



ENCLUDE

Energy Citizens for Inclusive
Decarbonization

D7.8 Final ENCLUDE Synthesis Report

WP7 – Communication, Dissemination, and Exploitation



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ENCLUDE PROJECT & DELIVERABLE PROFILE

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Preface

The overall vision of ENCLUDE is to help the EU to fulfil its promise of a just and inclusive decarbonization pathway through sharing and co-creating new knowledge and practices that maximize the number and diversity of citizens who are willing and able to contribute to the energy transition. Motivated by achieving an equitable and sustainable future and the fulfilment of individual potential, ENCLUDE will contribute to the upcoming transformation of energy use by: (1) Assembling, aligning, and adapting disparate energy citizenship concepts for diverse communities of citizens and for different scales of policy making, lowering the barrier for action. (2) Operationalizing the energy citizenship concept at all scales of policy making for decarbonization. (3) Catalyzing a chain reaction of decarbonization actions across the EU.



1. Changes with respect to the DoA

According to the Grant Agreement, this deliverable was envisioned to present “a final attractive ENCLUDE Synthesis Report”, with a design supported by an art student, to summarize the project’s objectives, activities and achievements.

During the elaboration of the project and the collaboration with ENCLUDE’s sister projects, it was decided to move the Synthesis Report earlier in the process and publish it as a joint policy brief on March 2024, distilling findings from ENCLUDE and its sister projects in a concise document for policymakers. Additionally, ENCLUDE has published syntheses of its findings in tailor-made formats for other stakeholders, namely the Playbook for supporting citizen-led initiatives and three booklets of results from Work Package (WP) 3 to support energy communities. All these reports were designed by a graphic arts professional to be attractive to their target audiences. Similarly, we have published results from all WPs on the Interactive Policy Platform that was designed based on the ENCLUDE visual identity.

This deliverable is mainly referencing all these outputs as a “collective” Synthesis Report. Additionally, D7.8 documents the project’s final event in Brussels on the 25 September 2024. The event acted as a synthesis of project results and was thus considered to be relevant for this deliverable.

2. Dissemination and uptake

This deliverable can serve as a documentation of all flagship outputs of ENCLUDE that synthesize information from the research work of all the project’s WPs. These outputs were designed for different stakeholders, i.e., policymakers, energy communities, and citizens that want to start their own energy-related initiative, and were disseminated in relevant events, e.g., the Policy Brief was disseminated in the joint event of ENCLUDE and its sister projects in Brussels as well as in the European Sustainable Energy Week 2024.

3. Short Summary of results (<250 words)

As shown in the “Changes with respect to the DoA”, this report is a collection of synthesis outputs that ENCLUDE produced throughout its duration. This includes the joint Policy Brief¹ of ENCLUDE and its sister projects, the ENCLUDE Playbook “A Changemaker’s Guide to the Energy Transition: Citizens designing change one step at a time”², the three booklets presenting results from the research of ENCLUDE on collective energy initiatives^{3,4,5}, and the results workspaces on the Interactive Policy Platform⁶. In addition, the deliverable documents the synthesis that took place during the final event of ENCLUDE in Brussels on the 25 September 2024. Apart from a short documentation of the discussions that took place in the event with external invitees from the JRC, the Municipality of Athens, and the GovernEUR, the deliverable includes links to the video recordings, presentations, and posters shown during the event.

4. Evidence of accomplishment

This report along with the accompanied documents showed above.

¹ <https://doi.org/10.5281/zenodo.10814076>

² <https://doi.org/10.5281/zenodo.11505128>

³ <http://encludeproject.eu/sites/default/files/2024-03/A5-WP3%20Case%20studies-Booklet-16P.pdf>

⁴ <http://encludeproject.eu/sites/default/files/2024-03/231023-ENCLUDE-Case%20studies-4x4A5-stand-zigzag-screen.pdf>

⁵ <http://encludeproject.eu/sites/default/files/2024-03/2024-A5-WP3%20Case%20studies-Booklet-44P.pdf>

⁶ <https://energycitizenship.eu>



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1 Synthesis throughout ENCLUDE outputs

During the elaboration of the project and the collaboration with ENCLUDE's sister projects, it was decided to move the Synthesis Report earlier in the process and publish it as a joint policy brief on March 2024, distilling findings from ENCLUDE and its sister projects in a concise document for policymakers. Additionally, ENCLUDE has published syntheses of its findings in tailor-made formats for other stakeholders, namely the Playbook for supporting citizen-led initiatives and three booklets of results from Work Package (WP) 3 to support energy communities. All these reports were designed by a graphic arts professional to be attractive to their target audiences. Similarly, we have published results from all WPs on the Interactive Policy Platform that was designed based on the ENCLUDE visual identity. All these results are shortly presented below along with links to the full files in ENCLUDE's website and Zenodo community.

1.1 Policy brief

Energy citizenship has so far been a missing piece of the energy transition puzzle. Energy citizenship pertains to citizen engagement and involvement in the energy transition and the rights and responsibilities of citizens to that end. Despite the European Energy Union's vision to put citizens at the core of the transition, much remains to be done to ensure that the pathway towards carbon neutrality is inclusive and provides opportunities and benefits for all.

On these issues, a joint policy brief was produced by four Horizon 2020 projects working on energy citizenship: DIALOGUES, ENCLUDE, EC2, and EnergyPROSPECTS. The four projects agree that the view on citizens' roles in the European energy transition must be expanded beyond being consumers, prosumers and belonging to energy communities. Across the four projects, around 32,000 citizens have been involved in research and capacity-building around the concept of energy citizenship through interviews, surveys, workshops, case studies, co-creation activities, and educational and training programs.

In this policy brief, we translate citizens' knowledge, perspectives, and experiences together with our analyses into concrete pathways and recommendations, for decision-makers, primarily at the EU-level but which may also be relevant for Member States as well as regional and local authorities. Excerpts from the joint policy brief are shown in Figure 1, while the full brief can be found in Appendix 1 and the link below:

Pearce, B., & Thalberg, K. (2024). Energy Citizenship in the making. Pathways to support citizen engagement in the European energy transition. Zenodo. <https://doi.org/10.5281/zenodo.10814076>



Figure 1 Joint policy brief by ENCLUDE and its sister projects



1.2 Playbook

ENCLUDE WP6 members developed The Changemaker's Guide to the Energy Transition, a playbook that aims to take citizens step by step to design, implement and reflect on an initiative of their own related to the energy transition.

This is the outcome of helping citizens develop their own community energy initiatives. The approaches used in the playbook are based on an online programme, called the ENCLUDE Academy, as well as methods that have been used with more than 1,500 Bachelor and Masters students in Europe.

This playbook is for anyone looking to contribute to or already engaged in the energy transition. It is tailored for those interested in launching or already working on community projects related to energy and decarbonization or for civic organizations and local authorities who want to empower citizens to work together towards change.

Excerpts from the Playbook are shown in Figure 2, while templates for applying the Playbook's Design Thinking methodology can be seen in Figure 3. The full Playbook can be found on the following link:

Pearce, B., Verhulst, B., Dagorne, E., Gamez Mokay, N., & Djinlev, V. (2024). A Changemaker's Guide to the Energy Transition: Citizens designing change one step at a time (v. 20240606b). Zenodo. <https://doi.org/10.5281/zenodo.11505128>

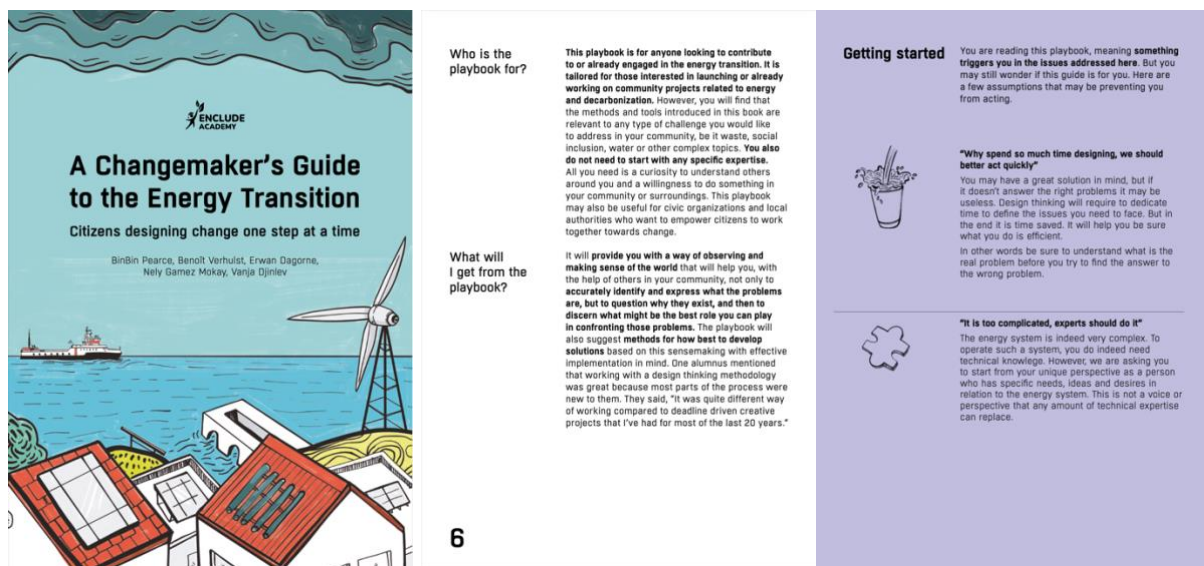


Figure 2 Excerpts from ENCLUDE's Playbook



A Changemaker's Guide to the Energy Transition
Templates to help you started

What "bugs" you?

- How are people using energy around you?
- What "bugs" do you notice about how this is happening? What could be improved?
- What doesn't seem to be working as well as it could be?
- What are things you notice that surprises you or that you didn't know before?
- What are some observations that you can't quite understand yet or makes you more curious to find out about?

Personas canvas

Negative trends
Positive trends

Headaches
Opportunities

Fears
Hopes

Name
Age
Occupation
Other information

Needs

A Changemaker's Guide to the Energy Transition
Templates to help you started

Show your prototype(s) to someone who can do something about the solution

What feedback did you find helpful?

What feedback will you act on?

Figure 3 Templates for applying the Playbook's Design Thinking methodology

1.3 Booklets for collective energy initiatives

By establishing a structured and well documented pool of case studies, the WP3 team aimed to study energy citizenship from a group-centered sociological perspective, in order to identify the most important processes and factors affecting the emergence and consolidation of energy citizenship groups. The creation of case studies for Collective Energy Initiatives (CEIs) was a comprehensive process that used both desktop research and qualitative semi-structured interviews.

In addition, the WP3 team collected valuable insights through a survey conducted with members of selected initiatives from July to October 2022. Further enriching their understanding, the WP3 researchers conducted interviews with various stakeholders involved in or connected to these initiatives. This approach is based on two theoretical frameworks: the Energy Cultures Framework and the Socio-Ecological Systems Framework for Integrated Community Energy Systems.

To analyze the obtained information, an adapted variant of the grounded theory was used while cases were categorized based on the information gathered for each of the posed questions. This categorization involved an analysis of all cases collectively and a detailed examination of each case individually. The goal was to discern patterns and trends within the collected data.

The results of this analysis were presented in three booklets that are showcased in Figures 4-6, designed by Agata Smok (Th!nk E). Links to the full booklets can be found below:

Matowska, M., Protopapadaki, C., Brenner-Fliesser, M. (2022). Things we have learnt from talking about energy with 68 initiatives. ENCLUDE. <https://encludeproject.eu/sites/default/files/2024-03/A5-WP3%20Case%20studies-Booklet-16P.pdf>

Matowska, M., Brenner-Fliesser M., Schwarzinger, S. (2023). Uncovering motivations and barriers for collective energy initiatives. ENCLUDE. <https://encludeproject.eu/sites/default/files/2024-03/231023-ENCLUDE-Case studies-4x A5-stand-zigzag-screen.pdf>

Matowska, M., Brenner-Fliesser, M., Fodor, N., Luketina, R. (2024). Things we have learnt from talking about energy with 68 initiatives (2024 update). ENCLUDE. <https://encludeproject.eu/sites/default/files/2024-03/2024-A5-WP3 Case studies-Booklet-44P.pdf>





1.4 Interactive policy platform

The Interactive Policy Platform has been developed and can be found online at <https://energycitizenship.eu/>. The goal of the platform would be to serve as a one-stop-shop on the topic of energy citizenship in Europe, starting from the research created as part of ENCLUDE and its sister projects: EC2, EnergyPROSPECTS, and DIALOGUES. Currently, the platform provides significant results from ENCLUDE and its sister projects through a curated portal (Figure 7). Each output is categorized as a “learn”, “explore”, and “modelling” resource and is linked to a specific audience and to one of the following themes:

- **What is energy citizenship?** An interactive explorer of different expressions of citizen participation in the energy transition
- **What examples of energy citizenship initiatives can be found across Europe?** A map of different initiatives throughout Europe along with testimonials of their members
- **What is the role of energy citizenship in the European energy transition?** An evaluation of the future impacts of energy citizenship on the energy transition
- **How can I organize an initiative in the context of the energy transition?** A collection of resources for organizing an energy citizenship initiative

The platform also includes interactive dashboards that synthesize information coming from ENCLUDE's deliverables in the context of WPs 2-5 (see Figures 8-10). As with the resources, these dashboards are also aimed for specific target groups and are connected to the themes above. More details on the development and current contents of the platform are provided in Deliverable D7.6⁷ and D7.7.

Resources
A collection of resources for organizing an energy citizenship initiative

Learn	Title	Description	Learn More →	Authors	Audience
Learn	Energy Citizenship in the Making	A policy brief on pathways to support citizen engagement in the European energy transition	Learn More →	ENCLUDE, DIALOGUES, EC2, ENERGY PROSPECTS	Policy-makers
Learn	A Changemaker's Guide to the Energy Transition	A playbook that aims to take citizens step by step to design, implement and reflect on an initiative of their own related to the energy transition	Learn More →	ENCLUDE	Citizens
Learn	Energy Citizen Empowerment Kit	A gamified tool that triggers and guides discussion about barriers to participation in the energy system	Learn More →	EC2	Citizens, Policy-makers
Learn	Things we have learned from talking about energy with 68 collective energy initiatives	A documentation of impacts, decision-making processes, and other dimensions of collective energy initiatives	Learn More →	ENCLUDE	Policy-makers

⁷ http://encludeproject.eu/sites/default/files/2024-07/ENCLUDE_D7.6_ENCLUDE_Interactive_Policy_Platform.pdf



