dependent on the quality and accessibility of the channels through which information is transmitted, as well as the awareness of contextual specificities [11].

Environmental education and energy literacy are pivotal elements in promoting energy saving at the household level and eliciting behavioral change at the collective level [12,13]. It is thus important to understand how different contexts receive the complex information concerning current transformations and to take a snapshot of the situation. This is necessary to: first, understand what technical tools and approaches can be used to elicit information literacy; second, to promote spatial, typological, technological and social change in the direction of ecological transition; third, to increase citizen participation and promote the emergence of "energy citizens", i.e., the active participation of citizens in the energy system and their ability to actively contribute to global decarbonization targets [14]; fourth, to ultimately make the transition widespread, scalable and effective over the long term [15].

In this framework, the dramatic economic effects of gas import dependency on household energy consumption and, consequently, on bills [16] have made citizens much more eager for accessible and reliable information; however, this is hard to find. This is especially true when it comes to topics with a high degree of complexity [17], such as the ecological and energy transition, and the new means of information make it difficult to distinguish between true and fake news [18–20]. This calls for the production of accountable information and widespread knowledge dissemination among citizens in order to fulfil the EU's aim to not leave anyone behind and to promote energy democracy.

1.1. Tackling Climate Change and Boosting Energy Transition in Italian Social Housing

These reflections are particularly relevant when dealing with people's living contexts (i.e., housing), where the ambitious visions and targets set at the policy level might encounter strong barriers to implementation due to citizens' sociocultural and economic conditions.

The need to focus on the social housing sector is dictated by the awareness that the distribution of the effects of climate change (and the benefits of the strategies to tackle it) is not equal among members of society. This is true at a twofold level: the global level, where the displacement of populations and communities due to the increasing non-livability of settlements affected by climate change effects has produced a new wave of migration (precisely, of climate migrants) [21]; and at the local level: the IPCC 2022 report indicates that "climate impacts are felt disproportionately in urban communities, with the most

economically and socially marginalized being most affected" [22]. Hence, the need for a "just transition" has been advocated, combining "the idea of transition both from the production viewpoint of moving towards low carbon sources" and "the consumption-based concerns of achieving energy efficiency in the long term without compromising individual well-being or community cohesion" [23].

The Social Housing (SH) sector is particularly affected by the issue because it concentrates on fragile socio-economic users that are potentially more exposed to energy poverty and social inequalities to be tackled [24,25]. Moreover, this asset is extremely in need of climate-responsive strategies. Most of the SH stock across the EU is more than forty years old, has poor energy performances and is in great need of retrofitting (not only in relation to energy efficiency) [26–28].

In Italy, the situation is particularly critical: first, because according to the EU Energy Poverty Observatory [29], the incidence of energy poverty in Italy appears much higher than in other EU countries; second, because most of the SH stock was built before the first energy regulation entered into force, thus it is, on average, highly energy-demanding and technically obsolete [28,30]. Furthermore, during the last fifty years, it has been intensely used, and as a result, technical obsolescence and maintenance issues have affected the livability of this asset. Here, several issues related to the functionality, accessibility and suitability of SH neighborhoods in accordance with today's needs are registered, among which are: high indoor and outdoor discomfort levels due to low thermal insulation, poor ventilation, and impervious surfaces, and the urban heat island effect as a result [31,32].

The building retrofitting opportunities offered by PNRR are often difficult to implement in SH contexts because of property fragmentation, low spending capacity of owners or a lack of both appropriate measures and context-specific understanding [33]. The latter is particularly widespread at the global level, especially for what concerns the energy consumption of households [34–36]. This might indeed hamper or slow the actual transition [37]. Even if occupants generally have no financial and legal capacity to retrofit their homes through technical interventions, they can act through their behaviors and attitudes, which are strongly related to awareness. In other words, the more people are informed about environmental issues and energy consumption in their homes, the more they tend to act responsibly [38–40].

Furthermore, even when the owner is the same for an entire SH complex—typically a public body—the challenge is to understand how to implement the suitable design solutions effectively and affordably, as well as how to make them acceptable to the inhabitants in order to prevent tampering.

Therefore, in order to implement EU policies in a way that truly leaves no one behind and is able to elicit behavioral change toward climate transition, a threefold need emerges:

- Understanding context specificities and citizens' level of energy literacy to assess their potential responsiveness to climate adaptation measures;
- Consequently, to understand which sources of information are being used and which sources are lacking to promote energy literacy and elicit behavioral change;
- Ultimately, the strategies needed to rapidly and adequately tackle the most fragile contexts, which are the most prone to both misinformation and to energy poverty.

1.2. The Initiative behind the Study

The paper stems from these three needs, which consequently oriented the research objectives that aim to provide an original contribution to the lack of information concerning energy literacy, consumption behaviors and channels of information—which is widespread and still largely unaddressed by research—to inform policies and strategies to tackle energy poverty [17,41]. These are indeed the objectives of a broader research project, of which this paper presents early outcomes for. In particular, it presents a study undertaken within the initiative "A selfie of the territories" launched by the Italian Society of Architectural Technology (SITdA) in 2022. The overall aim was to produce a report on the opportunities

and criticalities related to PNRR in Italy, with reference to its uptake in the built environment at a local scale.

