Promoting Active Citizen Engagement in Sustainable Energy Transitions: A Co-creation Approach (PRE-PRINT)

W. Rowan[a], S. McCarthy[a], S. Mebrahtu[b], Titiana Ertiö[c], Adriana Dimova[d], Desislava Asenova[e], Nektarios Moraitis[f], And Alexandra Revez[g].

[A]*Department of Business Information Systems, Cork University Business School, University College Cork, Cork, Ireland.*

[B]*Made Design Services, Meir 30, Antwerp, Flemish Region 2000, Belgium.*

[C]*Turku School of Economics, University of Turku, Turku, Finland.*

[D]*Applied Research and Communications (ARC) Fund, Sophia, Bulgaria.*

[E]*Pensoft Publishers, Sophia, Bulgaria.*

[F]*RESINVEST, 40-42 A. Sygrou Ave., 117 42 Athens, Greece*

[G]*MaREI, Environmental Research Institute, University College Cork, Cork, Ireland.*

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The shift towards sustainable and decentralised energy production has encountered a notable gap between the need to establish energy communities and the existing technological and infrastructural basis provisions for their facilitation. A concerted effort is thus required to align capabilities with the requirements for fostering energy transitions. This paper introduces the ACeT method, a novel decision-making approach aimed at involving citizens in the context of sustainable energy transitions. The aim is to support the collaborative development of visions and roadmaps by citizens and regional/local authorities, who co-create strategies to mitigate broader societal impediments to the adoption of renewable energy. By addressing issues such as bureaucratic procedures, inequitable tariffs, and legal constraints, this approach offers valuable insights for stakeholders. Policymakers can further scrutinise and substantiate these insights and recommendations derived from this novel approach.

Keywords: Sustainable energy; citizen participation; co-creation.

1. Introduction

By 2050, it is expected that prosumer-generated energy could cover 98-100% of electricity and heating demand in Europe (Gährs, et al. 2020). Prosumer and consumer-driven energy initiatives are expanding rapidly, with figures from the European Federation of Renewable Energy Cooperatives showing that it has grown in the last ten years to a network of 1500 energy cooperatives representing one million European citizens (Huybrechts and Haugh, 2018). The continued growth of energy community projects in Europe presents many opportunities to manage energy at the local level through the consumption of self-generated energy. Benefits of this approach include greater acceptability of the siting of renewable energy at the local level, a considerable broadening of the investment base and ensuring that the decarbonisation process required to tackle climate change is inclusive and fair (Neves et al., 2024).

Yet, at present the European and global energy markets are still dominated by the production, trade and consumption of oil and gas (Leal-Arcas, et al. 2019). Furthermore, many have argued that community-initiated energy is still a ‘fuzzy’ concept that remains inaccessible with visible geographical and socio-demographic discrepancies telling us

that more must be done to enable more communities to succeed in this new enterprise (Campos and Marín-González, 2020; Spasova and Braungardt, 2021).

A study by van Summeren et al (2020) points towards considerable challenges in transposing the 'community logic' into an energy system bound by parameters set by incumbent energy producers. Their study also highlights institutional barriers and the need for a shift in the focus of running energy communities from fixing decisions on a purely financial basis to embracing a plurality of community values.

This paper aims to inform the design of methodological interventions that help with the establishment and management of energy communities which will benefit public authorities, private enterprises, civil society organisations, and society at large. Central to the Active Citizen Energy Transitions (ACeT) approach is the delivery of three rounds of decision pilots with citizens and local/regional authorities, combining participatory and future-oriented methodologies with technical scenario analysis to enable the emergence of salient and inclusive solutions for energy communities in Europe. ACeT aims at engaging citizens and local authorities - at both European and national levels - in dialogue on the challenges of establishing and managing energy communities. This involves the co-diagnosis of implementation barriers (legal, administrative, financial, technical, and social) for energy communities (both Citizen Energy Communities (CEC) and Renewable Energy Communities (REC). The ACeT approach engages civic society and local/regional municipalities to deliver participation-driven, future decisions for sustainable energy transitions in the European Union (EU).