Figure 7 Example of resources from different projects hosted on the platform

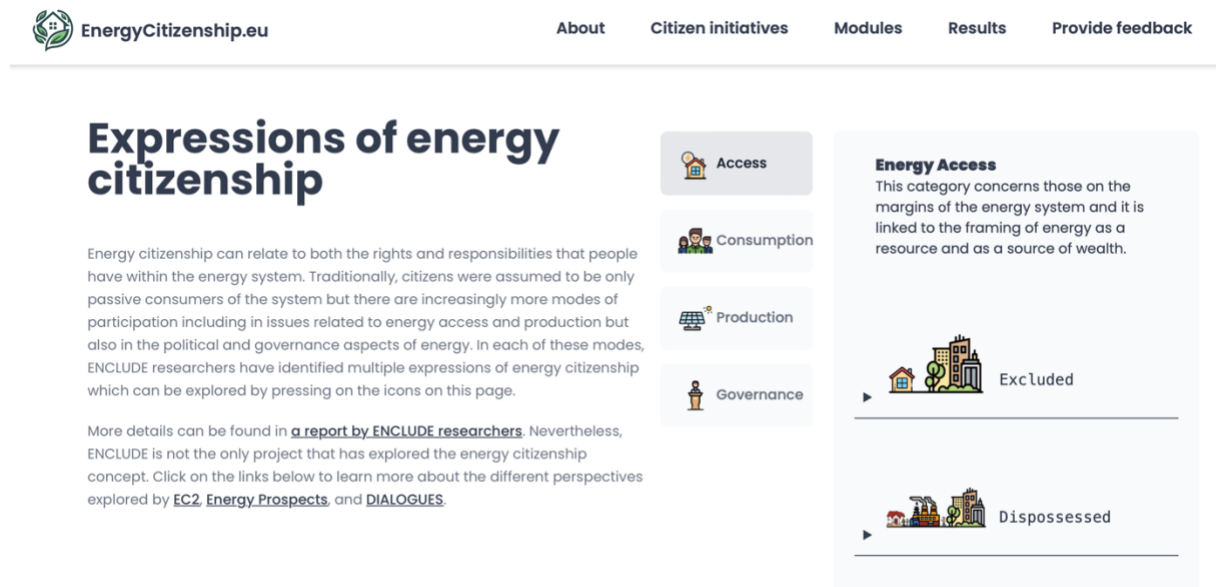


Figure 8 Integration of WP2 results to the platform

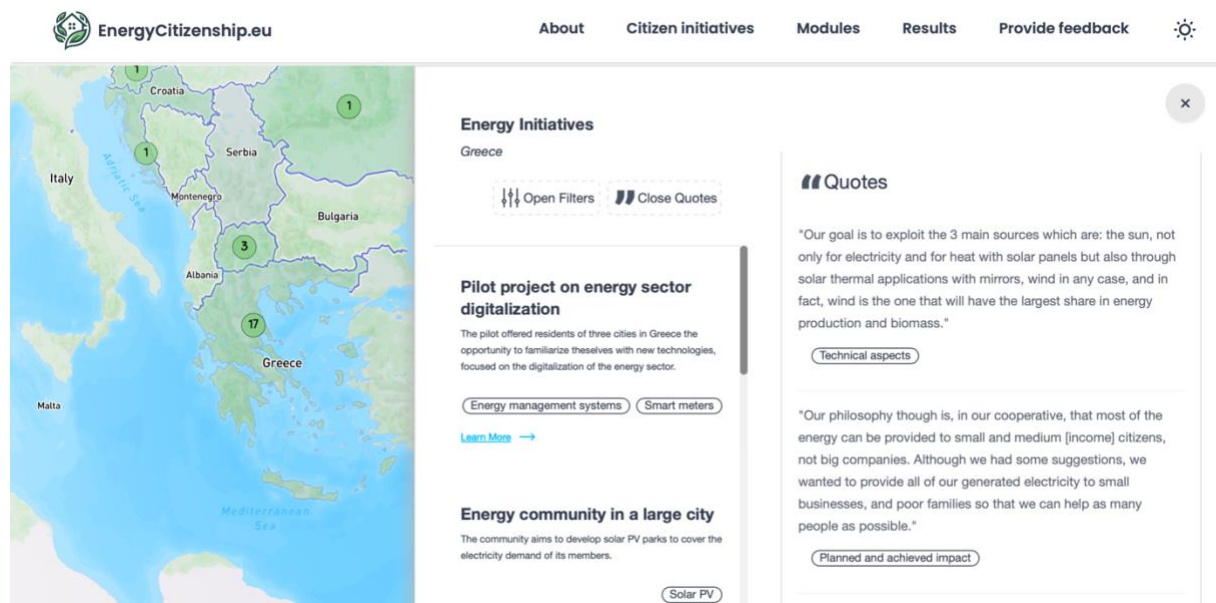


Figure 9 Integration of WP3 results to the platform



On this page

Introduction

Research/ Policy questions

What are potential driving factors that could support the diffusion and further growth of Collective Energy Initiatives i...

What is the emission reduction (decarbonization) potential related to the further growth of CEIs around...

Citizen personas: what individual motivations are driving the further growth of Collective Energy Initiative...

The Green Guardian

The Security-Minded Sceptic

The Eco-Collaborators

Min

Average

Max

Cloughjordan Ecovillage - Ireland

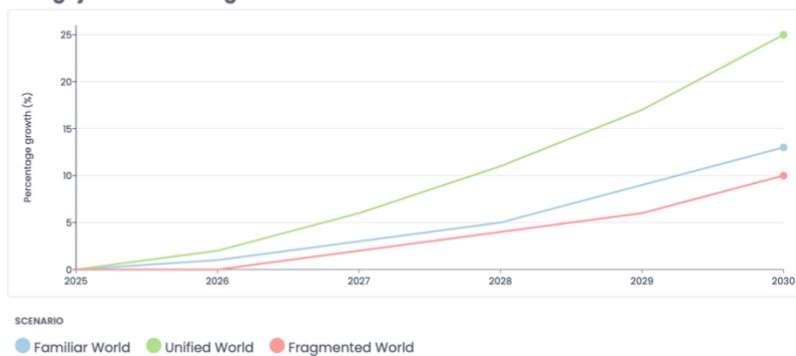


Figure 10 Integration of WP5/WP4 results to the platform



2 Synthesis at the final event of ENCLUDE

ENCLUDE organized a final event in Brussels on the 25 September 2024, aiming to consolidate its main messages in three concise presentations as well as in a poster exhibition. The event was attended by 36 in-person and online participants and its agenda can be seen in Appendix 2. The full recordings of the sessions can be found below:

- Introduction to ENCLUDE's final event - <https://youtu.be/YnGzHMQRBMs>
- Topic #1: Energy Citizenship is for everyone! - <https://youtu.be/tjn6uqVNuzQ>
- Topic #2: What have we learned about Energy Citizenship? - <https://youtu.be/CCbqvoLNyac>
- Topic #3: Energy Citizenship for the Future - <https://youtu.be/5nM-fn-vaag>
- Panel Discussion - https://youtu.be/DLf-e_5_mmw

The Topic #1 presentation revolved around the assumption that everybody is an energy citizenship and described the results of the energy citizenship typology in the context of ENCLUDE's WP2 and the findings from the research on collective energy initiatives from WP3. The Topic #2 presentation was related to findings from the clustering of energy citizens in WP4 and the extensive modelling work of WP5, and discussed ways that these findings can be useful at the local, regional, national, and EU scale. The Topic #3 presentation was about the future of energy citizenship, presenting the Playbook from WP6 and the Interactive Policy Platform from WP7, and discussing next steps for their exploitation. Screenshots from the presentations can be seen in Figure 11, while the full presentations can be found in Appendix 3 and on the link below:

ENCLUDE (2024). Project results – September 2024 (presentations). ENCLUDE. https://encludeproject.eu/sites/default/files/2024-09/ENCLUDE_final_event_presentations.pdf



Figure 11 Presentations at ENCLUDE's final event in Brussels

ENCLUDE's results were further discussed by the following participants, that were specifically invited to contribute to each of the main topics of the event:

- **Dr. Tessa Dunlop**, Joint Research Centre of the European Commission / Competence Centre on Participatory and Deliberative Democracy (online)
- **Prof. Vaggelis Marinakis**, DAEM of the City of Athens (online)
- **Dr. Mattijs Taanman**, GovernEUR (on-site)
- **Cornelius Chen Chen**, ENCLUDE Academy (on-site)
- **Sam Odong**, ENCLUDE Academy (online)
- **Dr. Nives Della-Valle**, Joint Research Centre of the European Commission / Unit of Energy Efficiency and Renewables (online)



Dr. Tessa Dunlop (Figure 12a) discussed the novelty of the modelling results from Topic #2 and reflected on potential ways to use these results for citizen engagement. WP5 members responded that the results already fed to engagement activities of ENCLUDE and that they are also available in the Interactive Policy Platform, allowing them to be further used by stakeholders. In a later discussion, Dr. Tessa Dunlop noted that engagement is crucial as it is important to talk to people to understand their issues and not only collect data about them for modelling solutions without them. The Citizen Science Toolkit for Climate Assemblies (CLIMAS project) was also suggested as a potential synergy and a way to transfer some of the knowledge created in ENCLUDE⁸.

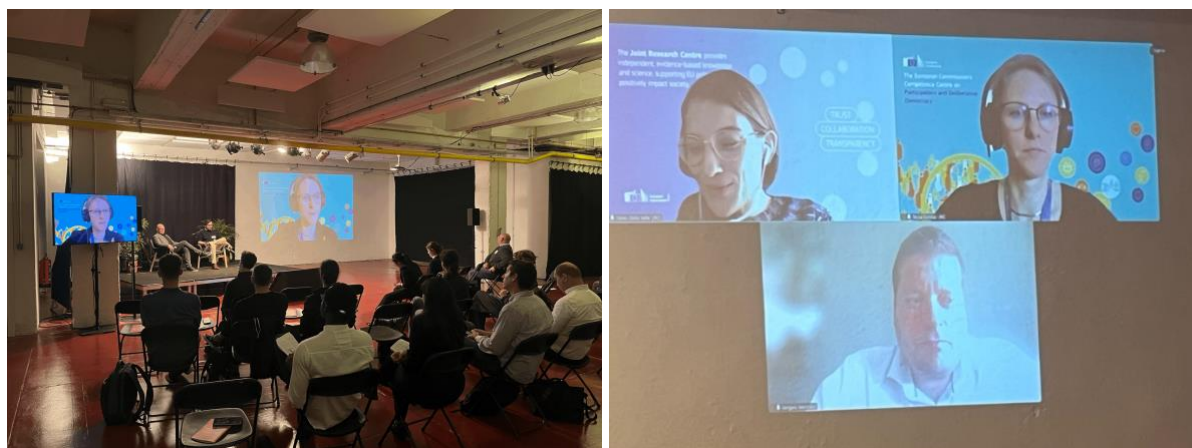


Figure 12 Panel discussion at ENCLUDE's final event in Brussels

Prof. Vaggelis Marinakis (Figure 12b) suggested that the tools and key findings from the ENCLUDE project have significant potential for empowering energy citizens by providing actionable insights and resources for informed decision-making. These tools can create a platform for citizens and local communities to engage actively in energy-related decisions, promoting a deeper understanding of energy consumption, increasing transparency, and fostering collective action.

Prof. Marinakis also reflected on whether the methodology from the case study in Megalopoli that was presented by the members of WP5 can be transferred to another city such as Athens, given that it is a completely different city in terms of population size, infrastructure, characteristics, and needs. The WP5 responded that this would create challenges in the data collection but that would be helpful to go beyond the just transition areas and look at such kinds of metropolitan areas. Prof. Marinakis also suggested that apart from replicating modelling studies to Athens, ENCLUDE results such as the Playbook can be used to support the Climate Youth Assembly of Athens.

Cornelius Chen Chen and Sam Odong (Figure 13) reflected on their experience as participants of the ENCLUDE Academy and the fact that the Design Thinking methodology that was used helped them to structure their perspective about the challenges that they wanted to solve. Specifically, Mr. Chen Chen focused on developing a business case for a combined application of forest management and enhanced weathering in Uganda, which could be then promoted to the carbon market and provide income and support to the local population area along with emissions reductions. Mr. Odong worked on a local mini-biogas plant for household use which was applied at a pilot project in Uganda. The two participants also mentioned that their experience with the Academy helped them to further advance their careers and that they now feel more confident in energy topics.

⁸ <https://cop-demos.jrc.ec.europa.eu/blog/citizen-science-toolkit-climate-assemblies-empowering-grassroots-climate-action>



Figure 13 Presentation of ENCLUDE Academy projects by Cornelius Chen Chen and Sam Odong

Dr. Nives Della-Valle (Figure 14, left) presented relevant work to the energy citizenship topic from the Energy Efficiency and Renewables Unit. The presentation included ways to empower energy citizenship among energy poor populations and an analysis of energy poverty and vulnerability. Dr. Della-Valle also discussed urban climate plans in the context of the EU Mission on Climate Neutral & Smart Cities and the awareness of these plans of climate-justice issues. The presentation closed with a perspective on how to co-create debiased and just climate action. Related to ENCLUDE, Dr. Della-Valle commented on the usefulness of the Academy and the Playbook for future engagement activities. She also suggested that through the Design Thinking process, participants can be made aware of problems within the energy system that they have never even thought of.



Figure 14 Online presentation by Dr. Nives Della-Valle & on-site discussion with Dr. Mattijs Taanman

Finally, Dr. Mattijs Taanman (Figure 14, right) reflected on the two facets of energy citizenship that were presented in the Topic #1 presentation, i.e., the rights and responsibilities of citizenship within the energy system. Dr. Taanman also suggested that research should go beyond energy citizenship perspectives and look at other roles with more practical impact to the transition such as energy installers. Dr. Taanman also suggested that the roles between citizens and energy companies within the energy system should be flipped, as the companies actually need the citizens, while the citizens also legitimise the government that provide the policy for the energy transition. He also noted that energy literacy is an important barrier,



and that researchers, policymakers, and companies need to make the energy system “easier” for the citizens. Thus, citizens should not (only) be nudged to specific energy behaviours but should be able to have the know-how to take an active role within the system.

At the afternoon part of the event, a discussion took place along with the Project Officer of ENCLUDE Dr. Annarita Ferreri on the further exploitation of ENCLUDE’s findings. The event concluded with a poster session presenting major outputs from the project. Examples of the posters can be seen in Figure 15 while all the posters can be found in high definition in the following links:

- ENCLUDE (2024). Project results – September 2024 (posters). ENCLUDE. [https://encludeproject.eu/sites/default/files/2024-09/ENCLUDE Final Event Posters 0.pdf](https://encludeproject.eu/sites/default/files/2024-09/ENCLUDE%20Final%20Event%20Posters%200.pdf)
- ENCLUDE (2024). Project results – March 2024 (posters). ENCLUDE. https://encludeproject.eu/sites/default/files/2024-03/results_exhibition_light_0.pdf



Figure 15 Examples of posters presented at the final event.



3 Appendix 1 – Joint Policy Brief

The joint policy brief is shown in the next 15 pages and can be also found on the link below:

Pearce, B., & Thalberg, K. (2024). Energy Citizenship in the making. Pathways to support citizen engagement in the European energy transition. Zenodo. <https://doi.org/10.5281/zenodo.10814076>

Energy Citizenship in the making

Joint Policy Brief

Pathways to support citizen engagement in the European energy transition

Leads | BinBin Pearce and Karin Thalberg

Contributors | Ariane Debourdeau, Benedetta Buccolini, Breffní Lennon, Daniel Botha, Giulia Garzon, Laura Guaita, Marko Hajdinjak, Marlyne Sahakian, Michael Brenner-Fließner and Nikos Kleanthis



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Introduction

This is a joint policy brief produced by four Horizon 2020 projects working on energy citizenship: DIALOGUES, ENCLUDE EC2 and EnergyPROSPECTS.

Energy citizenship has so far been a missing piece of the energy transition puzzle. Despite the European Energy Union's vision to put citizens at the core of the transition, much remains to be done to ensure that the pathway towards carbon neutrality is inclusive and provides opportunities and benefits for all.

Energy citizenship pertains to citizen engagement and involvement in the energy transition and the rights and responsibilities of citizens to that end. This includes considering how to balance right and responsibilities between different stakeholders in the energy transition, ensuring that citizens have the possibility to get engaged in ways tailored to needs.

The four projects who have collaborated on this policy brief agree that the view on citizens' roles in the European energy transition must be expanded beyond being consumers, prosumers and belonging to energy communities. There are a variety of energy citizenship practices, including collective endeavours undertaken by citizen-based or hybrid organisations either by themselves or in collaboration with private and public entities, participation in energy-related governance and decision-making, as well as in social movements and protests.

Across the four projects, around 32,000 citizens have been involved in research and capacity-building around the concept of energy citizenship through interviews, surveys, workshops, case studies, co-creation activities, and educational and training programmes. In this policy brief, we translate citizens' knowledge, perspectives, and experiences together with our analyses into concrete pathways and recommendations, for decision-makers, primarily at the EU-level but

which may also be relevant for Member States as well as regional and local authorities. Our combined research findings form a strong knowledge base for strengthening citizen engagement and involvement in the coming European mandate period to achieve the Union's 2050 climate neutrality target.

This policy brief starts by identifying the key challenges for energy citizenship from citizens' point-of-view: (in)equitable distribution of resources; (lack of) meaningful public participation in energy governance decisions and institutional trust; and broader issues pertaining to legal and economic frameworks. Thereafter, we present three pathways with concrete policy recommendations¹. These recommendations aim to empower citizens to take part in the energy transition both individually and collectively.

Navigating the energy transition: Challenges faced by citizens

In this section, we outline questions from citizens that often come up when discussing energy citizenship: highlighting citizens' key concerns, perceptions and challenges regarding their involvement and engagement in the energy transition. We also present principal barriers for energy citizenship practices identified across the four projects.

Challenges of equitable distribution: *Why should I be the one to change?*

Inflation and decreasing purchasing power, large income and wealth inequalities, energy poverty, and high initial investment costs in green technology were found to be major barriers for citizens to take part in the energy transition. If green options are not accessible and affordable, citizens ask: *"Why should I be the one to change?"*

An increasing number of Europeans experience energy poverty. The energy price crisis (2021-2022) brought to the surface the wider inequalities that characterise the prevailing energy

¹ To see the recommendations, go the page 7.

system. In 2021, 7% of EU citizens were unable to keep their homes adequately warm compared to 9% in 2022, with large differences between Member States: ranging from 1.4% in Finland to 22.5% in Bulgaria². At the same time, energy poverty is usually one facet of a much more complex assemblage of socio-economic challenges. Many citizens have more pressing issues than the energy transition to consider in their day-to-day lives.

The energy transition is taking place in an increasingly difficult socio-economic context. While most Europeans are well-aware of the climate emergency and the majority are already personally affected by its consequences, a high proportion of citizens now prioritise concerns related to purchasing power³ and the fight against poverty and social exclusion over climate action.⁴ This underlines the effects of the current economic situation characterised by high levels of inflation.