According to the premises of this work, raising citizens' energy literacy and willingness to take part in the transition are crucial to the adoption of environmental and climate-responsive solutions. Therefore, the specific objective of the study is to utilize citizen science approaches to launch a survey to investigate the awareness level and willingness to change of inhabitants with regard to the ecological transition, the transformations that are taking place and their challenges and opportunities [42].

Because the topic is particularly critical in the national SH context, this is assumed as the focus by the authors. A test run in two SH neighborhoods is made before the upscale of the survey on a larger scale. The two cases are selected from different socio-cultural and climatic contexts right for testing if the survey can be scaled at the country level; thus, the aim is not to discuss differences among them, but rather to find common grounds for raising energy literacy and spreading climate-responsive solutions, which need to be locally targeted.

By so doing, the study lays the foundations to frame the context for action, identify information gaps and formulate strategic directions that can contribute transversally to several objectives—which are also named in PNRR—such as: the strengthening of widespread awareness of energy issues; the potential emergence of energy communities; their contribution to energy poverty mitigation and social innovation, which is defined by creative and collective solutions to common problems [7]. On this basis, the most effective and suitable solutions to improve the livability of these neighborhoods could be better identified and implemented.

2. Materials and Methods

The overall methodology is broken down into three main phases:

1. Preparation of the survey on energy literacy around the relevant PNRR objectives.
2. Launch of the survey in two Italian pilot case studies located in neighborhoods with a pervasive presence of social housing (Barca, in Bologna, and Sbarre Inferiori, in Reggio Calabria) and the interpretation of results.
3. Refinement of the survey and launch on a broader scale (national level).

The article focuses on the first two stages, which are the survey preparation and piloting in two representative cases. The conclusion additionally reflects on the limits of the survey and on its refinement before the upscaling phase.

2.1. Structuring the Survey

Based on previous experiences in the field, the survey was assumed to be suitable as an investigation mean for the study [13,34,36,38]. The target group is SH inhabitants, which considers all those who are living in neighborhoods with mainly public housing, whether they are owners or renters.

Next, the structure and content of the questionnaire have been devised considering advice from previous studies based on surveys.

Regarding the content, four themes were selected among those that have the potential to impact SH inhabitants' life, economy and the environment and, at the same time, are related to information that are likely to be misunderstood. In particular, these are:

- (i) Renewable energy, because the EU's ambitious climate neutrality target by 2050 relies largely on the conversion of current fossil-fuel-based energy production systems and on their mainstreaming into users' consumption habits.
- (ii) PNRR, namely 'Italia Domani' ('Italy Tomorrow'), which consists of a EUR 191.5 billion investment. PNRR aims at the efficiency and digitalization of the public administration, the development of more modern and capillary sustainable mobility, territorial cohesion, effective and proximity-based public health, and the development of a more dynamic labor market.

- (iii) ‘Superbonus’ incentive, the 110% deduction that applies to documented expenses to improve the energy efficiency of buildings owned or in use. In the period 2021–22, it has enabled the opening of more than 200,000 construction sites and has mobilized billions of euros in investments [43]; it is expected to extend its impact far beyond these figures, as it has been prolonged to 2026 for social housing only.
- (iv) Ecological transition, which is related to both the improvement of living spaces and the need for curbing emissions related to construction sites and their environmental impact.

The online survey—which was accessible either through a personal computer or smartphone—was selected as a way to reach the highest possible number of participants. The survey is designed to be spread through social media groups of SH neighborhoods, which are often very active channels where energy transition issues are discussed, either in a positive or negative perspective. For this purpose, Google Forms was selected as a free, easy-to-use and open-access software.

Thus, 22 multiple-choice questions have been formulated in an informal and simple-to-grasp style, also ensuring a short filling time (within 5 min). The language is Italian but easy translation into other languages can be made interactively through free tools.

The questions are organized into six sections (Figure 1 and Appendix A):

- Introductory section, to explain the project to the participant, as well as to collect basic personal data such as age group, name of the neighborhood, gender, housing ownership, and personal interest in environmental sustainability issues. These were not sensitive data as defined by GDPR and were anonymized for result interpretation and discussion.
- Thematic sections about the four selected topics (i–iv).
- Conclusive section, open to any free comments by the respondents.

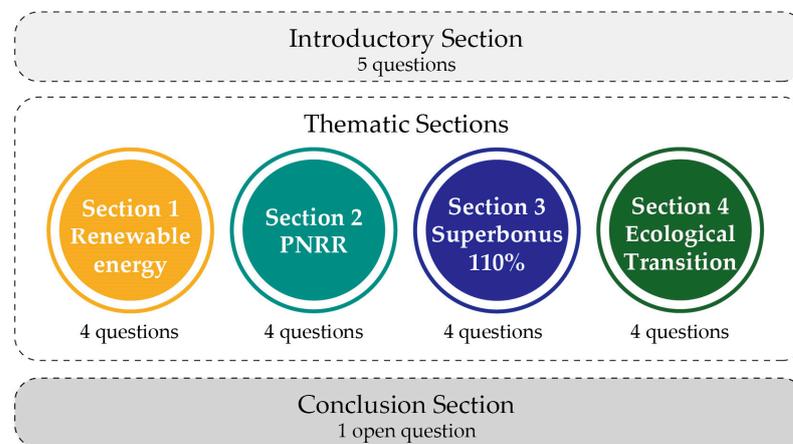


Figure 1. Structure of the survey. Authors’ elaboration.

