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# Engagement and Inclusion Experiences for Energy Communities. An Ongoing Case Study in Cagliari, Italy

Ivan Blečić, Alessandro Sebastiano Carrus, Emanuel Muroni, Valeria Saiu, and Maria Carla Saliu

**Abstract.** In recent years, we see further progress in the interest of the concept of energy communities. They have been able to attract much attention and research effort both because of their central role in the development of sustainable energy systems and because they are able to include and engage many people. Research indicates that participation in desirable energy activities is one of the keys to the effective enforcement of energy transition and, consequently, to the successful fight to climate change. Despite the potential for inclusion that energy communities hold, the classical governance tools favour the technical side rather than focusing on encouraging the active involvement of stakeholders and citizens who are potential participants in the energy community. For this reason, the overall aim of this article is to propose a method, projects, and engagement activities to build the conditions in which participation in the energy system can trigger virtuous behaviour by developing a certain dose of self-sufficiency in terms of management. We will argue that such method of engagement influences the extent to which parties can or cannot engage in the whole framework for the collective management of energy communities. To exemplify this approach, we present a still ongoing experience of a Solar Energy Community, the first in the city of Cagliari, to demonstrate how the dynamics of inclusion and exclusion in renewable energy projects can contribute to producing spatial, social, cultural, and economic context that can adapt to changing circumstances, capacity demands, technological innovations, demographic, social, and economic trends.

**Keywords:** Renewable energy community · REC · Local energy community · Energy transition · Social behaviours · Social acceptance · Community engagement · Cagliari (Italy)

## 1 Introduction

The European Union (EU) in 2019 introduced the Clean Energy Package for All Europeans (CEP) [1], a broad set of measures to promote high energy efficiency buildings, renewable energy, consumer rights on self-generation, and cross-border cooperation,

among others. To achieve these goals, the CEP introduced the concept of energy communities in its legislation, notably as Renewable Energy Communities (RECs). The Renewable Energy Directive (2018/2001/EU) [2], also known as RED II, aims to make renewable energy more accessible to citizens by providing them the opportunity to engage in joint renewable energy projects. The directive introduces the need to make citizen-driven RECs capable of consuming and producing renewable energy and, in some cases, also storing and selling renewable energy and providing flexibility services to the grid through demand response and storage as legal entities. In Italy, for instance, energy communities are subject to the technical rules outlined by the GSE ("Gestore Servizi Energetici") the Italian Energy Services Operator [3], and by the regulation 318/2020/R/EEL of the ARERA ("Autorità di Regolazione per Energia Reti e Ambiente") the Italian Regulation Agency for Environment, Network and Energy [4]. In this way, citizens have the opportunity to become increasingly environmentally and socially conscious towards energy issues. RECs therefore need to develop democratic processes that allow citizens to actively participate in energy policies and the energy market.

During recent years, we have had the chance to witness the strong increase in calls for energy transition in terms of assigning a fundamental role to Energy Communities [5–14]. The recent literature on RECs has addressed issues related to normative barriers [15], maximizing self-sufficiency [16], local energy sharing strategies [17], and the interaction of RECs with the electricity system. The analysis of the energy and climate issues, however, as correctly observed by Mignani [18], reveals a topical predominance of engineering and economic sciences. Traditional approaches emphasise the technical and legal side when setting up the energy community, in order to find the optimal configuration of technologies and energy-sharing strategies among members. The social elements of energy systems and their consequences are often neglected or underestimated, especially in processes that involve local governments [19, 20]. According to Mignani [18] this happens because energy is considered only a basic factor whose diverse forms structure the temporal and spatial organization of social life. Actually, there is a tendency to neglect both step and organization of direct personal/collective engagement of citizens. Through the presentation of an ongoing case study, we will highlight how instead humans and social behavior are central as they are able to profoundly influence the future energy scenarios. This article starts from the general aforementioned consideration and has the general objective of highlighting the sociological relevance of the energy question.