68% of Europeans believe that the energy transition can only succeed if it addresses social and economic inequalities and supports policies that take these into account⁵. There is a real risk that the implementation of European Green Deal policies might have negative distributional impacts in terms of benefits and costs for citizens. Therefore, the increased ambition at the EU-level, for example on energy retrofitting⁶ and the phase out of fossil powered heating technologies⁷, needs to be accompanied with support particularly directed towards those with the least capacity to change. The financial envelope currently foreseen to support vulnerable households in the energy transition under the Social Climate Fund is not sufficient to meet the challenges⁸.

Empirical evidence suggests that home ownership and high incomes are key factors for households to invest in energy efficiency measures and renewable energy⁹. In the long run, these investments will allow select households to make considerable financial savings — leaving behind tenants, in cases where building owners fail to invest. Thus, if public support programmes are not well-designed and targeted, there is a risk that socio-economic inequalities will be entrenched or aggravated, which in turn could create frustration and social back-lash.

Many citizens perceive that the current path of the energy transition is not inclusive. In a survey carried out by ENCLUDE, 66% of respondents disagree that the current path of the energy transition is inclusive and equal for all citizens. 42% think that their efforts to participate in the energy system have been limited by current government structures or decision makers¹⁰. Equally, a majority of respondents in a survey from DIALOGUES found that: people will not benefit equally from the transition to more renewable energy (66%) and not everyone should bear the same burden for the cost of the energy transition (72%)¹¹. To that end, policy makers need to make sure that clean technologies and options are affordable and accessible for all, taking particular care of the ones with the least capacity to change.

Challenges of democracy and trust in institutions: *Why should I trust what you tell me?*

Lack of trust in institutions, lack of representation, lack of social networks, lack of clear and inclusive communication, as well as fragmented

² Eurostat. (2023). Inability to keep home adequately warm - EU-SILC survey. 2013-2022.

³ Ipsos and BNP Paribas. (2023). Just transition. *Global survey report*.

⁴ Eurobarometer. (2023). EP Autumn 2023 Survey: Six months before the 2024 European Elections.

⁵ European Investment Bank. (2023). EIB Climate Survey 2023-2024.

⁶ European Commission. (2023). New rules to boost energy performance of buildings across the EU.

⁷ Kurmayer, N.J. (2023). EU agrees 2040 fossil boiler ban in revamped green buildings law. *Euractiv*. 8 December.

⁸ See page 23 in: Thalberg, K., Defard, C., Chopin, T., Barbas, A. & Kerneis, K. 'The European Green Deal in the face of rising radical right-wing populism'. *Policy Paper n. 296*, Paris: Jacques Delors Institute, January 2024.

⁹ Ameli, N. and Brandt, N. (2014) 'Determinants of households' investment in energy efficiency and Renewables'. *OECD Economics Department Working Papers*.

¹⁰ Dunphy, N., Revez, A., Lennon, B., & Brenner-Fließer, M. (2023). Typology of Energy Citizenship(s). ENCLUDE Project. <https://doi.org/10.5281/zenodo.10005552>

¹¹ A survey conducted among people participating in DIALOGUES Citizen Action Labs (n=168).

access to information were found to be essential barriers for citizen engagement in the energy transition. Citizens ask: *"Why should I trust what you tell me?"*

Declining and low trust in institutions are challenges for the EU and its Member States that go well beyond the energy transition¹². However, considering the large-scale societal transformations that achieving climate neutrality by 2050 will require, trust of institutions and experts appears to be an important foundation for the energy transition to succeed. The recent health, geopolitical and energy crises have led to strong pessimism among the population about the current socio-economic situation. Lessons from the 2008 recession have shown that trust in European institutions among groups with lower levels of education and income have not yet risen to pre-recession levels¹³. There is thus a risk of further erosion of trust in democratic institutions if the EU and its Member States fail to adequately facilitate access to affordable green alternatives, as highlighted by the recent energy price shocks¹⁴.

There is a lack of a common transition narrative with tangible objectives that has relevance for citizens' everyday lives. The transition remains for many an abstract process entailing vague ideas and goals about increasing the deployment of renewable energy sources, electrification of transport uses, reducing energy consumption, and so on. Furthermore, the framing of citizens as consumers in the mainstream transition narrative and policies limits their involvement and engagement beyond the marketplace. One challenge that relates to democratic engagement is about rendering opportunities for collective action,

beyond the marketplace, concrete. Different forms of experimentation are promising, such as the citizen action labs that were tested in the DIALOGUES¹⁵ project or, more generally, citizen forums and assemblies.

Women, people with low income and other social groups are underrepresented in collective action efforts and community-building. In initiatives that enable active involvement and engagement of citizens in the energy transition, such as energy communities, there is often a lack of representation. This dynamic of exclusion stands in the way of more people being able to access the potential benefits of energy communities particularly and of the energy transition more broadly.

There is a widespread mistrust towards energy transition decision-making. In a survey carried out by ENCLUDE¹⁶, 70% of respondents are not confident that they would be invited and encouraged to participate fully in decision-making processes related to the energy transition. Of those who have participated in the past, 45% felt they were not heard in those decision-making processes and 65% do not think that these decision-making processes are fair and just.

Similarly, according to the survey conducted by EnergyPROSPECTS¹⁷, 69% of respondents agree or strongly agree with the statement that politicians do not consider the views and ideas of ordinary citizens when designing policies pertaining to development of the energy system. 57% believe that the options that individuals must contribute to developments in the energy system are limited to their private lives. These results indicate that the lack of trust in decision-making processes is a significant stumbling block for

¹² Eurobarometer. (2023). Standard Eurobarometer 98 - Winter 2022-2023.

¹³ Jansen, J. (2023). "When trust becomes a luxury: How economic crises undermine political trust among the most disadvantaged". Policy Brief. Berlin: Jacques Delors Centre/Hertie School, June.

¹⁴ Thalberg K., Defard C., Chopin T., Barbas A. & Kerneis K. "The European Green Deal in the face of rising radical right-wing populism", *Policy Paper n. 296*, Paris : Jacques Delors Institute, January 2024.

¹⁵ Clément, G. et al. 2022. Guidebook for designing and implementing Citizen Action Labs and Recruitment to the Citizen

Action Labs. DIALOGUES Deliverables 5.3 and 6.1 European Commission Grant Agreement No. 101022585.

¹⁶ Dunphy, N., Revez, A., Lennon, B., & Brenner-Fließer, M. (2023). Typology of Energy Citizenship(s). ENCLUDE Project.

<https://doi.org/10.5281/zenodo.10005552>; Debourdeau, A. et al. (2021). Conceptual typology. EnergyPROSPECTS Deliverable 2.1, European Commission Grant Agreement No. 101022492.

¹⁷ Hajdinjak, M. et al. (2024). "Analysis of the online survey". EnergyPROSPECTS Deliverable 5.4, European Commission Grant Agreement No. 101022492.

more people to take part in democratic processes as well as citizen-led initiatives. However, this same mistrust has catalysed citizen action in the case of projects that strive for energy self-sufficiency and independence¹⁸.

A feeling that ordinary citizens have very limited power and agency to affect political ambitions and actions in relation to energy and climate was also found in the DIALOGUES Citizen Action Labs. Survey results also illuminate these sentiments: one third of the participants had the general impression that the government is not doing enough to guarantee access to affordable and clean energy; only 36% trust that the government will help their country to transition to sustainable energy in the near future, and 59% of the participants believe that the environmental taxes were not used properly¹⁹.

Challenges in legal, economic, and technological frameworks: *Am I able to take part in a citizen-based energy transition?*

In addition to socio-economic challenges and barriers related to trust and democratic processes, there also exist a number of regulatory, administrative, economic, financial, technical skills, and knowledge-related challenges. Citizens ask: *"Am I able of making changes and taking part in the energy transition or is it just talk?"*

The lack of consistent, coherent, and tailored regulatory frameworks combined with complex administrative processes and highly limited administrative support remain important impediments for citizens to engage in the energy transition, both individually and collectively. Similarly, economic frameworks are not well-adapted to active citizen engagement or citizen-led initiatives.

In general, economic frame-works reflect a top-down, producer-consumer relationship not well-adapted to more active forms of citizen engagement in the energy transition, such as self-consumption, energy sharing, local storage facilities and energy community involvement. Moreover, the general lack of readily available, understandable, and reliable information regarding regulations, procedures and possible fundings further complicates the endeavour. Lengthy administrative procedures also hamper citizen initiatives²⁰. These findings are supported by an in-depth study of 69 collective energy initiatives by ENCLUDE that found 48% of energy communities, for example, found that there was not enough support by authorities, 45% faced bureaucratic barriers, and 43% lacked access to funding²¹. This shows that even the most committed citizens in the energy transition perceive a lack support for their activities.

These challenges can hardly be addressed at the level of individual citizens since they related to *the ecosystem* of energy citizenship. This ecosystem encompasses notably the intermediation activities and intermediary actors that are enabling energy citizenship to take shape through various sorts of initiatives, as well as the transformative agency of energy citizenship. Here, policy makers have an important task to respond to these barriers and create an enabling environment in which energy citizenship can thrive. Supporting and strengthening the capacity of intermediary actors is an important priority in this regard.

Intermediaries and intermediation are a central part of emerging 'new' forms of governance aimed at accelerating the energy transition by helping energy citizenship initiatives to achieve their goals²². Many energy citizenship initiatives

¹⁸ Dunphy, N., Revez, A., Lennon, B., & Brenner-Fließner, M. (2023). Typology of Energy Citizenship(s). ENCLUDE Project European Commission Grant Agreement No. 10122791. <https://doi.org/10.5281/zenodo.10005552>

¹⁹ Zhan, M. *et al.* (2023). Pathways to deepening energy citizenship. DIALOGUES Deliverable 5.4, European Commission Grant Agreement No. 101022585.

²⁰ Bertel, M. *et al.* 2023. "Catalogue of potential legal and economic barriers and facilitators of energy citizenship". EC²

Deliverable 3.3, European Commission Grant Agreement No. 101022565.

²¹ Brenner-Fließner, M., Matowska, M., Schwarzingner, S. (2023). Report on survey and structured interview results for identifying potential emergence and consolidation factors. ENCLUDE Deliverable 3.1, European Commission Grant Agreement No. 10122791, <https://doi.org/10.5281/zenodo.10696080>

²² See, Markantoni, M. *et al.* 2023. "Strategic collective system building and institutional change: The nature and role of intermediation in making actors cooperate and transact with

face a range of obstacles to get their activities or projects up and running. Examples include a lack of knowledge, skills or resources, time-constraints, information asymmetry or communication problems. Intermediary actors act as bridge-builders and help initiatives overcome the diverse barriers they face.

Intermediary actors are highly diverse, from commercial actors (such as banks and law firms) to governmental actors and agencies, from educational actors to non-governmental collective or civil society organisations (such as umbrella organisations, cooperative networks, etc.) to key individuals or “intercessors” (i.e., individuals with original ideas, drive, skills, mediation abilities and the ability to create links and networks between different actors). Findings from the projects provide some key in-sights on intermediation activities:

- ▷ **A combination of intermediations** is needed for energy citizenship initiatives to achieve their goals, providing diverse services across the development stages of initiatives.
- ▷ **Financial and organisational intermediation** are the two most important types. Governmental, commercial, and non-governmental collective/umbrella organisations are particularly important for these types of intermediations.
- ▷ **Intermediation is not always successful or neutral**. In some instances, intermediary actors may champion certain innovations or represent certain interests that are influenced by their funding, which can endanger the contribution of energy citizenship to a more sustainable, just, and democratic energy system.

Exploration of transformative agency²³ and pathways for strengthening, lengthening, and deepening energy citizenship²⁴ highlight that, **much**

more than government and business, energy citizenship initiatives champion different ownership structures, give more attention to ecological sustainability and energy justice. Transformative agency depends on many factors: resources, empowerment, forward-thinking and attention to justice. The (transformative) agency of energy citizenship actors are dependent on their ability to obtain funding, to combine institutional logics and engage in work leading to institutional change (which in turn depend on their ability to lobby for specific institutional arrangements). It is enhanced by the presence of intermediaries and well-crafted strategies for achieving political and social change.

Recommendations: Pathways for energy citizenship

In the previous section we have outlined major barriers for energy citizenship across our four projects which contributes to citizens’ reluctance about engaging in the energy transition. In this section we lay out three pathways to overcome these barriers including concrete policy recommendations that European policy makers should consider in order to improve the enabling environment for citizen involvement in the energy transition.

Pathway I: Deep inclusion - ensuring meaningful inclusion in decision-making with marginalised groups in the energy transition

Deep inclusion within the energy transition means creating conditions which enable all people, including marginalised²⁵ groups and those with diverse perspectives, to all take part and make a difference in energy governance. Concretely, this means policy makers and organisers should: 1) Embolden participants to

each other”. EnergyPROSPECTS Deliverable 4.1, European Commission Grant Agreement No. 101022492.

²³ Kemp, R. *et al.* 2023. “Enhancing the transformative agency of energy citizenship. The transformative agency of social innovation actors”. EnergyPROSPECTS Deliverable 4.4, European Commission Grant Agreement No. 101022492.

²⁴ Debourdeau, A. and Markantoni, M. 2023. “Viable business models and strategies for growth and expansion. The economic-

transactional aspects of energy citizenship cases”.

EnergyPROSPECTS Deliverable 4.5, European Commission Grant Agreement No. 101022492.

²⁵ Specific groups of people who do not easily participate because of socioeconomic, demographic, attitudinal and/or cultural barriers.

voice their perspectives, 2) Ensure that these perspectives will matter for decision-making processes, and thus contribute to-wards realising energy justice.

This pathway is relevant to specific aspects of the challenges described previously and further identifies opportunities and recommendations to address these challenges. The recommendations are primarily targeting Member States and local and regional authorities but could equally be beneficial for participative exercises at the EU-level, such as citizen panels²⁶, and integrated into the knowledge base of the Competence Centre on Participatory and Deliberative Democracy²⁷.

The "why should I be the one to change?" challenge. People's willingness to become active in the energy transition is linked to a diverse set of values and needs, ones that may or may not be directly related to energy. These needs are inter-linked but distinct (for example, poverty, the need for collective belonging and community building, ability to control one's own access to resources, etc.). A siloed approach to discussing and making decisions about energy may discourage participation by those for whom issues of concern lie outside of the energy system but who might otherwise be motivated to use energy concerns as a vehicle of involvement.

Recognizing and acknowledging these different needs while talking about the energy transition could be a means to build public trust of institutions by exhibiting empathy (as opposed to pity or sympathy alone) for people in diverse situations in life. This would embolden participants to make their point-of-view known and allow an integration of the goals that people conceive for them-

selves and those that are determined by distant policymakers.

Recommendations

▷ In public documents and communications, **acknowledge that a diverse set of values and needs exist** that both encourage and discourage people's involvement in the energy transition. Rather than assuming that citizens respond primarily to financial incentives (which may be the case sometimes), take on a "human-centred" governance strategy that assumes people act according to their beliefs and values that may enrich rational considerations²⁸. *[European Commission, Member States, local and regional authorities]*

▷ In public participation events organised by authorities, **enable citizens to elicit, deliberate and prioritise values as a precursor to deciding** on a course of action. To equal the playing field of those who may be more verbal vs. those who are less comfortable to speak, consider approaches which are accessible to more people, like visualisation techniques and guided activities²⁹. *[European Commission, Member States, local and regional authorities]*

▷ **Recruit excluded and/or marginalised participants through local community organisations** where members of a disadvantaged group already meet voluntarily on a regular basis. The voices of the marginalised may have a better chance of being heard when there is more than one person or group representing this minority view³⁰. *[Local and regional authorities]*

The "why should I trust?" challenge: Participation organised by governmental authorities can often be perceived as an "empty ritual" rather than a means by which all voices will be equally heard and heeded. Though public participation activities

²⁶ European Commission: Citizens' Engagement Platform.

²⁷ Joint Research Centre: Competence Centre on Participatory and Deliberative Democracy.

²⁸ Brenner-Fliesser et al. (2023) and Matowska et al. (2023) from the ENCLUDE project found that leaders and members of collective energy initiatives were motivated to join these initiatives by their overall concern for environmental sustainability, self-sufficiency and gaining a sense of control over decisions in their community, sense of belonging to a community.

²⁹ These techniques have been tested with positive reactions through the ENCLUDE Academy and documented in Pearce, B., & Djinlev, V. (2022). Action-based online modules.. ENCLUDE deliverable 6.1. <https://doi.org/10.5281/zenodo.7319479>

³⁰ The approach suggested by Young, I. M. (2002). *Inclusion and Democracy* (1st ed.). Oxford University Press Oxford. <https://doi.org/10.1093/0198297556.001.0001> was followed during online sessions during the ENCLUDE Academy.

may be organised with the best of intentions, it still may appear to those who are invited that without a redistribution of power in the process of participation, it remains a frustrating process for those without power. In some of these processes, perhaps participants will be heard and able to hear, but there is no pathway by which their points-of-view will be acted upon.