Regarding the questions’ definition, participants are asked to identify the truthfulness of the information provided, in order to identify the actual context in which to design pro-environmental strategies and actions. Random pieces of fake news are included as an investigative means (namely, stratagem) to this end.

It was decided to maintain the same neutral register even for false statements, using question periods sometimes preceded by informal phrases such as “did you know that . . . ?” or “do you agree with . . . ?”. For each question, possible answers are “yes”, “no” and “I don’t know”.

Next, infographics (Appendix B) were created to provide the ‘correct’ answer to the questionnaire, demystifying the false myths and fake news included in the survey and encouraging the reader to know more about the topics through hyperlinks that led

to reliable, institutional websites or bibliographical references. These infographics were downloadable at the end of the questionnaire.

Appendix A shows the whole survey with all the questions translated in English, while Appendix B contains infographics that include institutional references for each explanation provided [40,44–50].

2.2. Pilot Case Studies

Prior to the launch of the survey on a broad scale, the research team decided to test the tool on a small sample. To this end, two SH neighborhoods have been selected, which differ in the geographic area, climatic zone and sociocultural context. However, both neighborhoods are characterized by Ina-Casa settlements, the massive social housing project which the Italian State undertook in the post-war reconstruction period (lasting until the early 1960s) to promote housing accessibility and affordability [51]. The first case study is “Barca” in Bologna; the second is “Sbarre Inferiori” in Reggio Calabria (Figures 2 and 3).

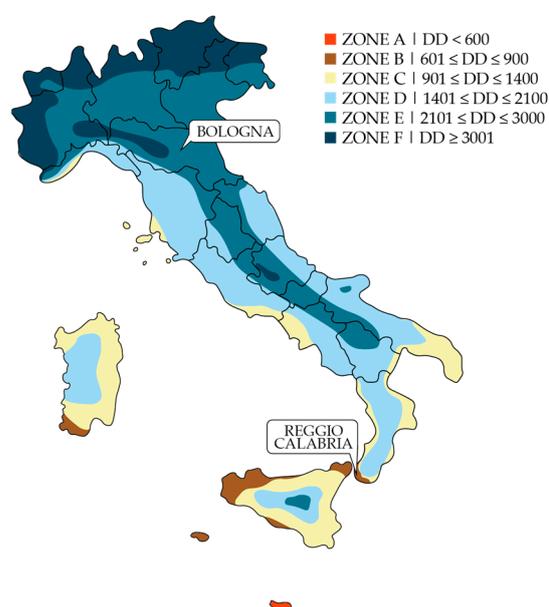


Figure 2. Map of Italy showing the two cities considered in the study, which are in diverse climatic zones (with DD = Degrees Day). Authors’ elaboration.



(a)



(b)

Figure 3. Within the red circles, the two neighborhoods in relation to the respective cities. (a) Barca (Bologna); (b) Sbarre Inferiori (Reggio Calabria). Source: Google Maps.

The choice to focus on the specific contexts of the Ina-Casa neighborhoods stems from the possibility of investigating the topic in similar settlements, albeit with different sociocultural and climatic situations, thus allowing the interpretation of data and the

definition of technically and spatially coherent design proposals as well as being potentially replicable in hundreds of other Ina-Casa neighborhoods spread across the Country.

Although they are located in two different contexts from the viewpoint of demography and development patterns, the two selected neighborhoods are characterized by a consistency that makes them easily comparable because they share structural problems related to the degradation of public and commercial spaces, the lack of services and the type of dwellings no longer fit for contemporary housing needs; therefore, they also relate to the ongoing demographic transformations, an aging population and the increase in foreign inhabitants [52].

Barca (BO) hosts 21,000 inhabitants (3200 of whom are foreigners). Most of the population is between 45 and 64 years old and over one third is over 65. The inhabitants of Barca perceive its isolation, the absence of services and security and the poor energy and environmental quality performance of the dwellings [53]. At the same time, the neighborhood shows great potential due to the low housing density, the wide availability of green spaces and the proximity of the Reno River, together with a homogeneous architectural language. Bologna presents 2259 DD and Global radiation on horizontal surfaces per year index of 5038 MJ/m² [54].

Sbarre Inferiori (RC) is located in a wider district that hosts more than 20,000 residents, with a high rate of population ageing with residents over 70. Similar to Barca, it is characterized by the poor energy performances of the buildings. Urban and residential public spaces are barely accessible and degraded while offering great potential for renewal. Several unpermitted constructions are recorded in the area, leading to further decay in the quality and functionality of either public or private spaces. Reggio Calabria presents 772 DD and Global radiation on horizontal surfaces per year index of 5850 MJ/m² [54].

The condition of socio-economic fragility that characterizes these places suggests that there is an urge to prioritize reflections and experiments in these contexts to support the adoption of good energy consumption practices without burdening the inhabitants economically and, at the same time, to improve their quality of life.