The rest of the document is organised as follows: A backdrop of energy sector policymaking and the significance of citizen participation in promoting sustainable energy transitions are given in Section 2. The conceptual basis of the ACeT approach for proactive citizen participation in sustainable energy transitions is presented in Section 3. The structure of the ACeT approach is described in Section 4, and the contributions that are pertinent to the practitioner and academic communities are covered in Section 5. Following that, Section 6 concludes the paper.

2. Background

Policymaking is a complex process. Commonly we see this depicted as an idealised policy cycle that illustrates the various stages involved in developing policy: setting an agenda, describing the problem, developing actionable solutions, implementing policy, and

evaluating the strategy (Sandfort and Moulton, 2014). While policymaking is usually more complex than represented by the policy cycle, one interesting aspect is that community engagement and consultation usually happen after policy solutions have been prepared. To counter this limited approach, the employment of upstream engagement, which includes the earlier stages of policymaking, has been flagged as critical to developing more inclusive and holistic strategies (Rhisiart, Störmer, and Daheim, 2017). Indeed, we see increased calls to reconceive civic engagement beyond specific stages or points in time in a way that strives to promote continuous and networked processes of innovation and change (Felt and Fochler, 2011).

Access to reliable and sustainable energy is one of the most significant challenges facing the world today. As indicated in the United Nations' Sustainable Development Goal 7 "Affordable and Clean Energy", this requires the ongoing transition towards renewable energy, including solar, wind, tidal, and hydro energy. The geopolitical climate has revealed vulnerabilities in the EU's existing energy infrastructure, accelerating the need for a paradigm shift (Costantini, et al., 2022).

The promotion of citizen participation in renewable energy communities represents a promising path for the EU to exit the current energy crisis (REPowerEU, 2022). However, it is crucial to develop a mutual understanding of implementation barriers for energy communities and energy resilience so that the implemented solutions will effectively encourage citizens to become active change agents in this process (Busch et al., 2021).

Public decision-making has traditionally been guided by the legal, administrative, and management disciplines. However, these disciplines alone are not sufficient to deal with the complexity and interdependence of today's problems (Wohlgezogen et al., 2020). The Europe 2030 strategy focuses on the social dimension of sustainability including social inclusion as well as economic recovery stability.

Building on the idea of social innovation (van der Have and Rubalcaba, 2016), energy communities aim to support collaboration between heterogeneous actors who each contribute towards the development of new 'green' value pathways (Neves et al., 2024). Energy communities provide social benefits such as awareness of environmental issues and a heightened sense of urgency in the transition to renewable energy sources, cohesion, and trust among members. Energy communities are active both on the supply side (as energy producers) as well as on the demand side (energy consumption) (Boon and Dieperink, 2014). Another added benefit of energy communities is the fact that they

enable flexibility of energy use when demand is high and practices of shifting consumption when demand is low - whether considering open or closed energy communities (Barnes, et al., 2022).

Energy communities have the potential to support the EU's ambitious climate objectives in terms of sustainable energy production, energy waste reduction, energy performance improvement, energy flexibility and quality of life improvement (including social, economic, and environmental sustainability). As highlighted at keynote presentations during the European Sustainable Energy Week (EUSEW, 2023) policy conference, increased citizen involvement in energy communities is seen as a key mechanism for supporting energy transitions. In particular, the Programme and Call for Environment and Climate Action (EU - LIFE) set targets for sustainable energy transitions with the needs and values of citizens as well as other stakeholder groups (local authorities, policymakers and decision-makers at the EU and national levels, researchers, and public sector actors including sustainable energy agencies and public administrations). Leveraging the collective intelligence of diverse actors can inform change that is inspired by community-led visions, needs, and desires for a sustainable energy future.

Novel measures are needed that support energy transitions in response to climate and geopolitical disruptions such as the current humanitarian crisis and conflict in parts of the world such as Ukraine and Palestine. Citizens can play their role here, by adopting a collaborative approach with energy agencies without losing sight of their local concerns and objectives. However, delivering on these objectives requires the mobilisation of citizens at a substantial level to raise awareness of local actions such as the installation of solar panels and smart meters, household renovation, energy production, community governance, etc. (Coenen and Hoppe, 2022). New instruments and partnerships that empower citizens and local authorities to become enablers of sustainable energy transitions must be implemented. Such instruments need to be designed jointly with citizens and other stakeholders to ensure that they are human-centred, legitimate, and efficient. Examples of instruments include the co-creation of new services, products, policies, and social innovation initiatives (Ryszawska, et al., 2021).