The projects encountered plenty of dedicated citizens who are working towards the goals of the energy transition in all modes of participation. We have found that those who are already involved in both invited, and especially invented, modes of participation³¹ have a sense of self-efficacy in which they believe they have an important role in the energy transition and transformation. There is hope that this perspective can be shared by more people.

Recommendations

▷ **Clear communication about the purpose and out-come of participation.** Level with participants about the type of participation they will take part in and what kinds of outcomes they should expect. If participation is only for the purpose of consulting their opinion, for example, then it should not be framed as participants taking part in decision-making.³² *[European Commission, Member States, local and regional authorities]*

▷ **Boost perceptions of self-efficacy by sharing stories of citizen initiatives.** Be aware that the wording of policies linked to the energy transition value citizens primarily as consumers and passive agents of change, except in the case of energy communities.³³ *[European Commission, Member States, local and regional authorities]*

▷ **Stronger governance structures that ensure greater inclusivity and transparency when developing energy infrastructure, both at the local and national levels.** In addition, greater transpa-

rency by public representatives, when commenting on a local energy infrastructure project, whereby they must outline and reveal any campaign contributions received or relevant past work with a project lead. *[Member States, local and regional authorities]*

The "am I able to take part a citizen-based energy transition?" challenge: people are implicitly excluded from active participation due to the time, energy and financial resources needed for taking part in meetings and discussions. Most forms of participation in the energy system require extra time and resources. Without access to these extra resources, it is not reasonable to assume that those who are already in need of basic comforts will be likely to also participate in the same way. Strategies need to be developed which would make it possible for those with limited resources to also participate, given the understanding that trade-offs must be made when participation is expected.

Understanding and acknowledging the obstacles to active participation in the energy transition is an essential step towards realising inclusive governance. Being creative about removing obstacles to meaningful participation for those who are not currently active would allow institutions to work towards the goals of the just transition and work towards the ideals of energy justice.

Recommendations

▷ **Consider including processes of deliberation and discussion in the daily routine of those who are currently excluded.** Discussions and decisions about the energy transition can be incorporated into workplaces, childcare centres, and social services³⁴. *[Local and regional authorities]*

▷ **Consider measures that would provide practical support for people who would otherwise be unable to expend the time or effort to attend in**

³¹ Mirafteb, Faranak. (2004). Invited and Invented Spaces of Participation: Neoliberal Citizenship and Feminists' Expanded Notion of Politics. Wagadu. 1.

³² Refer to the survey results from Dunphy et al. (2023).

³³ Building on insights from Fritzsche, I., Barth, M., Jugert, P., Masson, T., & Reese, G. (2018). A Social Identity Model of Pro-Environmental Action (SIMPEA). *Psychological Review*, 125(2), 245–

269. <https://doi.org/10.1037/rev0000090>, the documented impacts of storytelling from the GreenFutures Initiative at University of Exeter and interviews from Matowska et al (2023).

³⁴ Young, I. M. (2002). *Inclusion and Democracy* (1st ed.). Oxford University PressOxford.

<https://doi.org/10.1093/0198297556.001.0001>

meetings and events about the energy transition. Ideas range from providing childcare at participatory meetings, timing the participation around holidays (during which those who are disadvantaged are not travelling and more available than those who are travelling), mandating a "deliberation day", or dedicating (and paying for) certain workdays for participation in the energy transition. *[Local and regional authorities]*

▷ **Address gender issues by analysing reasons for exclusion or misrepresentation** in the first place, looking at the energy perceptions, needs and wants of the less represented, and finding entry points for organisational reforms at the initiative level. *[Euro-pean Commission, Member States, local and regional authorities]*

▷ **Provide opportunities for citizens with restricted financial options to engage** in collective energy initiatives without payment obligations. *[Local and regional authorities]*

Pathway II: Boosting innovation in democratic engagement and building institutional trust

To enable energy citizenship practices through innovation in democratic engagement, policy makers need to consider three interlinked questions: What shared perceptions around the energy transition exist; what skills and competencies do people have, for example to work collectively towards a common goal; and what spaces are available for them to do so? By providing answers to these questions, our recommendations can provide policy makers with tools to build institutional trust and boost citizen engagement in the energy transition.

This pathway of boosting innovation is relevant to specific aspects of the challenges described pre-

viously and further identifies opportunities and recommendations to address these challenges.

The “why should I trust” challenge: Without spaces where collective visions can occur, the energy transition risks remaining an abstract process for most citizens. The dominant narrative of citizens as consumers in the energy market furthermore hinders collective forms of energy citizenship.

The discussion of energy is in of itself a means for creating a shared vision of the future. Such discussions can help people to come together, reflect on the future and recognise how visions of the future can have an impact on decisions being made in the present. Engaging in change must go beyond tap-ping into individual preferences to the collective need for justice in terms of distribution, representation, and procedure. For example, each of the projects³⁵ created spaces or tools where and with which people could experiment with new know-ledge, share meanings and aspirations, develop new competencies, and generally come together to imagine and act in the energy transition. Clear and accessible information can further-more enable collective engagement in the energy transition.

Recommendations

▷ There is a **need for granular surveys** on the social determinants of support for different energy transition policy measures, both at the national and EU-level. The IFOP/RTE study on French decision making mechanisms on energy consumption can be seen as a good practice. Such data could complement participatory and deliberative exercises at different levels of government. *[European Commis-sion, Member States]*

▷ The **EU should strengthen provisions on public participation and consultation** under the regulation on the Governance of the Energy Union and Climate Action (2018/1999). This could

³⁵ Clément, G. et al. 2022. Guidebook for designing and implementing Citizen Action Labs and Recruitment to the Citizen Action Labs. DIALOGUES Deliverables 5.3 and 6.1 European Commission Grant Agreement No. 101022585; Pearce, B., & Djinlev, V. (2022). Action-based online modules. ENCLUDE deliverable 6.1. <https://doi.org/10.5281/zenodo.7319479>;

Dimitru, A. et al. (2023). “Empowerment toolkit and knowledge repository”. EnergyPROSPECTS Deliverable 3.6, European Commission Grant Agreement No. 101022492.; Enclude academy for energy citizenship leadership; and EC² Community Energy Academy.

be done for example by supporting Member States in setting up Citizen Climate Assemblies at the national and local levels in relation to update of their National Energy and Climate plans that is set to take place every five years. In organising such democratic processes, the recommendations in the pathway above should equally be considered. *[European Commission, Member States]*

▷ The transposition of the recast EU Renewable Energy Directive (2018/2001) mandates the introduction of single contact points to provide guidance and facilitate the administrative procedures for applicants undertaking renewable energy projects (developers, energy communities, self-consumers) throughout their administrative permit application and granting processes. The Irish introduction of a “single point of contact” could be seen as a good practice³⁶. This mission could be complemented with providing information on benefits, economic viability, and available subsidies for renewable energy, especially targeting citizens with no prior technical knowledge. *[European Commission, Member States]*

▷ EU initiatives such as the Energy Communities Repository, Rural Energy Community Advisory Hub and the Energy Poverty Advisory Hub could design calls for proposals to **fund existing collective energy initiatives in creating projects to support the development of skills and competencies** for community participation in their wider communities. *[European Commission]*

Pathway III: Creating a supportive ecosystem for inclusive energy citizenship

A series of measures could fruitfully be implemented to establish a more supportive environment at various levels (EU, member states, regions, local authorities) for initiatives aimed at enhancing energy citizenship. Overall, three over-arching recommendations could help shifting the power-balances of the current energy system to pave way for both individual and collective citizen inclusion in the energy transition:

redefining energy as a public service; redistributing profits from incumbent energy actors; and shifting the profit-maximising paradigm to a sufficiency paradigm.

This pathway of creating a supportive ecosystem for inclusive energy citizenship is relevant to specific aspects of the challenges described previously and further identifies opportunities and recommendations to address these challenges. **To respond to the “am I able to take part in a citizen-based energy transition?” challenge**, we provide recommendations which would represent strong leverages toward a citizens-friendly eco-system in the energy domain.

Recommendations

▷ Increase the support targeted towards vulnerable households by raising the financing envelope for the Social Climate Fund, for example through the earmarking of more revenues from the European carbon markets³⁷. *[European Institutions]*

▷ **‘Rewire’ the current financial models and funding schemes to be more accessible and flexible.** This depends on the removal of bureaucratic hurdles and improve support, for example through one stop shops for REC/CEC, as well as the removal of non-sustainable subsidies and the redirection of funds and resources towards citizen-led and community-based initiatives that support local action and employment opportunities. *[European Institutions, Member States]*

▷ **Speed up and adapt further the transposition of Renewable Energy Communities (REC) and Citizen Energy Communities (CEC) frameworks** and support structures at the national level. Adapt the legislative and regulatory framings to the diversity of local and regional contexts, to ensure that laws relating to energy are coherent at all levels of government, and also with related legal areas, such as property and spatial planning law, by involving more substantially regional and local governments. Ensure that the transposition limits

³⁶ See for example, the single point of contact set up by the Sustainable Energy Authority of Ireland.

³⁷ Defard, C. (2022). The need for a socially-just European Green Deal. Policy paper. Jacques Delors Institute.

cooptation of these models by incumbent businesses.

▷ **Create a European Facility for Citizen Involvement to support citizens involvement** in all kinds of energy transition initiatives. This facility could serve to complement the Energy Communities Repository by supporting initiatives beyond energy communities, for example led by public actors (at the local or regional levels), NGOs, citizen-based organisations, or businesses, and provide tools, recommendations, and best practices on how to involve citizens in local initiatives and enhance energy citizenship values in such endeavours.

▷ **Strengthen support to enhance environmental sustainability aspects** within innovative energy transition initiatives, for example by enhancing competencies to calculate carbon emissions impacts of projects and sharing of best practices. *[Member States, local and regional authorities]*

Recommendations targeting publicly run initiatives

▷ **Increase direct citizens' involvement and control capacities within publicly led projects**, for instance through the systematic creation of some "citizen co-decision structure" within initiatives that target the citizens. This needs to be done with respect and care for the citizen-based approach to avoid local and regional authorities appropriating citizen-based mechanisms. *[Member States, Local and regional authorities]*

▷ **Increase the innovation capacity of local and regional authorities.** This means creating a supportive innovative environment where new types of energy transition projects with citizen-involvement can be tested and developed, by ensuring adequate human resources, competencies, and financial capacities to experiment. *[Member States]*

▷ **Support the development and replication of innovative financial tools** (such as the [Haut-de-France Pass Renovation](#) third party financing scheme) through networks where best practices

can be shared, and support can be given for their implementation. *[European Commission, Member States]*

▷ Develop tailored and dedicated legal measures and political efforts to counteract dynamics of exclusion of marginalised socio-economic groups in an attempt to increase representation and tackle energy poverty. This could include, for instance, targeted financial support, regulatory changes, or communication strategies. With regards to regulatory changes, the draft law currently discussed in Germany concerning tenants' rights to plug-in solar devices is an interesting example.

▷ Develop strategies for boosting energy literacy within and beyond innovative energy transition initiatives through "**Next Door Energy Literacy**", i.e. by operating on a citizen-to-citizen level to raise interest and appeals to citizens' everyday lives and challenges. *[Local and regional governments]*

Recommendations targeting organisationally based initiatives

▷ Create an enabling environment within local and regional business ecosystems to increase innovative capacity and promote partnerships between the private sector, public sector, and citizen-led organisations. *[Member States, local and regional governments]*

▷ **Support capacity-building, professionalisation, and exchange structures/networks** to share knowledge and good practices, such as the Selbstbau.solar network.

▷ **Support the creation of solidarity structures among organisations** that could mutualise resources to enhance the resilience of the organisations' eco-system in situations of crisis (e.g. Covid crisis).

▷ Enable (legally) and support (financially) **alternative financing tools and funding models** to enable social innovations' viability over time.

Recommendations targeting community-based initiatives

- ▷ **Earmark EU-funding and technical assistance for continuous support of citizen-based organisations**, for example in initiatives like the Green Assist project and the Energy Poverty Advisory Hub. *[Euro-pean Commission]*
- ▷ Support community-based organisations in improving energy citizenship values in their projects. *[Member States, local and regional authorities]*
- ▷ **Enhance environmental sustainability aspects of initiatives**, for example, by providing recommendations and support on how to carry out carbon emission calculations and facilitating the sharing of best practices.
- ▷ **Co-developing strategies and diffusing best practices for participation beyond financial contribution** and toward the inclusion of the most vulnerable or minorities that are currently under-represented (women, migrants, etc.).
- ▷ Offering training on intercultural sustainability communication and gender diversity within and beyond organisations can help in the integration of epistemic justice values.

Energy citizenship in the making

Across all our projects, we find a common thread in understanding energy citizenship and how to make it a meaningful concept. That is, people are people rather than "just" energy citizens. They have lives filled with many of their own concerns. They live in a technical, political, and social system that does not always recognize their challenges. Under these circumstances, it is hard to act, even if they recognize the importance of the energy transition.

Therefore, a human-centred approach to governance and decision-making processes would approach a complex challenge with

empathy, especially to those who may already be struggling with existing stresses of daily life. This means that diverse needs and values of the populace are considered in decision-making processes. It is an approach that would inherently account for distributional, procedural and recognitional forms of justice.

An energy citizenship approach to the European energy transition recognises that everyone needs a place in the transition, and also acknowledges the differentiated responsibilities that people can take on, considering that not everyone wants or has the capacities to participate in the same way. Euro-pean policy makers therefore need to ensure that the changes that result from the energy transition are transparent, accessible, and affordable, taking particular care of the most vulnerable. Policy makers should also aim to make it simpler for those citizens who want to contribute more to changing the status quo. They could do this by, for example, by adapting and simplifying legislation, providing administrative support, provide network opportunities and ensuring access to financing for collective energy citizen-ship initiatives.

Such an approach is needed to make it possible for citizens to take an active role in the energy transition, to be the catalysts of change, rather than merely react to change. Supporting the capacity to act on information requires creating spaces for engagement and providing the conditions which make it feasible for people to join in. To do this, however, policy makers have an important role in creating conditions in which all people have the capacity to join in the effort and to ensure that these efforts will have real impact in shaping their own and our collective future. The policy recommendations introduced in this brief provide policy makers with pathways that mark important steps towards an inclusive European energy transition.

The energy citizenship projects



EC² explored barriers and enablers to energy citizenship from a psychological, legal, and economic perspective. The research has involved municipalities, energy communities and citizens in the attempt to get a comprehensive and multi-dimensional perspective on energy citizenships and its potential to foster and accelerate the shift towards a people-based energy transition. Finally, EC² developed tools and methodologies aimed at supporting the mainstreaming of energy citizenship and community energy initiatives. The main methods used were experimental lab and field studies, experiments, case study research, co-creation workshops, and a survey based on around 16,000 citizens.



ENCLUDE aimed to understand the diverse expressions of energy citizenship, as well as to operationalise and mobilise the concept by co-producing and co-creating knowledge with citizens themselves. The project engaged 850 energy citizens to create a typology of energy citizenship. We incorporated these expressions of energy citizenship in agent-based models and an integrated assessment model to consider the decarbonisation potential of diverse collective actions at multiple scales of policy and decision-making. The project also created the ENCLUDE Academy for Energy Citizen Leadership, a global program for leadership development based on design and system thinking to help mobilise bottom-up participation in citizen engagement in Africa and the EU. At this last stage of the project, we will be launching the ENCLUDE Interactive Policy Platform, which will collect, visualise, and help transfer learnings from diverse energy citizenship initiatives for more people and places.



EnergyPROSPECTS examined how energy citizenship can contribute to a more just, democratic, and sustainable energy transition through inter- and transdisciplinary research. Both a conceptual framework and a typology allowed to capture the whole breadth of energy citizenship, including its actual and potential, as well as its latent and manifest forms, the related issues, and the way they all take part in the energy transition. This was followed up by the identification of the enablers and barriers for the development of energy citizenship at the EU-level and in the 9 partner countries. 596 cases of energy citizenship were mapped, of which 40 were studied in-depth. The project drew on a wide range of social science and humanities disciplines, such as geography, governance studies, and social innovation and transitions research. The main methods used were case study research, co-creation workshops and a survey with participation of 10,000 citizens across Europe.



The key focus of **DIALOGUES** was the co-creation of energy citizenship innovations that integrate the perspectives of groups currently on the margins of the energy transition such as women, low-income households, the energy poor, ethnic minorities, but also wealthy households. The central methodological pillar of DIALOGUES was grounded in tested inter- and transdisciplinary techniques, with a spotlight on open innovation and co-design of the research process through nine novel Citizen Action Labs in eight countries. To support the policy and research communities, DIALOGUES aimed to move the idea of energy citizenship forward to an operational concept and to offer actionable policy insights, applied research tools and a unifying theory for citizen-oriented energy research.