The paper is structured as follows: Sect. 2 will highlight the key theoretical perspectives that have been emerging in the literature around the topic of energy communities, with a focus on the weight that dominant approaches give to sociological aspects; Sect. 3 deals the way in which the methodology can be applied; in Sect. 4, the type of results, critical aspects and suggestions it yields are illustrated, and both outcomes and difficulties faced by these community energy initiatives are discussed; finally, Sect. 5 presents concluding remarks, and outlines potential future perspectives.

## 2 Literature Review

The topic of RECs is attracting attention from researchers, local stakeholders, such as mayors, energy planners, and citizens. Energy, its consumption and its production have been at the center of the public and scientific debate, as well as the subject of national and European policies. In the literature, it is easier to find papers closely connected to highly topical issues, even general, such as climate change, the reduction of emissions, natural disasters, the security of supply, and the sustainability of the current model of economic development, just to name a few. Issues that intertwine with each other in complex and often contradictory ways [18]. The way in which these issues are often dealt with is through focus on technical aspects of design, e.g. designing various local energy systems [21]. Despite the fact that we can handle the topic from various perspectives, a substantial part of the literature does not refer to the evaluation of social impacts and benefits as part of the structure of RECs.

There is however a significant number of papers focusing on the design and operational phase of energy communities [22]. Di Silvestre et al. [23], for instance, provide an analysis of the European regulatory context, focusing on two adopted directives on the promotion of the use of energy from RECs and on the increase of energy efficiency. With these directives emerge the leading role of citizens (called "prosumers") in the energy transition. In this model in which even small domestic surplus productions could be an active part of the energy supply sector, another focus is about RECs as new actors in the electricity market. Instead, Cutore et al. [22] define, in accordance with the Italian regulation, two different energy-sharing configurations, distributed and centralized, to obtain a techno-economic comparison. By the analysis of energy performance assessment and cost-effectiveness of the investment the authors presented an optimization model and demonstrate that the configuration which improve the rates of total self-consumption has higher investment and maintenance costs, which means that greater investment in technologies reduce beneficial social impact on REC's participants.

In these lines of research there is a lack of attention to the involvement of the inhabitants. This method has for too long focused on *hardware* rather than on the human and social *software* that underlies energy systems. Among the lacking aspects related to the social phenomena, there are, for example, ignorance of social processes which, if present, would determine the acceptance and use of the technological solutions promote by researchers to obtain an optimized REC, the social factors and dynamics underlying the demand for energy services and the use of technologies, social perceptions regarding energy risks, communication methods in relation to energy choices [24].

On the other hand, there is a growing social relevance of energy that does not escape contemporary sociological reflection. In recent years, various aspects of energy communities have been studied what rally should it mean [25], with a focus to promote community initiatives [26]. Among these, some did through a quantitative [27] and others through qualitative research [15] on the motivations behind participation. Most of these were focused on both the willingness of citizens to participate, and the factors that influence their motivations to participate. Soeiro and Ferreira Dias [27], inter alios, define the citizens' participation as a crucial point for the development of this type of communities, adding that trust is very important for the development of any REC. Whereas Raven et al. [28] presents an interesting best practice in the field of engagement, with

a particular attention to the acceptance of energy community. Indeed, as pointed out by Azarova et al. [29], vast literature is available on the social acceptance of renewable energy sources and technologies [18, 30], also for the acceptance of RECs on the energy markets recommendations for the transposition [31]. Existing researches focus on specific local energy system management activities, especially in Italian urban realities that aim to build a dense network of RECs in their cities. It lacks attention for project and context specific explanations of how acceptance mechanisms are articulated according to the characteristics of the project, site, community, region, and the project development and engagement process. In order to further elucidate and improve this line of research, we present our experience that aims to ease traditional acceptance problems through a specific community engagement programme.

In the next section, we will show our approach based on participatory actions and the steps of community engagement.