A principal objective of ACeT is to co-design future-oriented, realistic, and participation-driven strategies for the development of policy recommendations that will empower citizens and stakeholders to engage in energy transitions. This novel decision-making approach investigates all obstacles, gaps, and promising actions/situations for the

development of energy communities that underpin the process of strategy development. By utilising the ACeT strategy actionable visions are illuminated on options to policymakers for the engagement of citizens and stakeholders in energy communities. ACeT seeks to enhance the capacities of public and private actors as well as civil society to engage in the participatory design of sustainable energy transitions. Complying with the Better Regulation Guidelines of the EU Commission, being open and transparent in the process. The next section outlines the conceptual underpinning of our ACeT methodology.

3. Conceptual Underpinning

The Vision-Building pilots which drive the ACeT strategy are underpinned by several bodies of knowledge, methods, and concepts including Co-Design, Participatory Technology Assessment and Foresight, Deliberative Democracy, and Business Modelling.

ACeT and Co-Design: ACeT involves multiple actors in the participatory design of sustainable energy communities looking towards 2030. Participatory design provides a bottom-up, collaborative approach to organisational change that engages stakeholders in the dynamic and complex process of change (Byrne and Sahay, 2007; Kautz, 2011). This contrasts with a top-down approach where leaders are responsible for prioritising areas of product or service change. ACeT seeks to engage with citizens and local authorities to contribute towards an emerging dialogical process by sharing their experiences and co-designing solutions to identified challenges. This participatory design approach brings together individuals, groups, or organisations who can affect or be affected by the proposed system and collects their personal experiences and perspectives to inform design efforts (Kautz, 2011). Background reading material and videos can be provided to citizens beforehand so that they are adequately prepared to contribute to discussions. This helps save time and resources compared to dedicated training sessions. Trained facilitators are also available on-site to guide discussions. ACeT as a participatory design ensures ongoing engagement between designers, domain experts, developers, policymakers, and citizens to guide the design of solutions.

ACeT and Foresight Processes, Participatory Technology Assessment: Expert-driven forecasts are often less effective in predicting the future when compared to predictions made through crowdsourcing approaches that leverage the ‘wisdom of crowds’ (Larrick

et al. 2012). Participatory Technology Assessment and Foresight processes explore future design scenarios through participatory and creative thinking approaches, it leverages the multiple perspectives of diverse actors (Havas, 2011). These multiple perspectives of actors can then be converted into scenarios and shared visions of the future, which eventually inform strategies and actions for policy creation (Caracostas, 2003). Similarly, ACeT as a form of technology assessment focuses on how actors are affected by the implementation of a technological artefact to understand how a technical solution may impact the social system e.g., in terms of dimensions such as social relations and the actions of users (Clegg, 2000). ACeT's main objectives for public engagement are illustrated in Table 1. These principles are critical in operational forms of research, such as the ACeT strategy as it involves working on interventions in real-world settings (Gregory et al., 2020).

Table 1. ACeT Objectives of Public Engagement.

Objective	**Description**
TO INFORM (disseminating information)	Provide the public with balanced and objective information on energy transition issues/challenges. The objective is to create awareness but there is no opportunity for the public to influence the outcome.
TO CONSULT (collecting information)	ACeT will collect input and feedback on energy transition issues/challenges, proposed programs, and policies before they are finalised. The aim is to test ideas/concepts with the public and assist in policy refinement and/or formulation
TO DELIBERATE (supporting dialogue)	ACeT will engage the public and local authorities in a dialogue to understand their views, opinions, and concerns on sustainable energy futures. The aim is to generate ideas and/or set the stage for problem-solving.
TO INVOLVE (working together)	ACeT will work directly with the public and local authorities throughout each step of the process, ensuring that their concerns, needs, and aspirations are understood and considered.

TO CO-CREATE (undertaking collaborative decision-making)	ACeT will directly collaborate with the public and local authorities to develop solutions and/or alternatives for sustainable energy futures. The aim is to undertake shared actions in decision-making.