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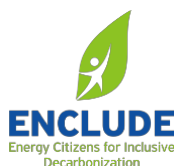


**Funded by
the European Union**

These projects have received funding from the European Union's Horizon 2020 research and innovation programme under the following Grant Agreements: EC2 no. 101022565; ENCLUDE no. 101022791; EnergyPROSPECTS no. 101022492; DIALOGUES no. 101022585



4 Appendix 2 – Agenda of the final event



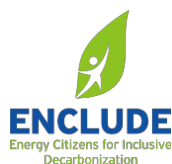
ENCLUDE:

Energy citizenship for inclusive and just transition

Venue: La Vallée, Brussels, Belgium and online

Day: 25th September 2024

Activity	Time
Arrival and Registration	09:00 – 09:30
Welcome message BinBin Pearce, TU Delft, ENCLUDE Coordinator	09:30 – 09:40
Topic #1 - Energy Citizenship is for everyone! <i>This session explores the definition of energy citizenship and builds on the work of both ENCLUDE researchers, as well as other projects on the topic which have recently ended</i> Questions for the audience: Do you consider yourself to be an energy citizen? What is the vision you have of the concept of energy citizenship?	09:40 – 10:10
Topic #2 – “What have we learned about Energy Citizenship that can be implemented by others?” <i>This session introduces the tools that ENCLUDE has developed for practitioners wanting to initiate energy initiatives of their own and for those who want to support them.</i> Discussants: ☐ Tessa Dunlop, JRC (online) ☐ Vaggelis Marinakis, City of Athens (online)	10:10 – 10:40
Topic #3 – “Looking ahead – Energy Citizenship for the Future”- Mobilizing energy citizenship can be a means of the challenges standing in the way of systemic change. <i>This session explores how policymakers can create systems of support that would make it more likely that energy citizenship can be aligned with the goals of the energy transition.</i> Discussants: ☐ Sam Odong, ENCLUDE Academy (online)	10:40 – 11:10



☐ Cornelius Chen Chen, ENCLUDE Academy (on-site)	
Coffee Break (collection of questions online and in-person)	11:10 – 11:25
Panel discussion: Energy citizens in context <i>This panel will discuss the linkages between ENCLUDE and work carried out by energy citizens on the ground.</i>	11:25 – 12:30
☐ Presenter and panelist: Nives Della-Valle, EC (online)	
Co-panelists:	
☐ Elissavet Mpargianni, City of Athens (online)	
☐ Tessa Dunlop, JRC / CC-DEMOS (online)	
☐ Mattijs Taanman, GovernEUR (on-site)	
Moderator: BinBin Pearce, TU Delft, ENCLUDE Coordinator	
Wrap Up	12:30 – 12:40
Lunch & Networking (Poster session)	12:40 – 14:00
Understanding the ENCLUDE's impact outside of the EU Presenters: Cornelius Chen Chen, ENCLUDE Academy Sam Odong, ENCLUDE Academy	14:00 – 14:15
Discussion <i>This session will help to decide on the follow-up next steps in the application of the outputs of ENCLUDE – what are connections to ongoing and future projects?</i> <i>How do we extend the impact of the project?</i> <i>What do we still not know about energy citizenship?</i> <i>What do we still need to work on to realize energy transition?</i> <i>How do we contribute to these needs in research and in practice?</i>	14:15 – 15:45
Moderator: BinBin Pearce, TU Delft, ENCLUDE Coordinator	
Summary of discussions	15:45 – 16:00
Facilitator: Alexandros Flamos, University of Piraeus (UNIP)	
Closing remarks BinBin Pearce, TU Delft, ENCLUDE Coordinator	16:00 – 16:05
Apéro	16:05 – 17:00



5 Appendix 3 – Presentations shown at the final event

The slides that were presented in ENCLUDE's final event are shown in the next 73 pages and can be also found on the link below:

ENCLUDE (2024). Project results – September 2024 (presentations). ENCLUDE.
https://encludeproject.eu/sites/default/files/2024-09/ENCLUDE_final_event_presentations.pdf



ENCLUDE project has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreement No 101022791



ENCLUDE
Energy Citizens for Inclusive
Decarbonization

Energy Citizenship is for everyone!

Dr Niall Dunphy / University College Cork
Dr Michael Brenner-Fließer / Joanneum Research



Th!nk E

slido

Please download and install the
Slido app on all computers you use



**Do you consider yourself an
energy citizen?**

① Start presenting to display the poll results on this slide.

slido

Please download and install the
Slido app on all computers you use



**Which words come to mind
when you hear the term ‘Energy
Citizenship’?**

① Start presenting to display the poll results on this slide.

Envisioning an ‘Energy Citizen’



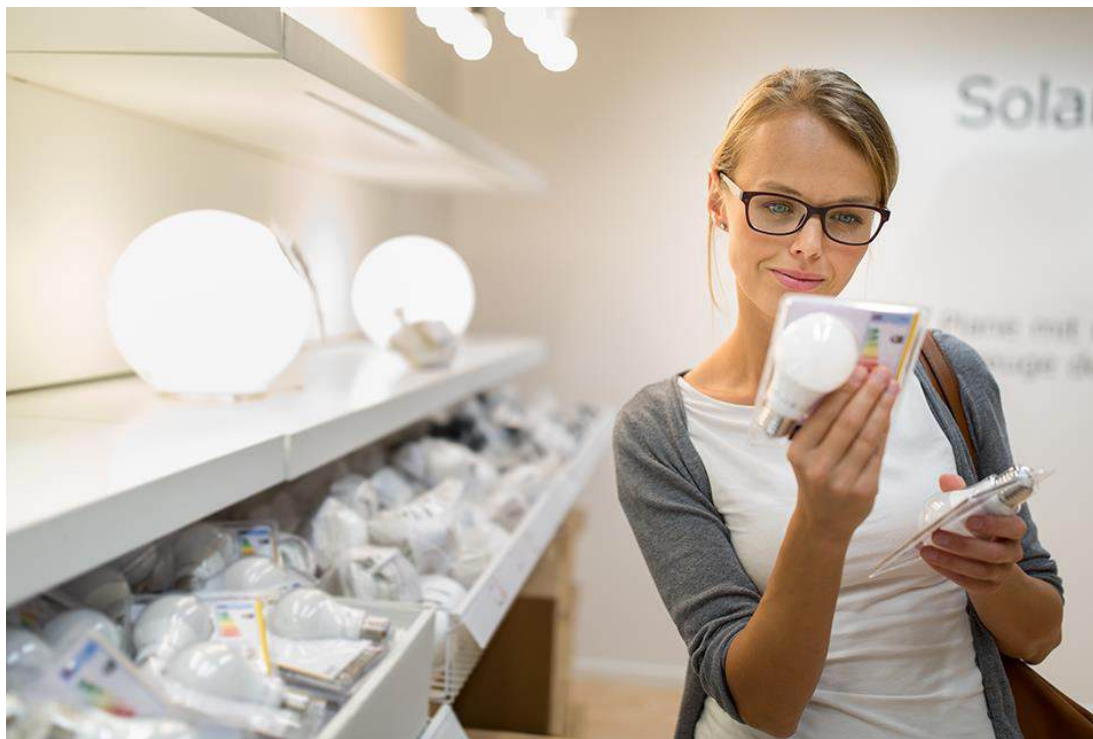
Envisioning an ‘Energy Citizen’



Envisioning an ‘Energy Citizen’



Envisioning an ‘Energy Citizen’



30/09/2024

Envisioning an 'Energy Citizen'



Envisioning an 'Energy Citizen'



Energy Citizenship



- If we conceive of energy systems as functional socio-technical systems, what exactly is the space for citizenship?
- The idea of ‘energy citizen’ is increasingly appearing in policy discourse signifying expansion beyond traditional role as ‘energy consumer’.

Energy Citizenship



- It can be said that neologisms such as *prosumers*, *active consumers* and *energy citizens* act as place holders for new roles and responsibilities.
- Although the precise contours of what this might involve are often left open.

Citizenship as belonging



- Traditional ideas of citizenship tend to be associated with formal membership of a polity.
- Such membership, is typically predicated on belonging to a particular people.
- In effect such citizenship defines who “belongs” to the political community (and who doesn’t) and the status that confers.

Citizenship as belonging



“inclusion and exclusion represent the two sides of citizenship’s coin.”

Lister (2002, p. 98)

Citizenship as belonging (and not belonging)



Citizenship



Terms like citizenship and citizen are powerful, with connotations

- ... of status and standing,
- ... of belonging and connection,
- ... of responsibilities and duties.

Civic republican tradition



- Draws from from the experiences of Athenian democracy, Republican Rome, medieval Italian city-states, *etc.*
- Citizenship is seen as a “practice”. It is based on duties and responsibilities and emphasises political agency.
- Active participation is defining feature. In the words of Rousseau, *“obedience to the law one has prescribed for oneself is freedom”*.

Liberal tradition



- Constructs citizenship as a “status”, focuses on fundamental rights.
- Within the Roman Empire, citizenship came to mean being protected by the law rather than participation.
- Status as a citizen is important primarily in so much as it protects freedoms from interference from others and from the state.

Cosmopolitanism



- Acknowledgement of a shared humanity, the idea we owe a duty above all to the global community of people.
- Dobson's idea of post-cosmopolitan citizenship adds a perceived obligation of justice to the idea of common humanity .

Energy Citizenship Typology



“All forms of participation – whether invited or uninvited, insider or outsider – are always orchestrated and framed in powerful and highly partial ways, and are thus subject to exclusions”

(Pallet *et al.* 2017, p. 607)

Energy citizenship



- We start from the position that an energy citizen is not something one becomes, it is not something one earns
- It is something that inherently exists by virtue of people's existing close relations with energy and the energy system

Energy citizenship



- We posit that energy citizenship can be expressed in multiple, overlapping, and sometimes transitory ways.
- We note that an individual's expression of citizenship(s) in the energy sphere is strongly influenced by their socio-economic privilege and life experience.

Energy citizenship



- Energy citizenship comprises a hybrid of civic republican & liberal traditions of citizenship. It involves a combination of rights and responsibilities.
- Depending on a particular expression it is underpinned by key sustainability and social justice principles reflecting attributes of cosmopolitanism and post-cosmopolitan citizenship.



‘Energy citizenship’

“the map is not the territory
no map represents all of 'its' presumed territory
maps are self-reflexive, i.e., we can map our maps
indefinitely.”

Alfred Korzybski

Similarly, we cannot capture all representations of
energy citizenship

Korzybski, A. (1995). *Science and Sanity: An Introduction to-Non-Aristotelian Systems and General Semantics* (5th ed.). New York: Institute of General Semantics.

Access to energy



- Those who find themselves expressing energy citizenship in this framing are marginalised, by the energy system by the economic system and possibly by wider society.
- They either operate outside of existing energy system structures or are negatively impacted by these structures.

Expressions of energy citizenship: Access



Excluded



Dispossessed



Energy Poor



EnergyCitizenship.eu

Energy Consumption



- The second way in which energy citizenship can be expressed is through the traditional relationship citizens have with the energy system, as a consumer.

Expressions of energy citizenship: Consumption



Active consumer



Digital native



Energy champion



Collectivist-consumer



EnergyCitizenship.eu

Energy Production



- The third mode of participation, and perhaps the most prominent in people's mind, is production-orientated.
- It encompasses the various ways in which citizens produce energy individually or with others.
- Hybrid configurations, *e.g.*, prosumption, offer potential for greater personal energy security.

Expressions of energy citizenship: Production



Prosumer



Self-consumer



Collectivist-producer



Citizen-investor



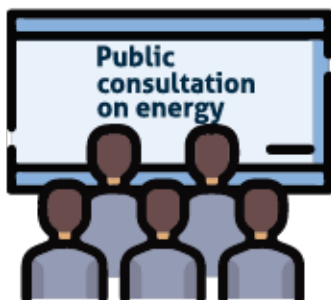
EnergyCitizenship.eu

Socio-political



- The fourth mode of citizenship participation around energy is in the (socio-)political arena.
- The highly regulated (almost quasi-public) nature of energy governance lends itself to this mode of involvement.
- This mode of participation is centred on decision-making processes, practices and outcomes.

Expressions of energy citizenship: socio-political



Citizen-litigator



Citizen-challenger



Citizen-activist



Disenfranchised

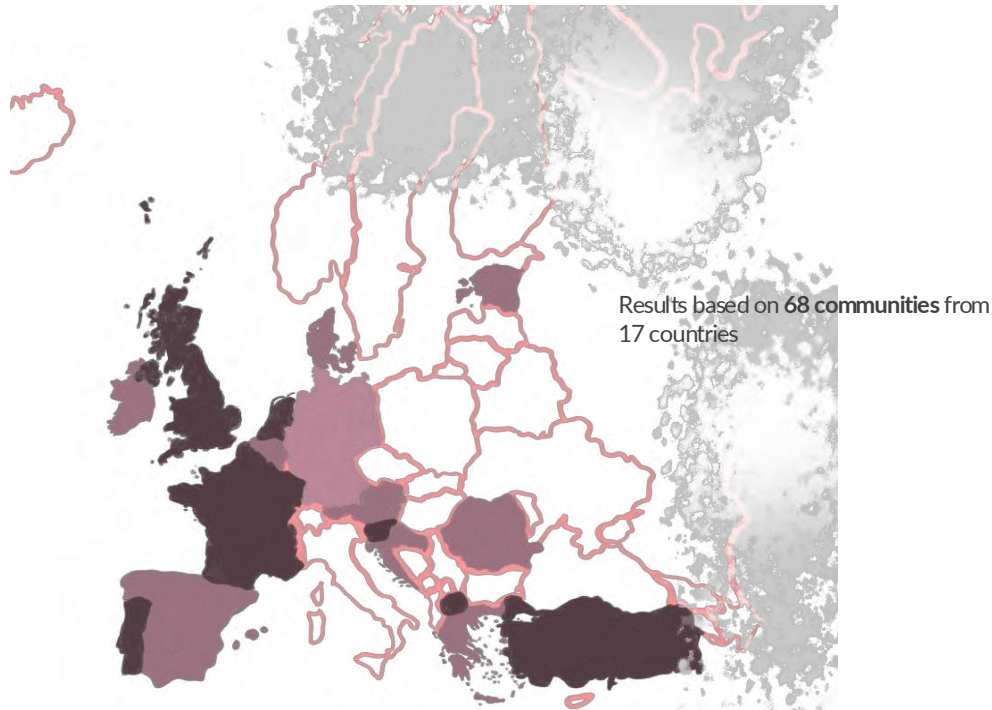


EnergyCitizenship.eu

Looking at energy citizens from a collective lens

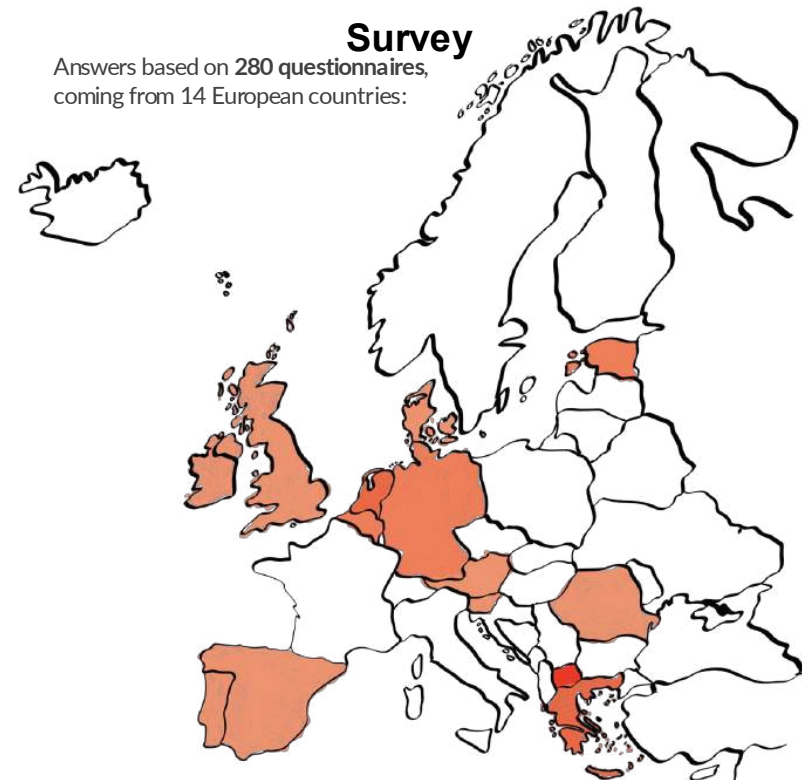


Case-Study Pool



Survey

Answers based on 280 questionnaires, coming from 14 European countries:



30/09/2024



Responses per country:



35

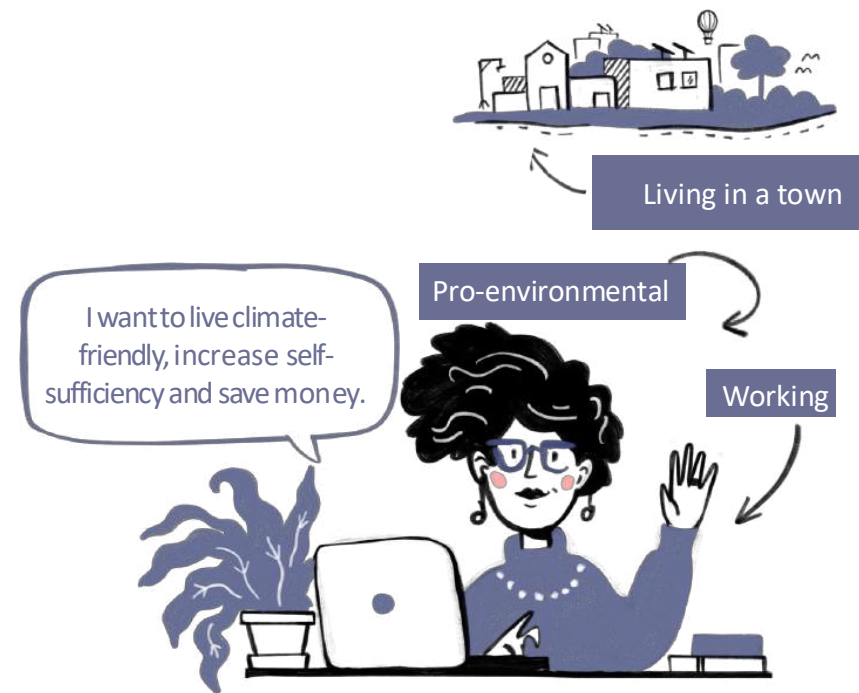
Looking at energy citizens from a collective lens



Energy Communities and Eco-farms



Collective Targeted Actions



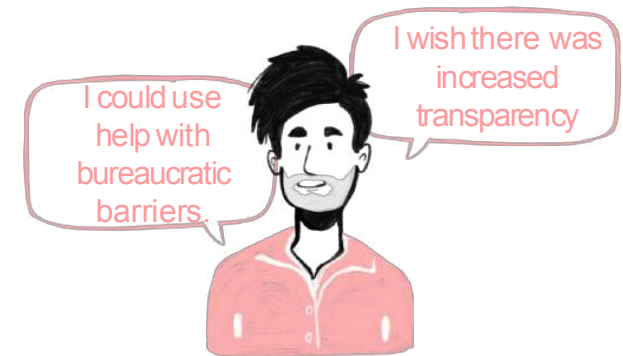
Looking at energy citizens from a collective lens



Political Collectives



Looking at energy citizens from a collective lens



Conclusion



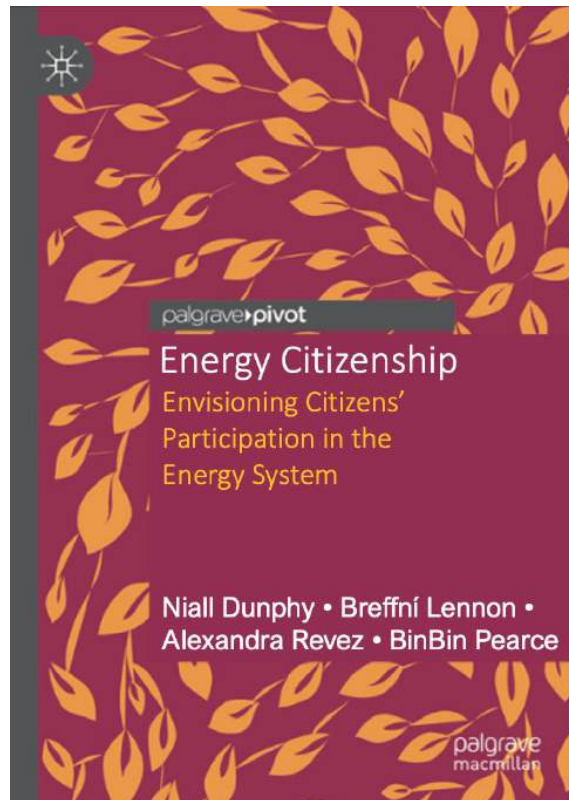
*To encourage more active participation in the energy system,
authorities and organizations must recognize and support the
diverse forms of active energy citizenships*

Forthcoming book

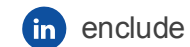


Energy Citizenship: Envisioning Citizens' Participation in the Energy System

Expected publication November 2024



Follow us on social media for updates



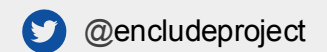
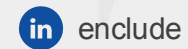
Thank you!



ENCLUDE project has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreement No 101022791



www.encludeproject.eu





ENCLUDE

Energy Citizens for Inclusive
Decarbonization

**Energy citizenship
for inclusive and just transition**

*Topic #2 – “What have we learned about Energy Citizenship that
can be implemented by others?”*

Dr. Vassilis Stavrakas, Prof. Dr. Alexandros Flamos

Technoeconomics of Energy Systems laboratory (TEESlab)
University of Piraeus Research Center (UPRC)

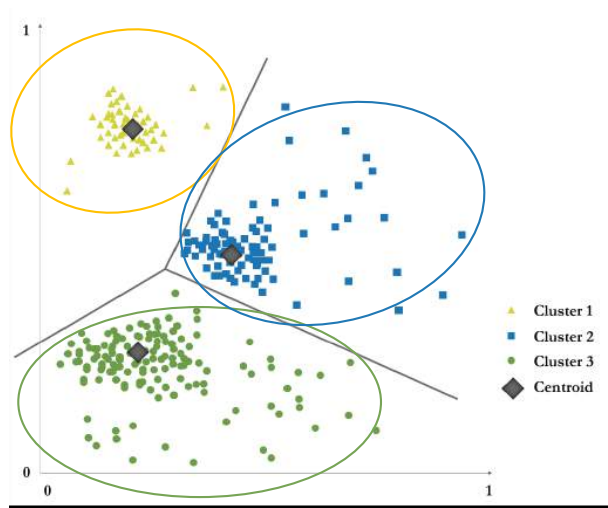
Dr. Sobhan Naderian, Prof. Gioia Falcone

University of Glasgow (UoG)

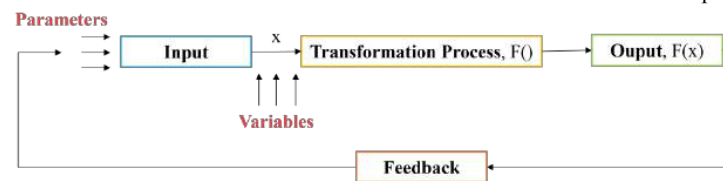
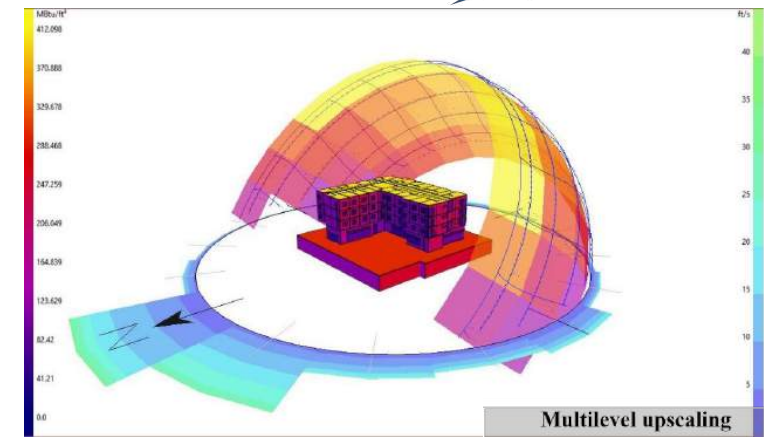
25 September 2024, Brussels



Data-driven clustering algorithms & Simulation models



Different (energy) citizen clusters

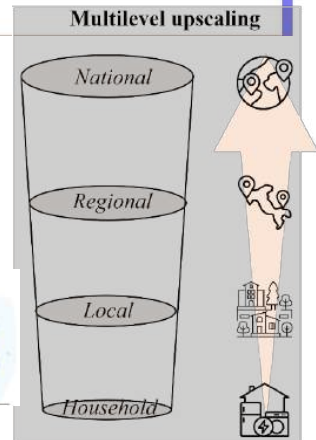


Decarbonization potential

Economic benefits



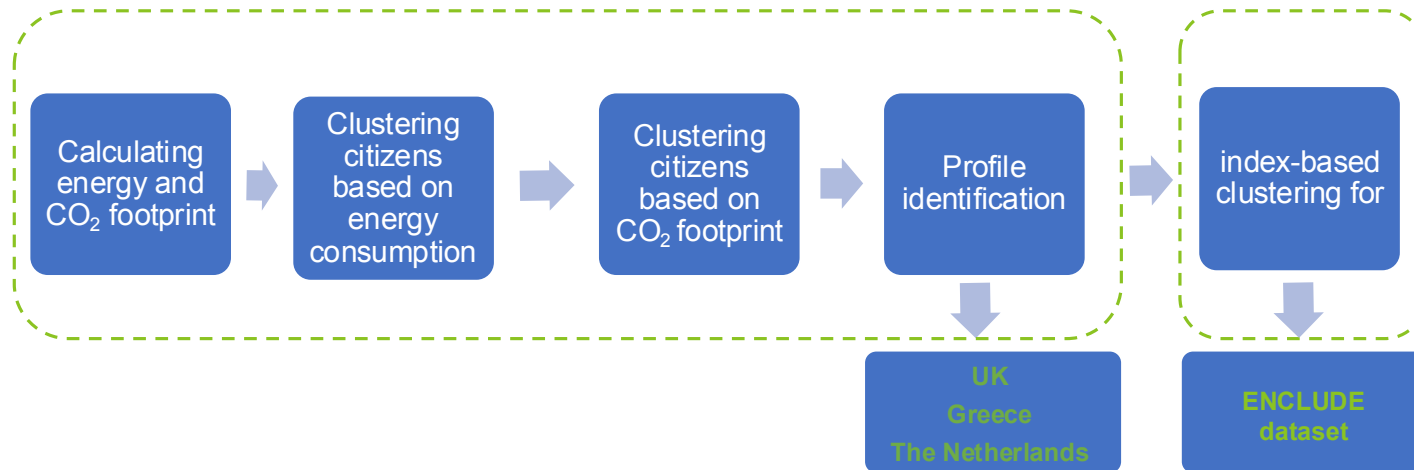
Social benefits



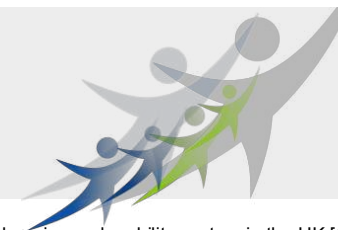
Data framework for clustering citizens – overview



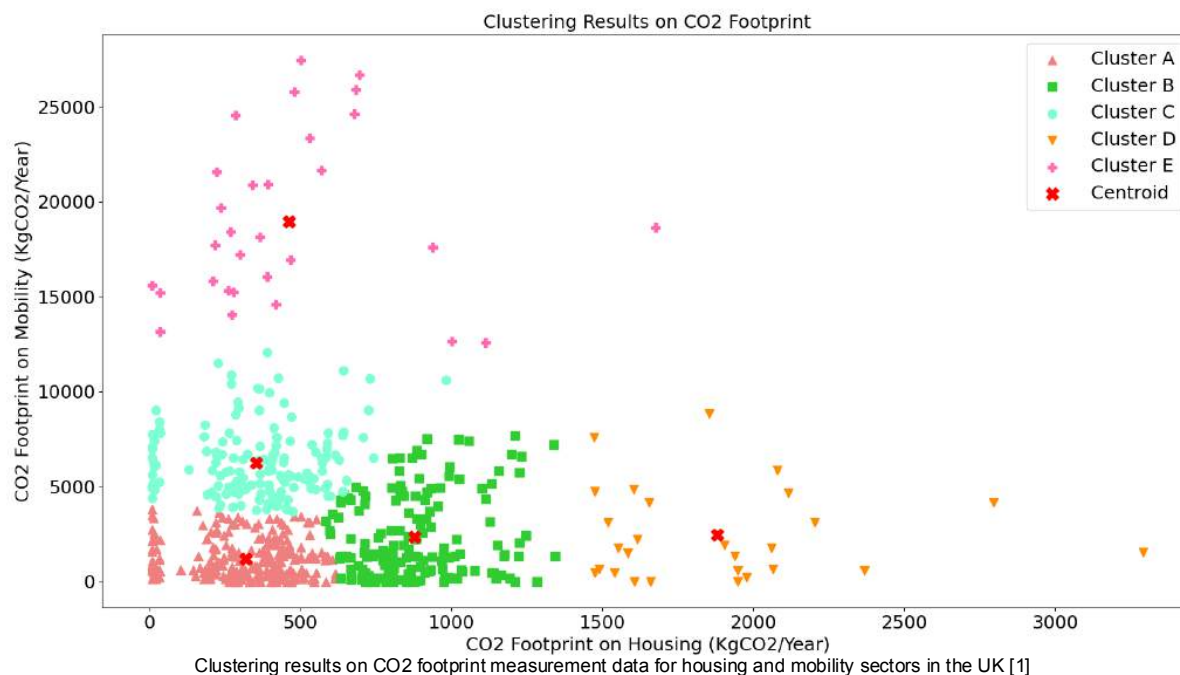
ECHOES dataset



K-means clustering method for clustering citizens based on carbon footprint – Results for ECHOES dataset – UK



Clusters result for CO2 footprint measurement data for the housing and mobility sectors in the UK [1]

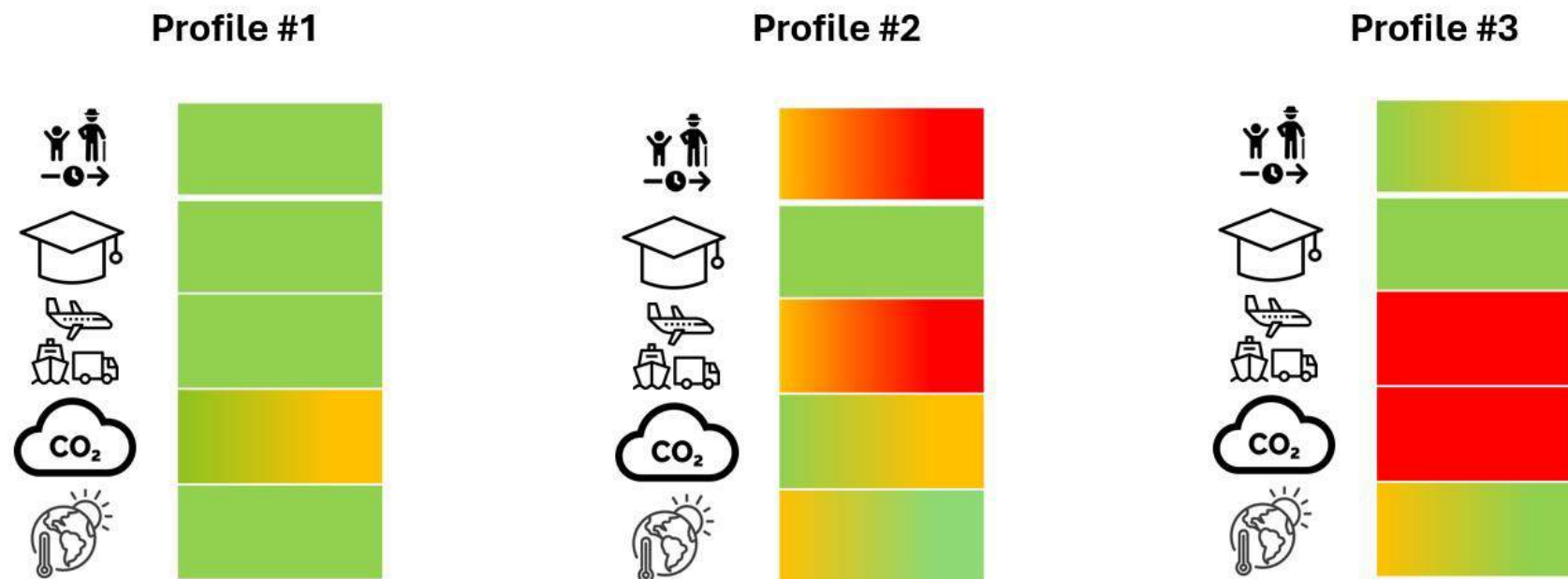


Cluster	Population	Centroid location on housing CO ₂ footprint (kgCO ₂ /year)	Centroid location on mobility CO ₂ footprint (kgCO ₂ /year)
A	247	320.63	1180.30
B	161	878.96	2343.67
C	157	352.97	6234.85
D	27	1881.56	2475.36
E	30	463.25	18935.05