## 3 Methodology

The methodology is illustred through the presentation of a specific case study [32]. The case study on which the empirical work draws is "CER-CA", an acronym of "Comunità Energetica Rinnovabile (English: Renewable Energy Community) and Cagliari"[1]. It is an initiative of the Municipality and the University of Cagliari to promote the first REC in Cagliari, the capital city of Sardinia and the most populous municipality on the island. The ongoing project includes a pilot program involving the installation of photovoltaic (PV) system in a socially difficult residential sector.

In this study we present an experience that is part of a project "Energy Efficiency in 40 Schools Support Communities – EE(40)Sco" from the NESOI (New Energy Solutions Optmised fo Islands) program (see Table 1), led by the Munincipality of Cagliari.

The proposal envisages an articulated plan of interventions involving about half of the city's school buildings around which to establish RECs. The area identified by the municipality to start the project is Piazza Medaglia Miracolosa (PMM) and consists of a square surrounded by buildings, forming a central block at the intersection of the main urban connecting roads in the San Michele neighborhood (see Fig. 1). It is a residential sector in a neighborhood characterised by a high density of urban commons and a socio-economic vulnerability of many residents. The kindergarten, located in the middle of the residential sector, serves as a meeting point for many families in the area, as well as the square. Despite its poor state of maintenance, the square remains a place of great interest to the community due to its strategic location and the presence of the kindergarten.

The pioneering project envisages the establishment of a REC through the installation of 1 PV system, divided into two lots respectively one on the best oriented residential block and one on the kindergarten. The municipality envisages that through the cooperation of 80 households and the electricity consumption of the kindergarten, the electricity produced by the PV will be almost completely self-consumed by the REC members.

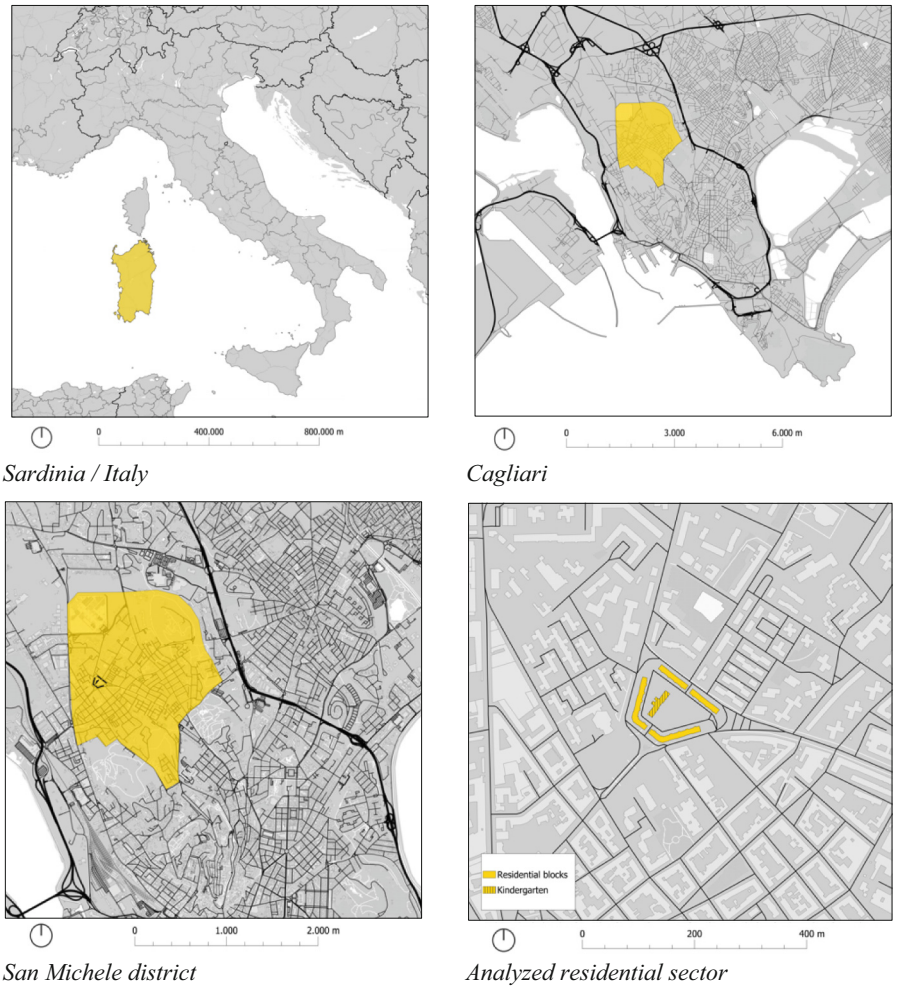
[1] In the Sect. 3.2, we will explain in detail reasons and meanings behind the choice of this naming.