ACeT and Business Modelling: ACeT provides the opportunity to explore the archetypes of business models for sustainable energy transitions and energy communities. This will be guided by Teece's (2010) work on the construction of the business model, including components of value creation, value delivery and value capture. Consistent with Teece (2010), ACeT views business models as a critical tool when technological innovation is brought to the market - hence the suitability of using this model to explore the citizen-informed, energy community business model. ACeT also builds on the work of Osterwalder (2012), to visually map different types of business models for the energy communities using a tool inspired by the Business Model Canvas. While the literature on energy community development is emerging, research on business models for sustainable energy remains a fairly nascent scholarly concept. Adopting the ACeT approach provides opportunities to explore business models within the context of the energy communities and provides an agenda for future work in this area.

We next introduce the steps in our proposed ACeT methodology.

4. ACeT Methodology

ACeT involves multiple actors in the transition towards renewable energy communities by harnessing cross-scale and future-oriented visions toward sustainable energy transitions. The impact of which is the development of mutual understanding, legitimacy, and informed perspective of sustainable energy transitions. ACeT's pilots seek to co-design and co-evaluate visions of sustainable energy communities for 2030 through multi-stakeholder workshops to develop actions that ensure energy communities can thrive going forward e.g., developing new processes for engagement between local authorities and citizens. The final versions of these desirable future visions can be prototyped and experimented with to elaborate and feed into policy recommendations. This process actively involves "energy champions" including local authorities with experience in building energy communities as well as those involved in grassroots initiatives. Liaising with these supporters, the ACeT pilots provide concrete examples of

how to achieve expected impacts in specific areas of sustainable energy communities. ACeT can help local and/or regional authorities to develop new processes of consultation and engagement, capitalising on their proximity to citizens and their ability to manage changes directly in local communities/areas. Leveraging the expertise of local and/or regional authorities, ACeT provides expertise in the designing of successful interventions at the local/regional level, working with multiple stakeholders to identify the local and current service gaps or implementation barriers that require further solutions and policy development. Specifically, the co-design processes can be used to acknowledge and highlight the importance of supporting citizen-led initiatives that integrate multiple aspects such as behavioural, cultural, and economic insights and targets.

Leveraging a co-design methodology, ACeT pilots offer a radically different approach to local/regional policymaking on energy communities. Derived from world cafe/ deliberative democracy principles that seek to provide a space for well-informed, other-regarding and future-oriented discussions (Escobar and Elstub, 2017) ACeT facilitates the emergence of multiple perspectives while at the same time allowing for consensus around key aspects of the energy transition. ACeT identifies all the stakeholders/actors (both central and marginal) concerned with the topic (e.g., energy communities), and involves them from the outset in the search for solutions. ACeT supports stakeholders to share their perspectives, assumptions and ideals for a given situation to make complex problems more understandable. ACeT facilitates a series of creative discussions among stakeholders to express their values for prototype solutions that are meaningful for them. The overall aim is to design public services that improve the lives of all through collaboration and negotiation. Applying this methodology, ACeT aims to foster mutual understanding and legitimacy through social acceptance at the local level. Thereby, ACeT builds support for sustainable energy transitions among policymakers and citizens by delivering a new process for local policymaking based on transparent communication and interaction with diverse stakeholder groups.

This approach can be delivered through three rounds of pilots as depicted in Figure 1. The pilots focus on participatory engagement, through which key project outputs, such as Future Visions, Roadmaps, Recommended Business Models for Energy Communities, Training Programmes, and Policy Briefs are developed.

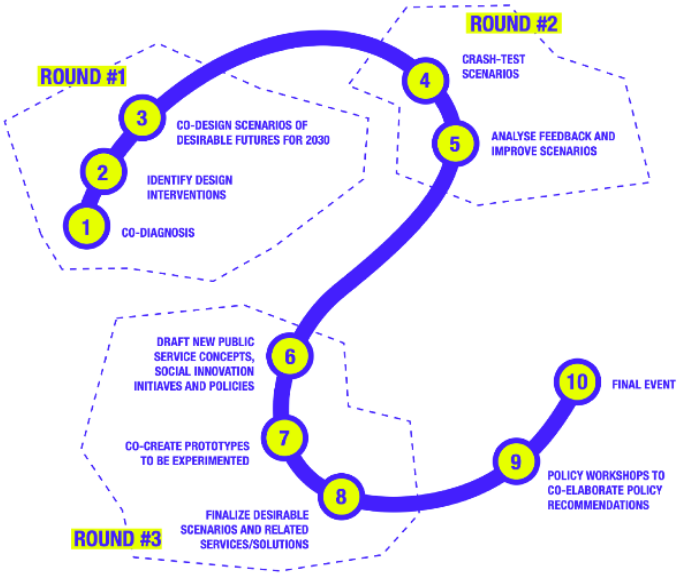

Figure 1. Rounds of Pilots in the ACeT project.