At the beginning of August 2022, the questionnaire was advertised to Facebook groups of the two neighborhoods. The Facebook post through which citizens were invited to take part in the survey clearly illustrated the purpose of the survey, the expected filling time and how to use it. After two weeks, the investigation was closed and the results were examined and aggregated.

3. Pilot Survey Results

The results from the launch of the survey in the two pilot neighborhoods are shown in Figure 4, in percentage terms, and described in detail as follows.

The profile of the respondents (69 in total) is rather heterogeneous, with 43% young people aged between 18 and 34, and the rest between 35 and 50 (20%), 50 and 69 (30%) and over 70 (7%). Therefore, the age distribution does not fully match with the current composition of the two areas. Respondents were mainly women (69.6%), and were nearly evenly distributed in the two case studies (56.5% from Reggio Calabria).

More than 80% said they are generally interested in environmental issues. Notably, those who declare not to be interested are all from Sbarre.

In section 1 of the survey—Renewable Energy Sources (RES), for example, 4.3% of respondents believe the doped silicon used in PV panels is harmful to human health (which is, in fact, false). These are all from Sbarre; over 80% indicated that they do not know. Half of the respondents believe that photovoltaic panels are not recyclable (which is false), while another 30% say they do not know. However, for these, the respondents are equally distributed between Barca and Sbarre.

Only 13% believe that the increase in RES installation will happen at the expense of new public housing being built in the next 50 years. With respect to solar energy, there is also relevant data indicating that 91.3% of the respondents would be willing to invest or

ask their landlords for photovoltaic systems shared with their neighbors; indeed, 52.4% of the respondents were owners.

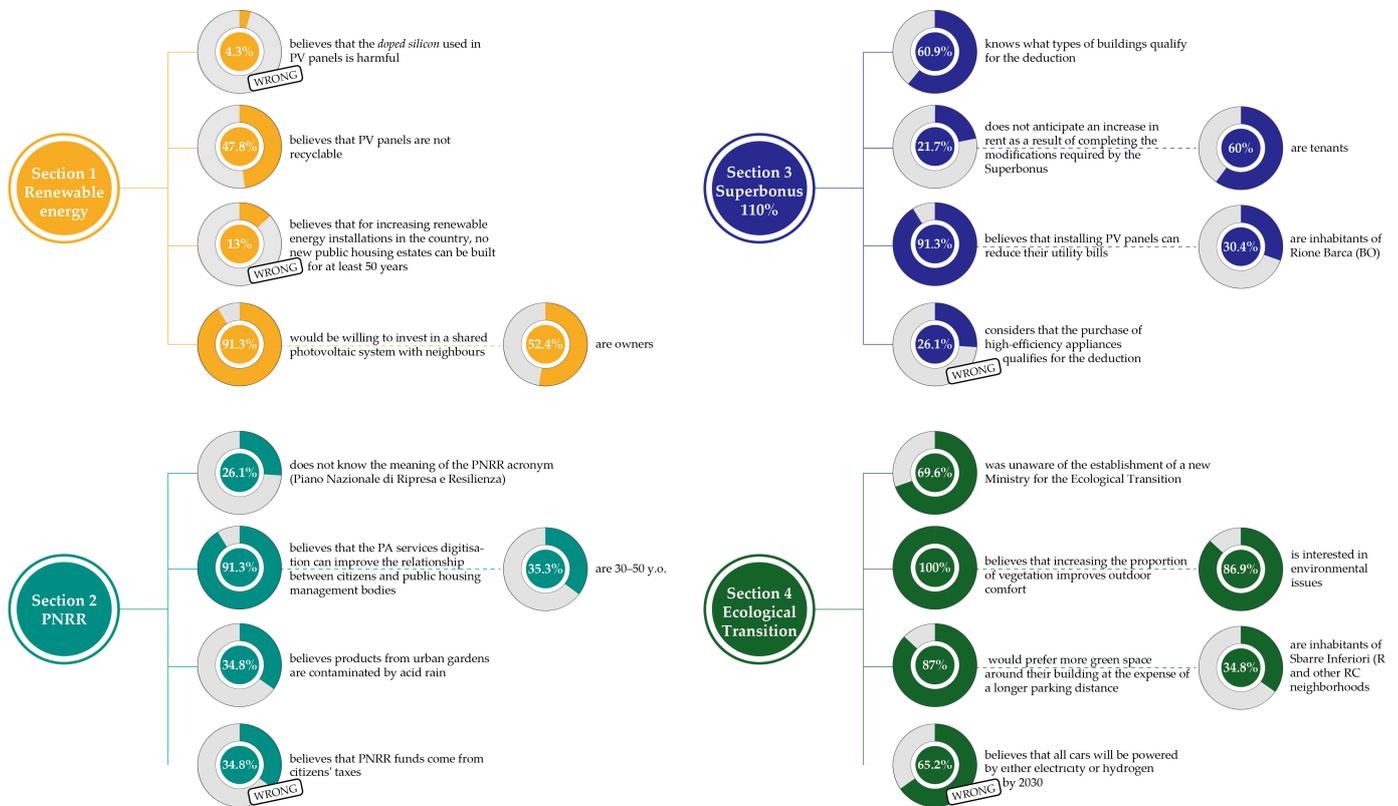


Figure 4. Graphic synthesis of pilot survey results. Authors' elaboration.