**Table 1.** Short history of the project development process and actors involved.

| Year | Project milestones and involved actors |
|---|---|
| 2019 | NESOI received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement<br>Opening of a window of opportunity for REC through EU support schemes and Italian project development aid |
| 2020 | First open call from the European Island Facility NESOI offers grants of up to € 60k per proposal as well as up to € 60k worth of Technical Assistance to help local European islands reach their energy transition ambitions |
| 2021 | Cagliari Municipality identified Piazza Medaglia Miracolosa site as a suitable location for the first REC in the city. Dominant characteristics found: shape, size, social condition of residential blocks, distance from existing infrastructure and connectivity, and vitality of the neighbourhood<br>Cagliari Municipality developed the project proposal called "Energy Efficiency in 40 Schools Support Communities - EE(40)Sco"<br>The proposal made for the city of Cagliari, in Sardinia, receives the financial support from the EU Inslands Facility NESOI |
| 2022 | The University of Cagliairi is called upon to assist the Municipality of Cagliari in managing the engagement step<br>The research group of University of Cagliari developed the project proposal called "CER-CA"<br>The proposal made for the research group is accepted by the Munincipality<br>Implementing Agreement between Munincipality and University of Cagliari<br>Approval of the executive project for the establishment of a REC in Piazza Medaglia Miracolosa<br>Arrival, erection, and commissioning of the PV system (two lots)<br>Work begins on the first lot (kindergarten) |
| 2023 | End of work: first lot (kindergarten)<br>Work begins on the second lot (residential block) |
| 2024 | End of work: second lot (residential block)<br>Commissioning of photovoltaic energy |

The large presence of not-for-profit cultural, social, and recreational activities managed by the community, the high degree of community-ownership, several years of operation, and the active community organisation pursuing a variety of community development goals, and more in generally the vivacity of the neighbourhood emerged during in-field analysis carried out on previous projects. These are used as selection criteria to find a matured project (despite still in progress) most likely to display a considerable and diverse impact on the community it is part of.

These criteria and these characteristics, including the fact that it is a well-delineated island community increase the visibility of local impacts, make this case study more of a critical case study that is especially helpful to illustrate by testing the methodology that we present here.




*Sardinia / Italy* *Cagliari*

*San Michele district* *Analyzed residential sector*

**Fig. 1.** Project location.

### 3.1 Survey Process

For the empirical study, data were collected during several fieldwork visits to the residential sector of PMM. Data were collected through a first probing activity, including an exploratory survey addressed to community members, in-depth interviews, focus groups with households, school administrators, representatives of local activities, cultural associations, religious leaders, and other group members, and finally the dissemination activity, carried out through a rich program of workshops addressed to different categories of stakeholders.

For operationalising actions, this study draws on a definition from the field of Social Impact Assessment, which studies "the processes of analysing, monitoring and managing the intended and unintended social consequences, both positive and negative, of planned

interventions […] and any social change processes invoked by those interventions" [33, p. 1].

Each step we will present was affected by an initial approach that could be called a step zero of engagement. A first contact operated via letter and email to ensure the willingness of the candidate to be a REC member generated negative impacts. Due to this approach, described by the technicians of the Municipality themselves as "unsuccessful communication attempts", in zero days of fieldwork, we had both a response of 10 out of approximately 240 and an already established condition of hostility between community and administration[2].