Vision Building: Round 1 explores citizens' and stakeholders' perceptions of barriers to the establishment and management of energy communities in regional and local contexts. Information is collected through co-design workshops involving a multitude of stakeholders [public authorities (local/regional), energy communities, private citizens (not involved in energy communities), industries and other stakeholders who are engaged in this topic (energy agencies, distributors, etc.)] and stakeholders who are rarely heard, such as vulnerable citizen populations (see Figure 2). The aim is to ensure balanced representation across each stakeholder group during recruitment. Step 1 is used to co-diagnose pain points concerning the implementation of integrated services to support the development of energy communities and to maximise their uptake by citizens. This builds on important existing work in areas such as energy poverty, energy resilience, social innovation and energy communities, gender-just energy communities, and energy justice (DECIDE Project, 2020). Step 2 uses the co-design approach to develop potential interventions and initiatives (integrated services). The focus is on developing new interventions that can introduce changes in a realistic and meaningful way to bring forward improvements/innovations for energy communities. This could include economic models, policy recommendations, and disaster recovery plans. Step 3 involves co-designing visions for sustainable energy communities looking to 2030. These visions are created through a series of multi-stakeholder workshops, aiming to define how different components should be developed or redesigned to ensure that energy communities truly thrive. Each vision tells the story of how a specific action in the process

of developing an energy community unfolds. Three to four alternatives are identified for the key themes of governance, finance, legal, technical, social aspects, and administrative procedures.

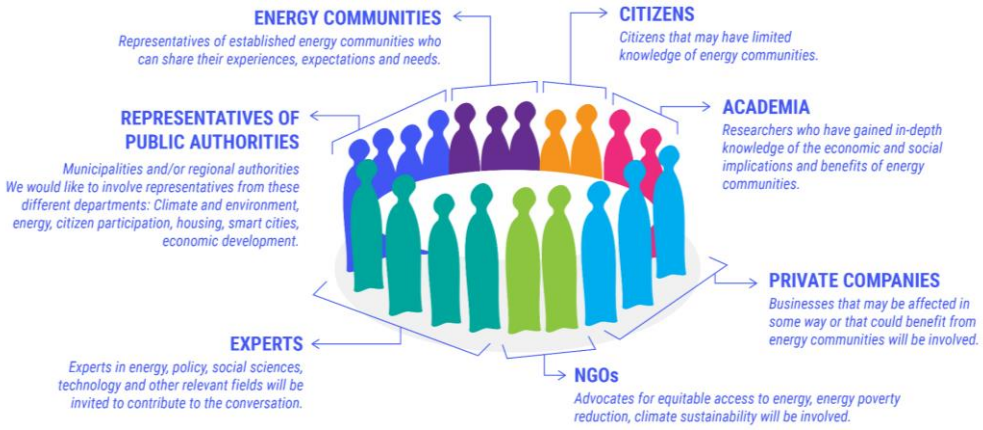

Figure 2. The Target Actors of ACeT

In Vision Building: Round 2, Step 4 of ACeT engages with experts, citizens, and stakeholders to gain feedback on the visions and to validate their feasibility. The visions are explained and visualised in an exhibition to gather reactions from a wide range of societal actors, focused on citizens, elected representatives, schools, policymakers, NGOs, lobby groups, and local groups dedicated to tackling climate change. Two or three workshops can then be organised in each partner location to collect feedback and define the next direction of the design of these foresight scenarios. Step 5 analyses the collected feedback to improve the visions of sustainable futures for energy communities. New experts are then engaged to further develop innovative solutions and services. This also includes the design of business models for energy communities which will consider the economic aspects of sustainable energy transitions.