Profile results for CO2 footprint clustering based on within-cluster statistics for the UK [2]

	Profile #1	Profile #2	Profile #3
Age range	19-34	>65	35-49
Education	College	College	College
Population %	64.95%	30.22%	4.82%
Energy on Mobility	Low	Low to medium	High
CO2 Emissions (housing and mobility)	Low	Medium to high	High
Climate Change Perception	positive	Neutral to positive	Neutral to positive

Profile development for citizens based on clustering results of CO₂ emission for ECHOES dataset – UK

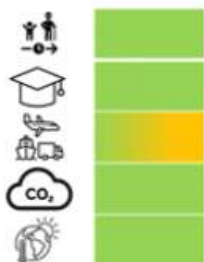


Energy citizens profiles based on clustering results and within-cluster statistics for the UK [1]

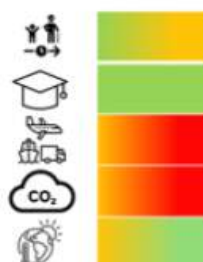
Profile development for citizens based on clustering results of CO₂ emission for ECHOES dataset – Greece and the Netherlands



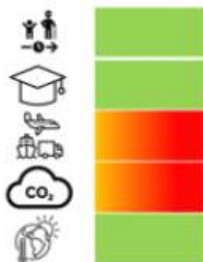
Profile #1



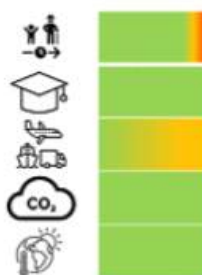
Profile #2



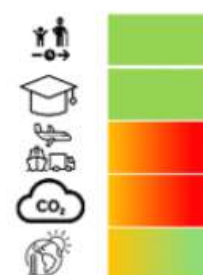
Profile #3



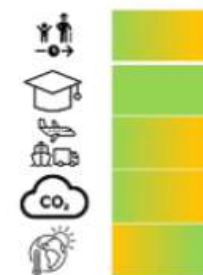
Profile #1



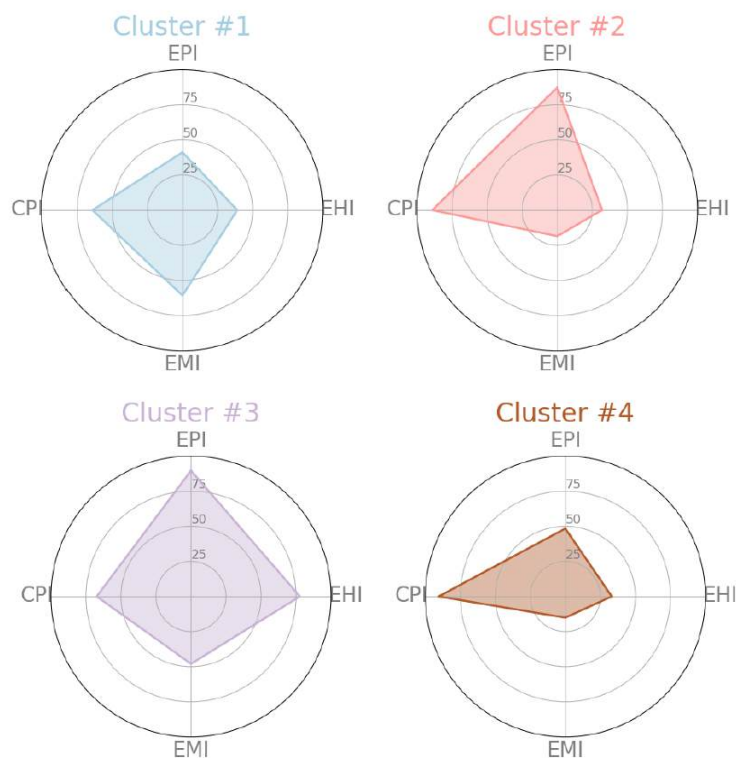
Profile #2



Profile #3



In ENCLUDE we did...



Spider plots of index-based clustering results for each of the four clusters [1]

- Clustering ENCLUDE data via defined indices based on answers to questions in 4 categories: **Energy poverty, Mobility, Housing, and Climate Change Perception** [1].
- The aim is to calculate indices for each category using simple addition of answers which are mapped into meaningful numbers.
- 4 indices are defined (rescaled to 0-100) for each respondent based on relevant questions to each index [1].
- k-mean clustering method is applied to the full data set

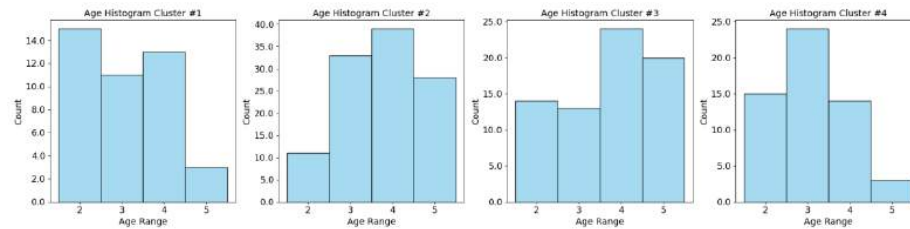
Cluster	Population	Energy Poverty Index	Energy Housing Index	Energy Mobility Index	Climate Perception Index
1	111	41.12	39.08	60.80	64.28
2	76	87.22	31.98	18.57	89.18
3	54	89.62	77.81	47.99	67.37
4	42	48.37	33.18	15.10	90.47

[1] Naderian, S., Ioannou, A. and Falcone, G., D4.3 – Report on bridging clusters for decarbonization with energy models

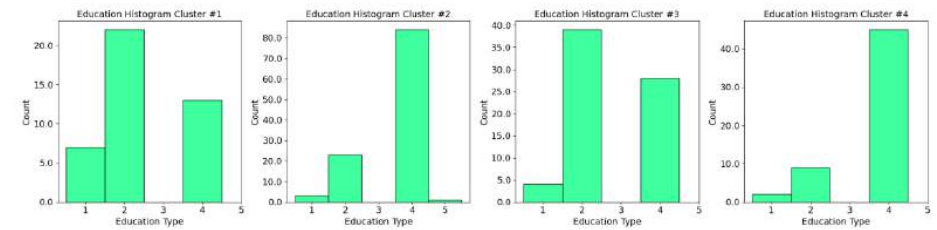
In ENCLUDE we learned...



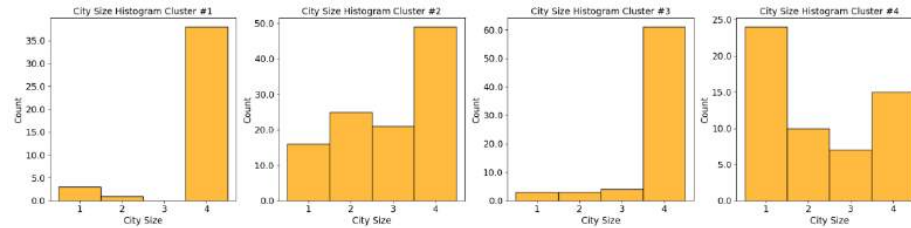
Age



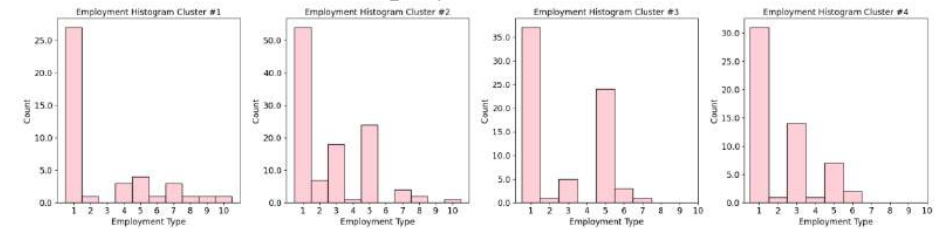
Education



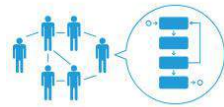
City Size



Employment status



In ENCLUDE we did...



*Agent-based
Models*

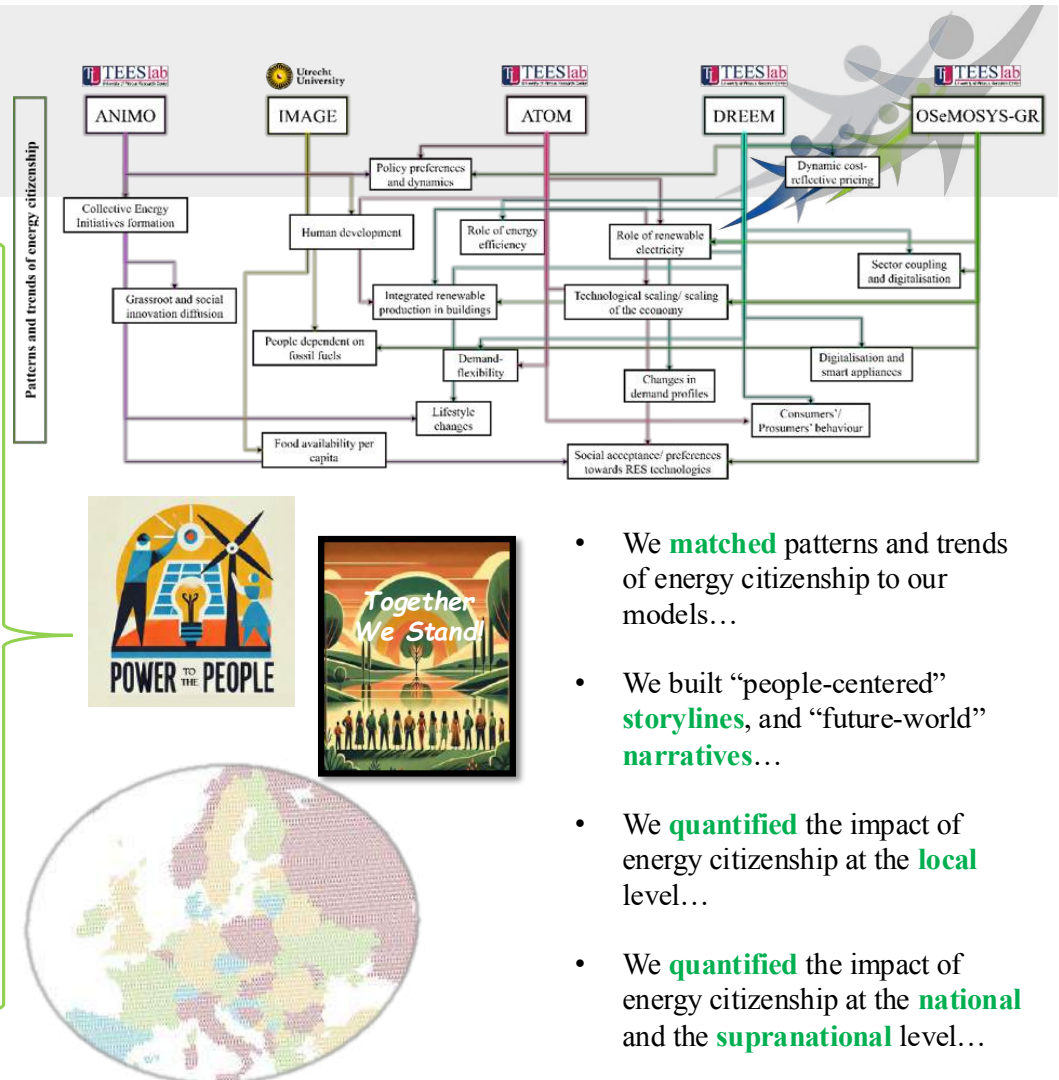


*Demand-side
Models*



*Integrated
Assessment
Models*

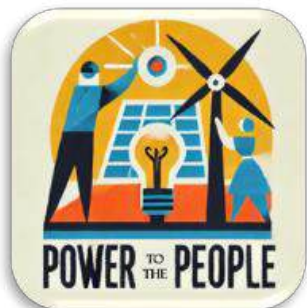
...for integration of **individual** and **collective** factors
of decision-making in the context of
ENERGY CITIZENSHIP !



- We **matched** patterns and trends of energy citizenship to our models...
- We built “people-centered” **storylines**, and “future-world” **narratives**...
- We **quantified** the impact of energy citizenship at the **local** level...
- We **quantified** the impact of energy citizenship at the **national** and the **supranational** level...



In ENCLUDE we learned...



Transformative



Scenario

Design



Framework

***“Future-world”**
narratives*



***“People-centered”**
storylines*



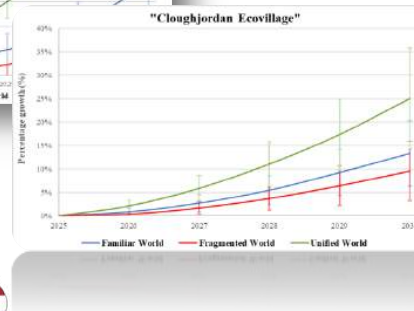
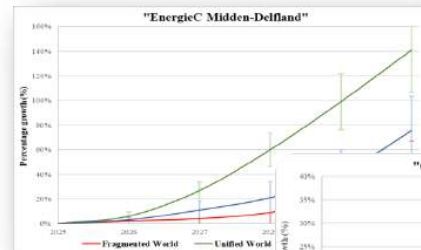
In ENCLUDE we did...



ANIMO

grAssroot innovatiON diffusiON Model

Agent-based
model



*Population density alone
does not ensure growth!*



**Togetherness
matters!**

*Our work encourages the future growth
of Collective Energy Initiatives (CEIs):*

- Identify and prioritize CEIs with the **highest potential** of further growth and **optimize resource allocation**,
- Increase **likelihood** for citizen **participation**,
- Impact of CEIs on **reducing carbon** emissions at the **local** level,
- Optimize **infrastructure** development.

In ENCLUDE we learned...

Targeted communication
strategies and tailored
policymaking 💡



...about 6 different personas outlining potential characteristics & motivations...



The Green Guardian

- Environmentalist
- Concerned about conventional energy sources
- Carbon footprint reducers
- Grid reliance reducers



The Eco-Collaborators

- Community-oriented
- Motivated by large environmental movements
- Appreciators of RES to reduce their environmental impact



The Self-Reliant Saver

- Self-sufficiency seekers
- Valuing energy independence
- Financial savers
- Motivated by lower energy bills



The Security-Minded Sceptic

- Attracted to financial benefits of CEIs
- Strong communal sense
- Trusting to their neighbors' positive experiences
- Encourage adoption



The Tech Trailblazer

- Technologic innovators
- Value smart home integration
- Interested in experimenting with and adopting latest technology



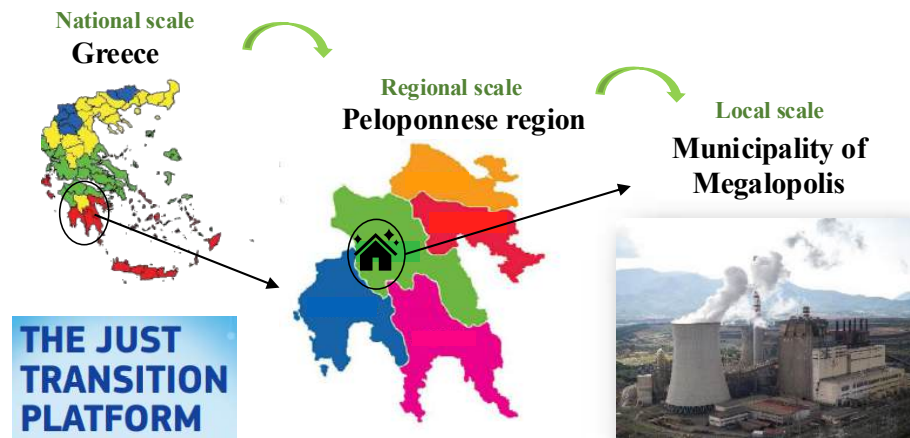
The Eco-Conscious Saver

- Environmentally conscious
- Carbon footprint reducers
- Money savers
- Mainly interested in CEIs' financial benefits

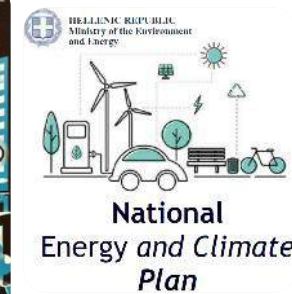
...driving citizens' **decision to join** a CEI, e.g., energy community, ecovillage!

In ENCLUDE we did...

Towards a “green” rebranding of a Coal and Carbon Intensive Region into a city of the people, by the people, for the people

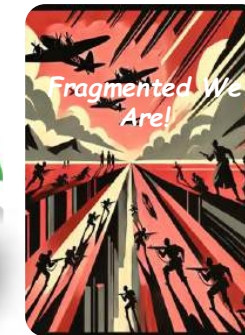


Familiar World



- Current EU and NECP policies
- Mid-late phase out of fossil-fuels

Fragmented World



Unified World



In ENCLUDE we learned...