Without losing the nuance and in-depth analysis that are necessary for a complex issue such as social acceptance of the REC project, the methodology has been simplified. The survey steps are presented in the following sub-sections.

**Step 1. Probing**

This phase of initial community engagement is structured by involving key actors. It is a step that aims at the acquisition of contacts through subjects 'already loyal/established', so to speak, in other contexts or previous project experiences such as the exploratory study conducted in San Michele-Is Mirrionis neighbourhoods [34]. The project, called "NeighbourHub" (NHub), developed over two years (2019–2022) has provided a participation process that involved over 30 associations. These group members were contacted in order to assist us in our first phase of presentation and introduction to the households of the PMM area.

The ethnographic fieldwork included two interactions with key actors in preparation for a meeting with each potential participant/REC member:

i) A first contact via phone or email to key actors. In this approach is necessary to inform key actors about the intentions and main issues of the REC project, but above all ask them if they would be available to be 'social pivot point' in this step of the project;
ii) A first contact with the households through key actors. In this interaction phase all known representatives of local activities (ice cream makers, bartenders, tobacconists), cultural associations, and religious leaders of the neighborhood have to be approached by us. Key actors have to explain to the latter who we are, present the general outline of the REC project and ask if they would like to hear from us.

These small groups of subjects will become our gateway to residential blocks. In the next step, the approach of direct engagement of households will be presented.

**Step 2. Community Survey**

In this step the key actors are identified. Three representatives from cultural associations in the neighbourhood of San Michele, the parish priest of the Church of Medaglia Miracolosa adjacent to the homonymous residential sector, and several representatives of

[2] A preliminary survey of potential real estate units and associated households revealed different living situations: owners, renters, and squatters. Any letter approach made by the municipality, if not ignored, scared the community.

local activities assist us during our extensive ethnographic fieldwork. It is a sort of "loyalty operation" aimed at implementing the number of key actors by recruiting them from among households. Initial surveys and meetings with residents, school administrators and local activities/cultural associations within the residential sector took place.

Step 2 is required in order to create a core group of members through the identification of kay actors in the community.

**Step 3. Focus Group**

Participants were recruited via the first exploratory survey assisted by the key actors. Tha phase of intensive community engagement and consolidation can therefore begin.

In this step, an initial information meeting will be organised with the stakeholders. These meetings will be repeated every 2–3 months. On this occasion, the project is promoted and disseminated to the local community. A mention will also be made of the presentation of the different tools available that will be used in the next steps, information materials, social media and the web, but also educational channels. One example pointing in this direction is the activity we explain in detail in the next section.

**Step 4. Other Activities**

The support process continues through the acquisition of new contacts and the consolidation of key actors among the households, with an eye on the potential REC members. To ease the problems of acceptability and invasiveness, we organised a series of activities.

A fundamental activity was conducted with young children of the kindergarten located in the middle of residential blocks, in order to create new opportunities to meet the community. The main focus is on the cleaning and redevelopment of the square.

In these terms, the activity with the school becomes more than a didactic activity aimed at imparting knowledge or skills. The activity becomes a tactical urban intervention with an ambivalent character: (i) Trojan Horse designed to increase curiosity, build an additional informative moment, expand the network of contacts, and consequently find the earliest REC members. The school activity in the square will take advantage of the "eyes on the street" [35] favoured by the shape of the residential sector, capturing the attention of all households; (ii) a trasformation of the space aimed at triggering important mechanism, including affection towards public space. Howcan these activities create affection or "attachment to place" [36]?