In section 2, concerning PNRR, it was interesting to observe that over a quarter of the participants do not know the meaning of the acronym (of which 1 in every 4 is from Barca) and about 35% believe that the funding is derived from citizens' taxes and not from European funds of the Next Generation EU recovery plan. Instead, regarding digital transition, 91.3% of respondents believe that the digitalization of Public Administration (PA) services will improve the relationship between citizens and public housing authorities; indeed, 35.3% of these are between the ages of 35–50, which indicates that they are likely to have previously used these services. Those who are not supporting digitalization are mostly owners and over 50, suggesting that renters tend to use more digital facilities with public entities.

Moreover, only 43% of respondents believe that acid rain does not contaminate crops in urban gardens, compared to the remaining 57% who believe it does (35%) or do not know (22%).

In section 3, which addresses Superbonus, shows that the incentive has grasped the attention and favor of citizens to the energy transition. In fact, 61% of participants know what type of buildings qualify for the deduction, thus they are aware that the tax deduction cannot be used on interventions involving building irregularities. Only 26% mistakenly indicated the purchase of high-efficiency appliances as an eligible intervention for 110%; the remaining participants do know that it is false that the eligible interventions are all the following: the replacement of windows and heating systems, and class A appliances. Here, respondents from Barca seems to be less informed than those from Sbarre, since over 40% of the first mistakenly indicated efficient appliances as eligible, while in the second it comes from less than 10%.

Many people think that the increase in the energy efficiency of housing due to RES and energy retrofiting will reduce utility bills (91.3%) while increasing rents (77.3%). No significant differences in the perception of renters and owners are registered to this regard.

In section 4—Ecological transition, about 70% of participants were unaware of recent changes in the Ministry for the Environment (then renamed Ministry for the Ecological Transition). On this point, as well, respondents are fairly distributed between the two case studies. All agree on the benefit of increasing vegetation in urban environments and 87% of them declare their willingness to park their car at a longer distance to their home in favor of closer green spaces. Two thirds of those disagreeing are from Sbarre. In the end, 65.2% believe that all cars will be powered by either electricity or hydrogen by 2030, mistakenly referring to the fact that no fossil-fueled cars will be produced in the EU after 2030.

4. Discussion

The answers are analyzed in blocks according to three observation lenses: (i) the set of answers from which critical elements and misinformation emerge with respect to the technical aspects of climate transition; (ii) the answers highlighting the lack of clarity related to public investments; (iii) the answers concerning, more specifically, citizens' drivers to adopt specific measures aimed at ecological transition.

4.1. Level of Information

The low level of information literacy is particularly critical in the case of energy issues, despite a general interest in environmental topics expressed by the majority of participants. This can be seen in questions such as the one on the alleged harmfulness of doped silicon to health or the fact that the development of photovoltaics will limit the parallel development of public housing, to which over half of the responses were "I don't know".

Interestingly, the Superbonus is correctly understood by most of those who responded to the survey, indicating that direct incentives or tax rebates stimulate energy literacy more than other less advertised climate-friendly solutions.

This suggests that raising energy literacy first is key to an effective transition, as confirmed by [11–13].

4.2. Knowledge and Misunderstanding of Public Incentives

The pilot survey indicated that almost half of the respondents (48%) are not aware of the meaning of the acronym PNRR. This is not necessarily explanatory of the degree of respondents' knowledge of the reforms encompassed by this acronym, but it is nonetheless symptomatic of a lack of knowledge about this investment program itself. This confirms what is pointed out also by other authors [13,55], which is that educational actions and involvement of all citizens in planning is often lacking when referring to energy transition.

This is particularly relevant as PNRR will impact the lives of citizens in the short, medium and potentially long term, while also being widely publicized through the national media and at the center of political discussions on a daily basis. Institutional channels should thus be updated to better reach all citizens. This would indeed prevent the spontaneous proliferation of fake news on social media, as indicated by [18–20].

There is also a great deal of uncertainty about the origin of this funding and the transformative dynamic at the political level (such as the fact that the Ministry of the Environment and Land and Sea had been replaced by the one of Ecological Transition, which is thus not a brand-new institution). This might suggest that social housing inhabitants do not generally access institutional information channels, where most of these changes are advertised.

In this context, there is indeed a general lack of trust in governments, which differs in other areas and countries [41], which suggests that institutions should use other and more effective ways to connect with citizens.

4.3. Drivers and Strengths of the Twin Transition

The majority of respondents seem to be in favor of interventions aimed at the ecological and energy transition: all respondents believe that increasing the share of public green spaces can improve the environmental comfort of their neighborhood (limiting excessive heat and improving air quality, for example); the vast majority believe that installing photovoltaic panels will help reduce expensive utility bills and gas shortages, and would be willing to invest/ask their homeowner to invest in a photovoltaic system shared with neighbors.