Building on these outcomes, Vision Building: Round 3 finalises the versions of the desirable futures. Step 6 involves a series of workshops to draft new integrated public service concepts, social innovation initiatives and policies that facilitates the development of energy communities. Step 7 is about the co-creation of feasible prototypes of services and initiatives to be tested. Working within the capacity and time constraints of the implementing stakeholders, Step 8 tests the feasibility, robustness and adaptability of the emerging solutions and importantly identify unintended outcomes. Experimentation feedback is collected and analysed to finalise the desirable visions and related services/solutions for energy communities. As the feedback and analysis mechanisms can vary depending on the solution/service, tailored reports are created to capture the unique

aspects of each. Using a co-design methodology, Step 9 develops provisional policy recommendations which will be further elaborated on through policy workshops. The final versions of the visions can then be used in a series of policy workshops organised to co-elaborate policy recommendations to support stakeholders in implementing solutions for developing effective energy communities. The final showcase event in Step 10 shares the final visions, derived services/solutions, and policy recommendations in an accessible format for a wide audience.

5. Implications and Contributions

ACeT seeks to address the challenge of integrating the visions, needs, and desires of citizen groups and energy agencies in future energy transitions for 2030. This innovative co-creation process includes novel decision-making tools (e.g., foresight processes) and platforms (e.g., Miro boards) that involve multiple citizen groups, local authorities, stakeholders, and policymakers in the design and development of sustainable energy communities looking towards 2030. The ambition is to integrate the values and interests of citizens and energy agencies in energy transition issues, policies, and actions to enhance mutual understanding and legitimacy (social acceptance at a local level). Thereby, ACeT's participatory process supports the involvement of civil society while the training that the project produces can enhance public and private actors' capacities. This provides the opportunity to develop visions and roadmaps to tackle issues related to local governance and drive policy development. The ACeT approach can deliver relevant specific outcomes and results on issues related to energy poverty, energy resilience, the retrofitting of homes for energy efficiency, energy communities and gender-just energy communities, energy justice, social innovation, and climate change. The ACeT approach is intended to be used with active citizen groups who are interested in renewable energies, however the principles of ACeT can be applied to any active citizen group who wish to work with multiple stakeholders to bring about change.

At the core of this approach is the contention that enhanced (more transparent, open, easier, in mutually agreed formats) interactions between citizens, local and regional authorities, energy companies and energy communities will deliver more successful (increased roll out and uptake, faster implementation) local renewable energy initiatives. Ultimately this will assist Europe to have a more secure, green, and cost-efficient energy supply and thereby meet its 2030 and 2050 energy targets.

To ensure local policy recommendations feed into local policy frameworks to facilitate the development of energy projects, stakeholder engagement activities are needed to explore the questions of implementation barriers, and design interventions to support the establishment of energy communities. The input from local policymakers, interested citizens and energy community groups will help to i) develop a collective understanding of the problems, and ii) identify feasible and meaningful areas of change. Through this process, existing regional programmes can be mapped and assist with the creation of future policy recommendations. This will contribute towards policies such as the Clean Energy for All Europeans Package (by recognising the rights of citizens and communities to engage in the energy sector), and the European Climate Pact (giving citizens a voice in climate action).

National policy workshops can engage with interested stakeholders and disseminate new policy recommendations. Through these networks, ACeT creates the opportunity to extend collaborations and the transferability of outcomes. Energy Communities Repository (ECR) and Rural Energy Community Advisory Hub (ReCAH) focus on collecting and analysing existing national legislation and enabling frameworks around energy communities, ACeT provides for the analysis of lessons learned from initiatives that have been successful and unsuccessful to identify the most appropriate processes and initiatives for local and regional authorities to implement in their specific contexts.

Going forward, new training and capacity-building opportunities are needed for community energy development. Resources developed through the adoption and use of the ACeT approach can support training at local/regional levels. Helping local/regional authorities develop more effective dissemination/communication practices and/or stakeholder engagement practices to ensure that the citizen energy initiatives get off the ground. This requires building and sustaining knowledge brokerage initiatives to bridge the gap between research, policy, and local action.

6. Conclusion

In this paper, we presented a participation-driven methodology to build social collaborations between different stakeholders by facilitating dialogue on how energy communities can address current and future issues around energy poverty, energy inclusion, equality, and well-being. ACeT supports energy transitions and has a strong

emphasis on the social dimension of sustainability by engaging citizens and local authorities in the co-design of energy communities.

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