Here activity is defined as a temporary perturbance related to a planned intervention that affects or concern people and space, directly or indirectly, perceptual or corporeal. The activity ends with the placement of a mark in the square. The children will sign their work with their name or more simply by leaving the imprint of their hand. Finally, they will be given a bright lamp. This lamp, which will have the symbol of the CER-CA project imprinted on it, will be left by the children in the square as a further physical sign of their appropriation of space. The action was planned to be antifragile [37], in that if the lamps remain in the square they will contribute to the aesthetic value of the public space, on the contrary if the lamps are stolen (as we expect) they will spread like a sort of 'information virus' in the houses of the citizens[3]. In fact, each bright lamp will be

[3] We could call it the physical concretisation of the the concept of contagion [40] at the basis of transference of emotions that spread through groups of people accompanying the behaviour and choices of individuals.

marked with a logo and a Qr code of the project. This will allow anyone to connect via a simple smartphone to the digital platform of CER-CA. Practice that becomes a tangible urban sign of rootedness, affection and attachment.

The project phases outlined have taken place and effects produced are discussed in Sect. 4. From now on, we will describe the planned future steps of the survey process as they really are, i.e. a plan of upcoming activities, we will explain which reasons are behind our choices and explore the expected outcomes.

**Step 5. Recreational and Convivial Moments**
Convivial launch events will be organised during this step.

The space transformed by the children through the tactical intervention now has a specific mark that makes it recognisable to the families living in residential blocks. The piece of square will become a REC pivot point in the study area. An information gazebo will be placed within the space circumscribed by the children's intervention, becoming the place where citizens will have the opportunity to engage in a safe environment about problems and concerns related to the project.

These recreational and convivial events can also be the celebration of activities such as the one described in the previous section. Moreover, these types of practices, if combined with informal practices active in residential blocks (e.g. barbecues), can become further auspicious occasions, pivotal moments for approaching future REC members. The pivotal idea is to stimulate the community through tactical or otherwise temporary activities in order to promote the energy community in the city.

**Step 6. Focus Group**
This step works in the same way as step 3. The actors and topics involved will change, but not the pattern. If before the target group was the key actors among the community now it is the households and potential REC members. If in the first focus group the project was presented together with its benefits, now we will try to give detailed information about the amounts that each household can save each month on its electricity bills, the incentives that can be received through certain targeted behaviours and in general how become REC member. At this stage, due in part to the trust gained, we will ask residents for their electricity bills. We will assess with them, through a simple formula, their current consumption and what it would become if they decide to become REC members.

**Step 7. Workshop**
In this step we would like to emphasise the learning dimension of the project CER-CA. This phase is preparatory to the consolidation of the methodology aimed at achieving a robust form applicable to other city contexts. A separate information workshop for the community and the REC members will be organise, so both groups could talk in a safe environment about the problems of the project. Participants were recruited via the exploratory survey, focus groups, other activities, and through information materials (e.g. poster announcements, flyers, brochures, gadgets).

The aim of this step is to construct theories of behavioral change. However, there will be no lack of constant follow-up to the process, aimed at triggering and reinforcing

virtuous behaviors by developing a certain amount of self-sufficiency in terms of management. Outline and define a clear methodology applicable and extendable to other contexts in the city was the pivotal prerogative.

Each step and activity presented (see Table 2) has been structured and designed in order to ensure constant follow-up, i.e. a continuous, periodic and planned control phases.

In the next section the parallel project of graphic design is presented.

### 3.2 Graphic Project

In this section, the design processes of the communication programme (logo, graphics, language code effectiveness and attractiveness) are presented.

The communication campaign came from the conception of a logo and naming. The output is a replicable object which can be adaptable to other contexts and social schemes. References to visual identities close to the symbol of the sun and local traditions were important.

The naming "CER-CA" was born from the meeting of the acronyms Renewable Energy Community and Cagliari specifically to represent the modular and replicable aspect of the project. Furthermore, CERCA in Italian means "search". The need to simplify the language codes and make them as effective as possible led us to choose this option to better integrate the information materials in the spaces of residential blocks. Like a sort of treasure hunt, the households are accompanied in their search not only for the object (the poster) but also for what each one represents (savings, community, etc.).