This suggests that the more people that are aware of the benefit of a climate-responsive solution, the more they are willing to implement it—as confirmed in the literature about energy literacy [34–37]. In fact, almost 87% of respondents were in favor of increasing permeable and/or green areas around their building, and were aware of the benefits for outdoor comfort, even though they knew that this might force them ‘to park at least 200 m away’, although this is not necessarily true. This suggests that the direct experience of the effectiveness and direct benefits of climate-friendly solutions is a powerful driver of the ecological transition. Proposed actions that are closer to the individual experience of respondents (e.g., benefits of green spaces) are both more generally known and welcome. This indeed confirms what is registered in the review by the authors of [17]: that contextualization and direct experience of abstract features such as energy and climate can help the uptake of good practices.

4.4. Conflicts and Similarities in the Two Pilot Cases

In the two neighborhoods, the energy transition is already taking place within a heterogeneous context and a social transformation. Both cases are characterized by criticalities due to the lack of services, the degradation of public spaces and the obsolescence of residential ones, and in which there is nonetheless a positive impetus towards issues and actions aimed at the ecological transition: the majority of respondents are in favor of increasing public green spaces and renewable energies, especially in view of the possible economic advantage (i.e., lower bills) that these could generate. Participants from Sbarre seems to be less interested in environmental issues than inhabitants of Barca, but in some questions they “demonstrated” more extensive knowledge of the topic (e.g., energy efficiency incentives). This suggests that also investigating the socio-economic status of the family (e.g., income and working condition) might help in better framing responses. Indeed, results from these surveys partly confirm what is registered in other “marginalized” area across Europe [55,56]: that energy literacy is scarce. Differently, however, the inhabitants from the two areas seems to be quite interested in Renewable Energy.

It emerges in both contexts that citizens are, on average, more informed about the issues closer to them and with direct economic feedback, such as incentives for energy retrofitting and the Superbonus, rather than about issues such as the recycling of building components (partly explained by the fact that more than half of the respondents are homeowners). There is not a great deal of differences between responses from owners and renters, which can be partly explained by the specific socio-economic condition of SH neighborhoods: even for owners, large investments are often lacking in these contexts due to both multi-family dynamics and the economic status of inhabitants. Nevertheless, it can be easily imagined that in other contexts, greater differences emerge between the two figures, supposing that renters are more interested in quick saving, while owners also value investments with medium-to-long term payback.

Answers about the political and macroeconomic framework in which the transition is taking place are instead more problematic, as those regarding ministries, reforms and the PNRR investment package appear very heterogeneous—which seems to suggest a distance between citizens and institutions that only fuels the spread of fake news at the expense of the common good. It is indicative that almost all respondents would like to see a digitalization of Public Administration that would favor accessibility to services and the exchange of information between institutions and citizens. Interestingly, renters tend to be

more in favor of this, suggesting that the easier and quicker management of utilities is in their interest.

Despite the two different geographical and socio-cultural contexts, almost the same heterogeneity in answers is recorded, suggesting that the survey could be launched nationally—through the SH managing agencies—without local adaptations.

In general terms, results from the pilot survey reinforce the thesis that raising the energy literacy of end-users is key to making the proposed actions and funding more effective and widespread.

4.5. Limits and Further Developments

The first two phases of the methodology have been completed and given positive results, so the third is now ongoing based on the outcomes presented in the article. Specifically, the number of respondents is low relative to the number of inhabitants; while this is attributable to the scale of the research project, which remains a pilot experimentation, some adjustments are being made prior to the launch of the survey on a broader scale in order to maximize the number and representativeness of respondents out of the pool of potential participants. To this end, other media channels could be used besides Facebook because many citizens, especially elders, might not have an account or be subscribed to certain groups. In addition, since elders can find some difficulties in accessing the survey via PC, a telephone surveying campaign or other types of inquiries (such as in-person interviews) could be carried out through SH local agencies. The involvement of institutions, policymakers and other actors of the transition (NGOs, CSOs and market actors) might assist in promoting the survey and in redesigning it to better meet political objectives.

In addition, since Google Forms allows not only access to the aggregated answers, but also to those given by each respondent individually, a more detailed interpretation of results could be performed by interpolating the answers to the various sections.

In general terms, a possible further development of the study is investigating the main channels through which citizens receive news and information: this would make it possible to frame the most effective ways of communicating correct information to citizens, limiting the spread of fake news and disinformation on energy and climate transitions.

5. Conclusions

This study aimed to understand the level of information literacy in two social housing contexts in Italy as a necessary prerequisite for context understanding prior to setting strategies and actions that promote the energy transition. To this end, the literature has been explored with specific reference to the climate crisis, energy transition and the resources deployed by the European Union to cope with it (including Next Generation EU). The social side of the transition is prioritized, with a twofold purpose: on the one hand, that of leaving no one behind; and on the other hand, that of accelerating the transition through the collective and widespread adoption of more sustainable behaviors, especially for what concerns energy consumption.

However, social change is hampered by the low availability of clear and accessible information regarding complex and stratified topics such as the ecological transition. This is particularly true in Italy, where energy poverty and poor energy performance of buildings pose issues at the social level as well as to the built environment, and where misinformation is widespread regarding energy transition topics. Social housing districts are, within this context, all the more fragile because the building stock is obsolete and largely inefficient in energy terms, and the social challenges of these districts are manifold.

To better frame these topics with a context-specific approach and to promote the understanding of local conditions prior to designing environmentally responsive interventions, the study has proposed a survey regarding four related topics: the Italian investment for the implementation of Next Generation EU, PNRR; renewable energy; the Superbonus (110% tax deduction); the ecological transition. The survey was then proposed to two social housing neighborhoods in two very different social housing contexts (both born as

Ina-Casa districts), Barca (Bologna) and Sbarre Inferiori (Reggio Calabria). In the survey design, some false answers (“fake news”) were placed among the answers to understand the level of information literacy, and at the end of the survey, infographics were provided to inform respondents about the topics of the questions. The latest indeed represents the first direct impact of the study, which might include enhanced curiosity in the respondents and their greater understanding of the topics illustrated in the survey.

The results show a prominent interest of the respondents towards environmental topics and a substantial willingness to adopt sustainable behaviors and design solutions for their own neighborhoods, but misinformation is widespread regarding public investments and some environmentally friendly solutions that are less directly experienced by citizens. This suggests that informative campaigns and active local engagement should be matched with technological solutions and design interventions in order to actually foster social change connected with the improvement of the built environment, and that specific attention should be placed on the sociotechnical premises of the ecological transition in particularly fragile housing contexts. The two sites, though different in terms of climates and the indexes of Degrees Day and Global radiation on horizontal surfaces per year, do not show particularly diverse levels of energy literacy. This result should be further discussed concerning the Distributed Energy Resources (DERs), which may vary region by region and could have a huge impact on energy-saving incentives. In the national context, this diversity can be partially explained by the historically grounded socio-cultural and economic gap between the northern and the southern regions of Italy.

The study highlights relevant implications for citizens as actors and beneficiaries of the transition: citizens can only enact a factual behavioral change if they are properly informed about the economic incentives, the actions to be undertaken and their impact/consequences (whether positive or negative) on the environment and on their lifestyle.

As for the specific pilot cases involved, results showed a significant readiness of citizens in both contexts, while at the same time underlining the need to provide informational tools that are accessible to different sets of users. In contrast, if the transition truly is to leave no one behind, it must account for the context-specific conditions of the built environment and for the social context so that a feasible and realistic transition plan is developed accordingly and that climate-responsive solutions are adopted that meet the needs and the specificities of places; in this case, the dramatic obsolescence of social housing and the risk of energy poverty incurred by most citizens requires urgent action that combines short-term measures to mitigate the current emergency as well as long-term plans for the buildings’ energy efficiency and retrofitting.

The study has a high potential for replicability, as the survey can be proposed soon to other Ina-Casa and social housing contexts to understand similarities and context-specific inferences further. What is more, the survey can serve as a preliminary material for manifold purposes, ranging from energy efficiency interventions to the built environment, to participatory processes, to training and educational programs regarding the transition, which can provide the operational basis for climate transition strategies in social housing contexts and beyond.

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Appendix A

Survey—Energy transition and information in the media.

You are invited to participate in an anonymous survey conducted by young researchers from the Universities of Bologna and Reggio Calabria (IT) in order to collect information regarding the quality of information conveyed by the media (both mass and social media) regarding energy.

As You may be aware that energy, energy refurbishment of buildings, and renewable energy production are central topics in current global, European, and local policies. However, the communication of this through the media is not always accurate and precise. Our study aims to investigate this issue by gathering information, in particular, from two communities that are distant from each other but share common characteristics. The communities involved are the 'Barca' district in Bologna and the Sbarre Inferiori area in Reggio Calabria. Both are important realities in the area, united by their origin as Ina-Casa neighborhoods and by a certain residential, diversity, cultural and transformation liveliness.

We would be very grateful if you would participate in this study, which will take no more than 10 min. The questionnaire is anonymous. Should you decide to participate, we ask you to go all the way to the last question, even if you feel confused on some questions. You will find further information at the end of the questionnaire.

Section 0—General info

Age

- 18–34 years old
- 35–59 years old
- 50–69 years old
- >70 years old
- I prefer not to respond

Sex

- Man
- Woman
- Non-binary
- I prefer not to respond

Where do you live?

- Rione Barca-Bologna
- Another district in Bologna
- Sbarre Inferiori-Reggio Calabria
- Another district in Reggio Calabria

Regarding the apartment, you are:

- Owner
- Tenant
- Other

Are you interested in environmental issues?

- Yes
- No

Section 1—Renewable Energy

In your opinion, are photovoltaic panels containing ‘doped silicon’ harmful to human health?

- Yes
- No
- I don’t know

In your opinion, is it possible to recycle photovoltaic panels?

- Yes
- No
- I don’t know

Is it true that no new public housing estates may be constructed for at least 50 years in order to increase the number of renewable energy installations in the country?

- Yes
- No
- I don’t know

Would you consider investing in a shared photovoltaic system with your neighbors to improve neighborhood services (lighting and security)?

- Yes
- No
- I don’t know

Section 2—PNRR

PNRR means “Piano Negoziale per l’incremento delle Risorse Regionali? Do you agree with this statement?

- Yes
- No
- I don’t know

Do you believe that the digitalisation of public administration services will improve the relationship between citizens and public housing authorities?

- Yes
- No
- I don’t know

Do you think that produce grown in urban gardens is contaminated by acid rain?