From the early steps of the project, 5 poster announcements (see Fig. 2) have been distributed in the four entrances of the residential sector. Each poster (size 85 $\times$ 150 cm) will have a head/slogan (variable depending on access points, info on savings, sense of community, and other REC benefits) and a body (fixed text with purely informational data), which aimed to tell the community who we are by informing them that "we are coming". The result will be posters announcements covering the residential sector with slogans such as "CER-CA il risparmio (Find the Saving)", etc. Through a triptych system of modular and increasing information, with consequential and non-substitutive outputs, the release of poster announcements has been scheduled. Every 2 weeks a new poster will implement information side by side, not replacing the previous one.

Modularity is the pivotal concept [37]. It was important to work in terms of simplification and replicability, producing reversible elements that are able to accept possibilities for remodeling. All this because of the needs related to the future intention of a program that aims to include 40 new energy projects in the city of Cagliari.

This will be followed by the production of information and communication materials, physical (e.g. flyers and brochures) and digital (social media and web) tools. Flyers and brochures have been distributed to the local shop adjacent to the residential blocks, but in the coming months we plan to extend the dissemination of materials.

**Table 2.** The data gathering process.

| Methods | Description |
|---|---|
| Probing | *Purpose:* Project and community context<br>*Target group:* Actors involved in accomplished and ongoing cultural projects (e.g. local government, intermediaries, school administrators, representatives of Non-Governamental Organizations (NGOs), local activities, cultural associations, religious leaders), and other key actors<br>*Methodological steps:* Community profile and project profile |
| Community survey | *Purpose:* General impression and perceived impacts<br>*Target group:* Key actors, households and community members<br>*Methodological steps:* Input for the upcoming experiences |
| Focus Group | *Purpose:* Activity planning<br>*Target group:* Key actors among families living in residential blocks<br>*Methodological steps:* Structuring the field activity (e.g. cultural activities, experimentation of tactical urban planning activities) |
| Other activities | *Purpose:* Project and specific activity<br>*Target group:* Key actors, households and community members<br>*Methodological steps:* Experience of temporary projects and activities |
| Recreational and convivial moments | *Purpose:* Information activity<br>*Target group:* All community<br>*Methodological steps:* Station for the collection of REC members |
| Focus Group | *Purpose:* Deepening understanding of how benefits come through behaviour and lifestyle adjustments<br>*Target group:* All community including REC members<br>*Methodological steps:* Input for theories of behavioural change in the workshops |

(*continued*)

**Table 2.** (*continued*)

| Methods | Description |
|---|---|
| Workshops | *Purpose:* Deepening understanding of how benefits come through behaviour and lifestyle adjustments that is not feasible in a focus group. For example, because of personal nature or other sensitivities, or because the person is exceptionally knowledgeable on a pattern of behaviour related to the energy transition. Another reason may be because some groups may not be able to visit a focus group or comfortable to talk in this setting *Target group:* All community including REC members *Methodological steps:* Constructing theories of behavioural change |


**Fig. 2.** Overview of posters announcements.

## 4 Results and Discussions

The general theme of this paper concerns the relationship between energy and community, with particular attention on the social acceptance of RECs. In the previous sections we presented some of the outcomes of the qualitative approach in an ongoing progress process, aimed at identifying the main operational models and organisational frameworks put in place for the development of a REC.

In 7 steps we identified possible practices that could overcome the technical and social challenges leading to the formation of a REC in a difficult residential sector in the city of Cagliari. In each step of engagement, the governance of the community was deemed as a fundamental pillar for the success of the project. Concerning the first steps already carried out, we can enunciate some considerations which we think will be fundamental for the work in progress. These considerations applied particularly to 3 steps out of 7: step 1, during which some of the households we came into contact with have not replied and others did not give their availability mainly because did not know anyone from the study area. Several, however, have been available to assist us and contacted the known families living in residential blocks directly; step 2, during which the first meeting with households confirms the profound citizens' distrust towards institutions. In general, there is a problem with the acceptability of top-down administrative proposals. This area