- Yes
- No
- I don’t know

Do you think that most of the measures in the PNRR will be financed by government funds (citizens’ taxes)?

- Yes
- No
- I don’t know

Section 3—Superbonus 110%

Are you aware that you can also benefit from the Superbonus in the case of building irregularities?

- Yes
- No
- I don’t know

Do you believe that utilising the Superbonus 110% will increase the value of your home or your rent?

- Yes
- No
- I don’t know

Does the installation of photovoltaic panels have the potential to reduce high utility bills and the shortage of Russian gas?

- Yes
- No
- I don't know

The recurring 110% interventions are: replacement of window frames, boiler and class A appliances. Do you agree with this sentence?

- Yes
- No
- I don't know

Section 4—Ecological Transition

The Ministry of Ecological Transition does not add to, but replaces the Ministry of the Environment and Land and Sea Protection. Were you aware of this? *

- Yes
- No
- I don't know

Increasing the proportion of public green spaces can improve the environmental comfort of your neighborhood (excessive heat and air quality). Do you agree with this statement?

- Yes
- No
- I don't know

Are you in favor of increasing the permeable and/or green areas around your building, despite the fact that this could force you to park a minimum of 200 m away?

- Yes
- No
- I don't know

According to a motion submitted by Greta Thunberg to the European Commission by 2030 all existing cars must be electric or hydrogen powered. Do you agree with this statement?

- Yes
- No
- I don't know

If you would like to add a comment, please write below. Thank you very much!

...

* At the time the survey was launched, this was the name of the Ministry. After the political elections of September 2022, and the subsequent change in the Italian government, the name was once again changed, and the "ecological transition" has disappeared from the name and the narrative of the Ministry, now called "Ministry for the Environment and Energy Security" (<https://www.mase.gov.it> (accessed on 21 March 2023)).

Appendix B

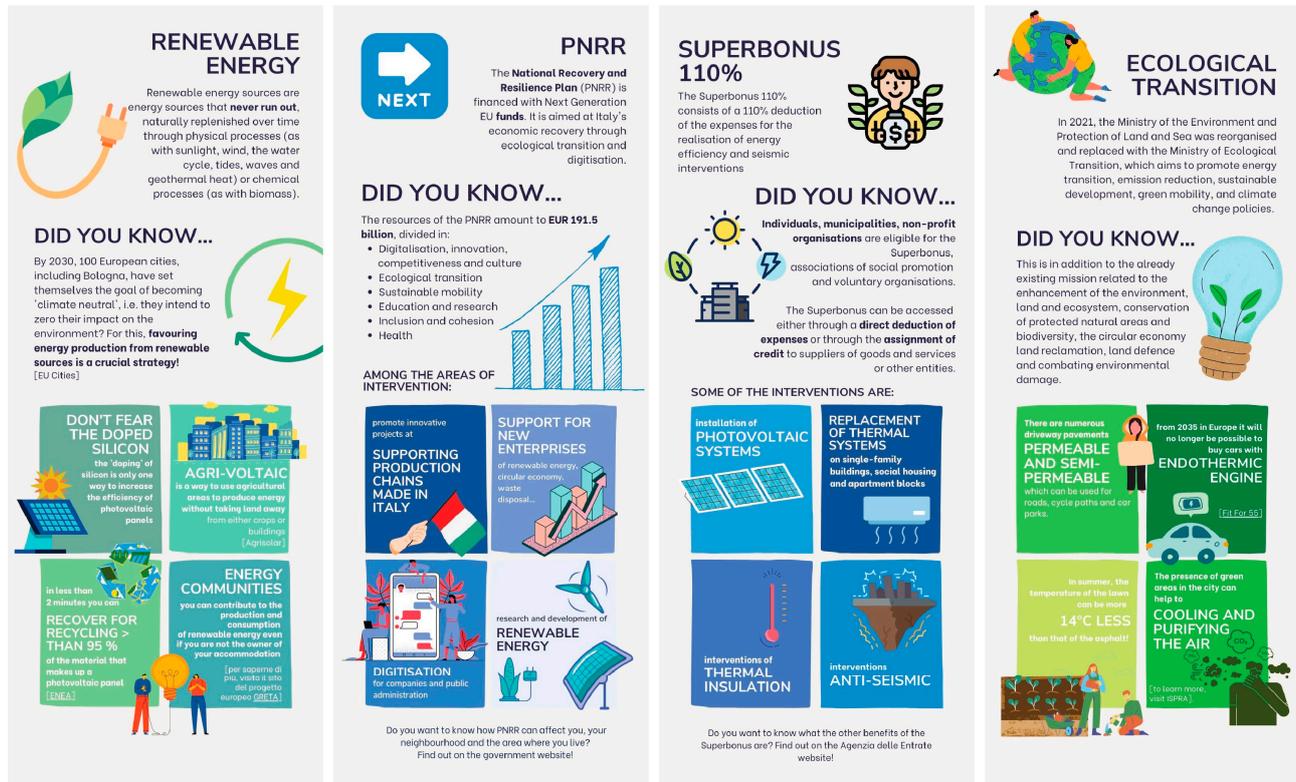


Figure A1. Informative leaflet that respondents could access after completing the survey. Graphic made by the authors.

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