has often been faced with coercive policies and actions (see the recent project for the adjacent Piazza San Michele, which was never accepted by the residents). It was found by Warren and McFadyen [38] that the community element can ease opposition and create support. While considering that it is neither or a panacea for local acceptability of REC, or nor a guarantee of solely positive outcomes we believe that the French philosopher René Girard would have agreed with this thought. In this respect, the idea was to turn an apparently negative condition such as the distrust of households towards institutions into an opportunity. The approach we used is close to the Girardian concept of the scapegoat mechanism, in which social cohesion is strengthened by uniting against an arbitrary other [39, 40]. This fundamental approach has been instrumental in easing the classic problem of community division on the matter, which, especially in small communities, can be detrimental [41]. The approach, was also helpful in opening to some interesting confessions, which gave us a more precise framework of the socio-democratic profile and some informal activities within the residential sector. Forms of extension of the private and appropriation to the public areas manifested (e.g. the presence of barbecues and gazebo built by residents on the sides of the square); step 4, during which demands, needs and desires prevail over initial fears and perplexity of the community. In addition the activity proved to be an opportunity on several fronts. One of them aims to discover new contacts among teachers and many school children's families who live within residential blocks.

The two critical aspects that could were identified are teamwork and empowerment. An important point that we need to work on is the engagement of the critical community members. Their attendance at the activities, focus group and, in the best-case scenario, workshop is not necessary but important if we aim to activate empowerment processes. Effective teamwork and coordination are critical to the success of REC like CER-CA.

Empowerment enables households to have the proper tools to participate in engagement activities, which are useful in building the conditions in which participation in the energy system can trigger virtuous behaviour by developing a certain dose of self-sufficiency in terms of REC management, while ensuring that they are accountable for their decision-making and actions.

Aspects identified by others as problematic (e.g. the opportunistic behavior [28] or the individual wishes [42]) were overcome through some specific and targeted engagement practices only because these were designed to be adaptable to the changing dynamics of the context. We also observed how engagement activities through projects of space (interim use) can offer new scenarios for urban regeneration. It is therefore important to ensure a modular design [37], among other things.

In these terms, this study aims to contribute methodologically to facilitate the process of social acceptance of REC in order to both produce motivation [43] for participating in a joint transition project based clean energy production and to trigger mechanism of attachment to place [36] in which it takes place. We believe this is necessary if we aim to achieve a truly effectiveness future-proof REC.

## 5 Conclusions

This section concludes the paper by discussing the results of the case study, as well as the potential of the methodology used. In this paper, we presented the still ongoing CER-CA project and in particular the role of a CER within a programme that will include 40 new energy projects in the city of Cagliari. Experience is showing us some general challenges that are important to deal with when developing new energy projects.

Recognising the energy transition as a chance not only to expand its community empowerment policy, but also to trigger processes of revaluing space, from an affective point of view, of attachment to place, rather than merely identity, can be considered one of the original contributions of this research. To arrive at the definition of a methodology applicable in other contexts, accompanied by other specific work plans, it is necessary to begin to recognize energy communities as evolving and changing objects. The social impacts of the first completed steps show us an effective method of engagement because it is able to influence the extent to which parties (key actors, social point pivot and REC members, iter alia) can engage in the whole framework for the collective management of energy communities. The still ongoing status of the practice does not allow us to fully discuss our experiences here, so we prefer to present some critical aspects noted and suggestions for the next steps.

In conclusion there is a remaining research question, i.e. if is whether CER-CA is more widely applicable beyond the residential sector of PMM. Applying the CER-CA pattern to other contexts, observing how it changes and adapts to other actors and frameworks, could provide an interesting and fruitful research contribution. We extracted lessons with an overall validity for the transferability of drivers and success factors. Creating evidence of the positive impacts requires dedicated surveys, qualitative, experiential accounts, and preferably also a before and after measurement to track change reliably. This is the track we intend to follow in the next steps.

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