More PEOPLE around
Europe need to know
that



A **green** citizen-led transition in Megalopolis could not only be environmentally friendly, but also the **most financially viable** option in the long term.

A **GREEN TRANSITION** is not necessarily an **EXPENSIVE** one

Around **€300 million** could be saved at the municipality level. Downscaling to the household level, this translates to total savings of around **€60,000** by 2050 (i.e., ~3 times the **current GDP per capita** in Greece)!



“Unified World” achieves significant emission cuts by 2030- a milestone that “Familiar World” doesn’t reach until over 10 years later!



Coal & Carbon Intensive Regions CAN achieve BOTH sustainability and economic prosperity!

A **green** citizen-led transition could decrease households’ energy **costs**, limiting the effect of **wage** reduction, and provide a significant helping hand to the **most vulnerable citizen groups**.



In ENCLUDE we did...

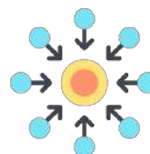
Citizen preference-led planning alternatives towards 100% renewable-based energy systems, or fossil fuel-based economies



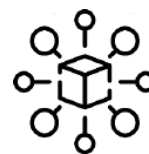
Unified World



100% renewable-based planning



Centralized



Decentralized

Familiar World



BUSINESS AS USUAL



National
Energy and Climate
Plan

Fragmented World



Fossil fuel-dependent planning



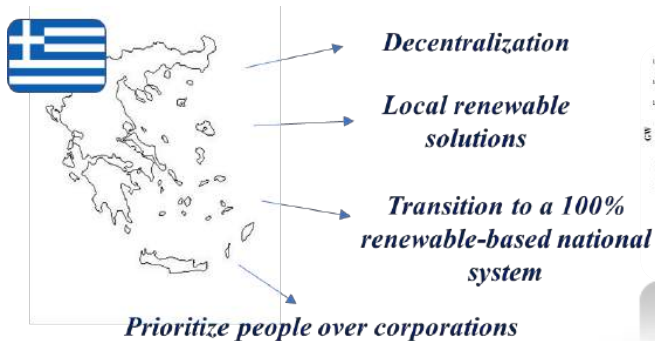
Gas



Lignite

In ENCLUDE we learned...

Integrate citizens' preferences into decision-making!



- ✓ Electricity mix
- ✓ Capital costs and investments
- ✓ Power generation
- ✓ Carbon footprint
- ✓ Total costs of electricity supply
- ✓ Socioeconomic benefits for citizens

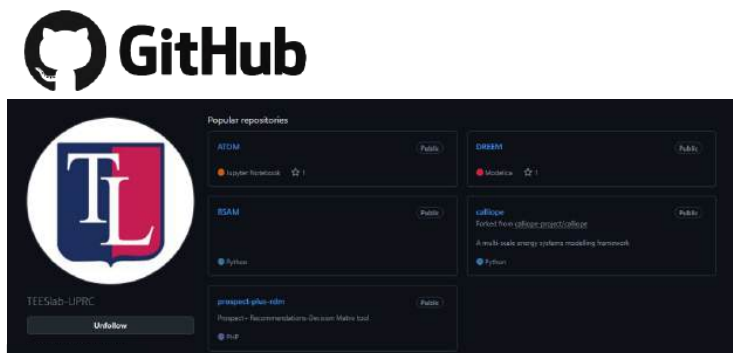


A green energy system isn't just sustainable. It's also **PROFITABLE!**

- **Investment timing** is a key factor for the energy transition since *the earlier citizens* start investing in solar rooftop PV the *higher* the potential *socioeconomic benefits* are going to be.
- Acknowledge that a **"Decentralized"** energy system can provide citizens with a more **democratized** and **equitable** future.
- Recognize that a **"Centralized"** energy system presents a more **individualistic** and **unfair** future in which socioeconomic benefits are distributed between a **smaller share** of people.



Find more about our work...!



Published May 14, 2024 | Version v1

Project deliverable Open

Report on the decarbonisation impact of energy citizenship at the local level: Deliverable 5.3 Energy Citizens for Inclusive Decarbonization (ENCLUDE)

Fotopoulos, Dimitris¹ ; Manias, Nikos¹ ; Kleanthis, Nikos¹ ; Papantonis, Dimitris¹ ; Stavrakas, Vassilis¹ ; Flamos, Alexandros¹

1. Technoeconomics Systems of Energy Laboratory (TEESlab), Department of Industrial Management & Technology, School of Maritime and Industry, University of Piraeus, Karaoli & Dimitriou 80, Piraeus, 185 34, Greece



Published July 8, 2024 | Version v1

Project deliverable Open

Report on the decarbonization potential of energy citizenship at the national and the EU levels: Deliverable 5.4 Energy Citizens for Inclusive Decarbonization (ENCLUDE)

Manias, Nikos¹ ; van den Berg, Nicole J.² ; Kleanthis, Nikos¹ ; Fotopoulos, Dimitris¹ ; Stavrakas, Vassilis¹ ; van Vuuren, Detlef P.² ; Flamos, Alexandros¹

1. Technoeconomics of Energy Systems laboratory (TEESlab), Department of Industrial Management & Technology, University of Piraeus, Karaoli & Dimitriou 80, Piraeus 18534, Greece
2. Utrecht University, Heidelberglaan 8, 3584 CS Utrecht, The Netherlands



Thank you!

**Dr. Sobhan Naderian, Prof. Gioia Falcone,
Assoc. Prof. Anastasia Ioannou**



ENCLUDE project has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreement No 101022791

www.encludeproject.eu

 @encludeproject

 @encludeproject

Thank you!

**Dimitris Fotopoulos, Nikos Kleanthis, Nikos Manias, Sophia Theodoropoulou,
Dimitris Papantonis, Roula Charitopoulou, Dimitra Aglamisi,
Dr. Vassilis Stavrakas, Prof. Dr. Alexandros Flamos**

Technoeconomics of Energy Systems laboratory (TEESlab)
University of Piraeus Research Center (UPRC)



ENCLUDE project has received funding from the
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ENCLUDE

Energy Citizens for Inclusive
Decarbonization

Topic #3 – Mobilizing Energy Citizenship

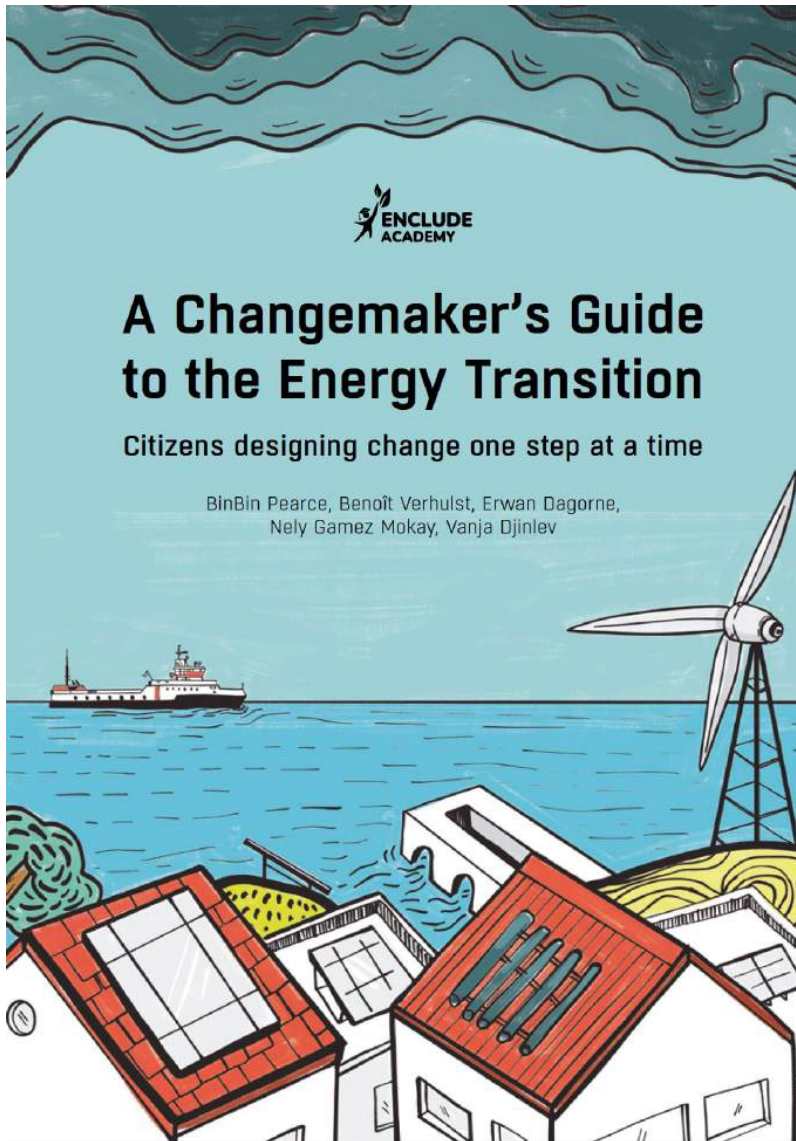
ENCLUDE final event, 25.09.2024



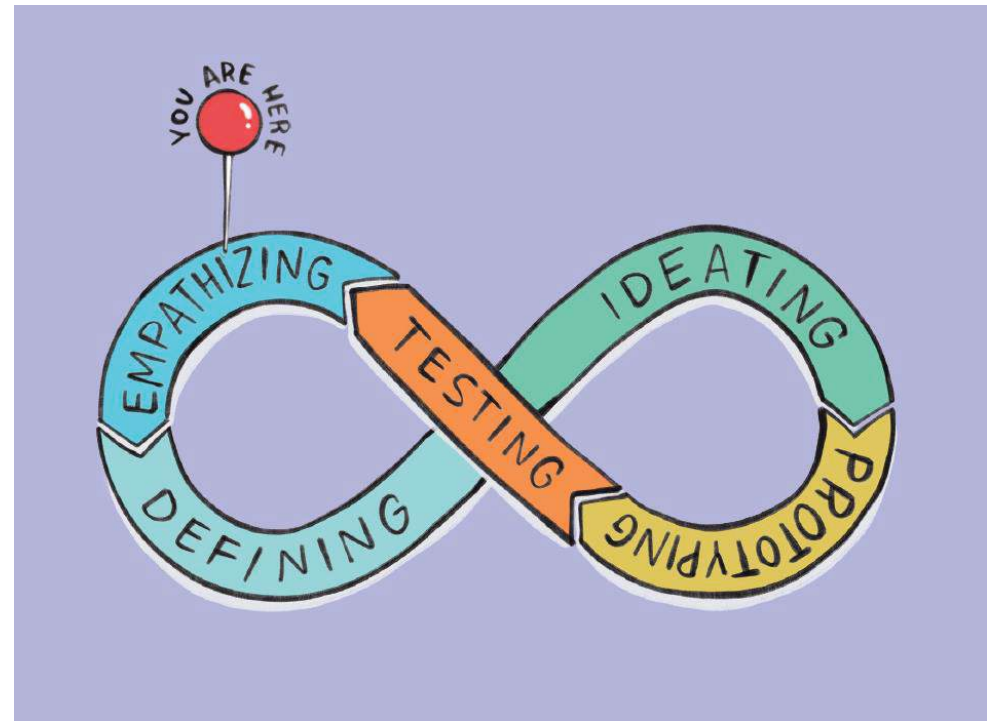
**How has ENCLUDE
mobilized energy
citizenship?**



**What does this mean for
energy citizenship in the
future?**



The ENCLUDE collaborative playbook



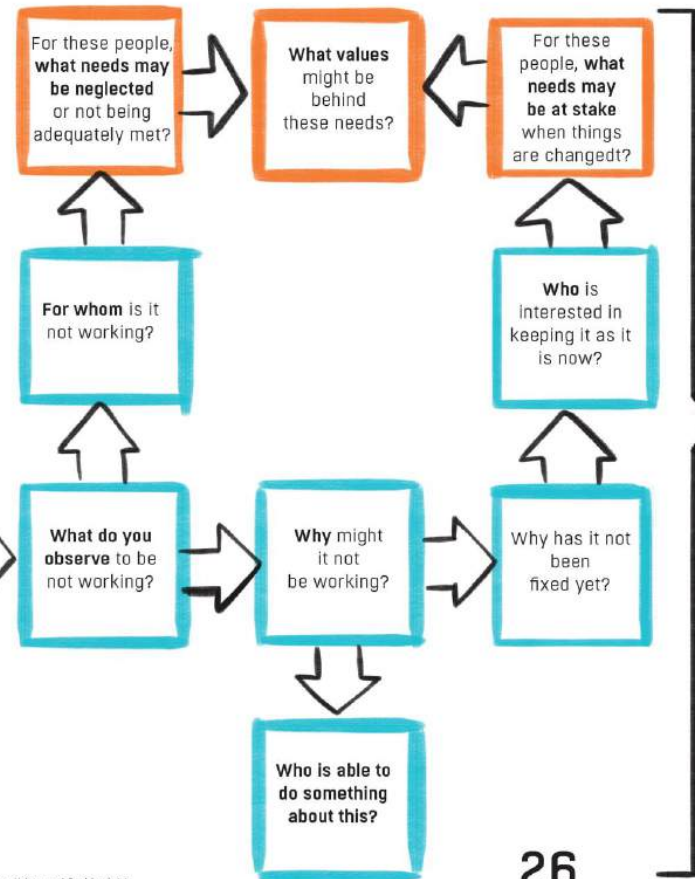
ENCLUDE's co-creation training for designing for system change

At the end of this exercise, you should have developed a good idea about not only about **what** is happening, but also **why** and how it is happening and **who** are the people affected or can affect the problem. Together, this information amounts to having an **INSIGHT** about the problem.



25

Empathise and find insights



5/ An example of insights

A tip from a past participant :

"Maybe the thing with design thinking is that you cannot do it alone. It needs a couple of minds around you to clarify or maybe share ideas because when you do it alone it can be OK but in the end, maybe the targeted group may not appreciate it."



26

Empathise and find insights

4/ Write your problem statement from one point of view

Examples of a single perspective problem statement:



35

For **one** of the actors you have named in 2/, take a try at creating your first problem statement. You can use the following structure to give it a try:
SOMEONE... (a specific group of people that you named already);
NEED(S)*... (something lacking/unmet values which this group of people could use help with);
HOWEVER* OR BECAUSE*... (an insight about this group of people from Step 1/).

*Please note that you do not need to use this structure exactly. These words are here as a hint, but you can use your own.

Women and girls in rural areas of Nigeria need to have a way of accessing fuel for cooking that is not detrimental to their health and which also does not take up all of their time such that they have no more time left for their education or other personal development goals.



However, currently, they have to walk long distances and spend a lot of time collecting wood fuel, which makes them vulnerable to physical violence and takes away time for education. The fuel also burns in stoves which causes a lot of indoor pollution, causing negative health impacts for these women and girls.



Write another problem statement for several actors.

Define the problem

SOMEONE...

NEEDS...

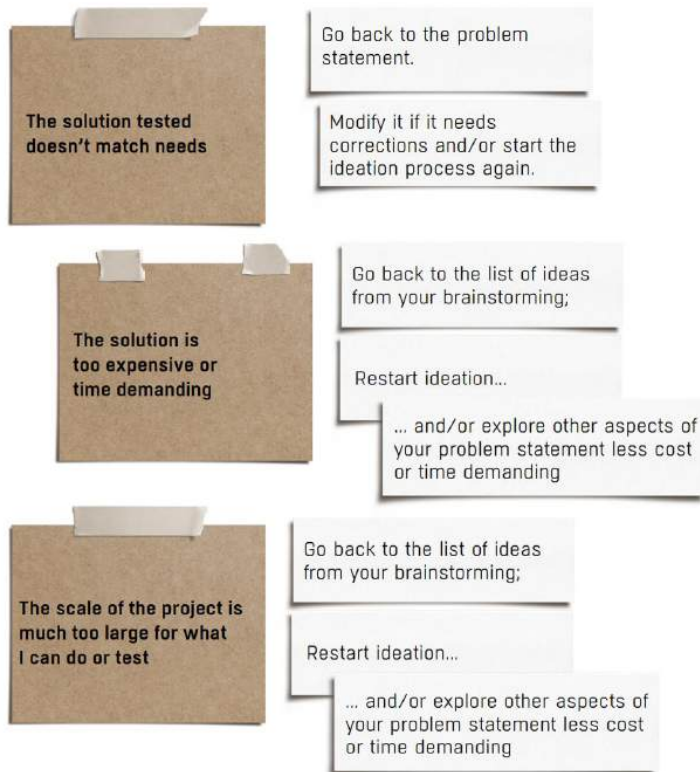
HOWEVER...
or BECAUSE...

36

Define the problem

6/Some tips when you are faced with obstacles

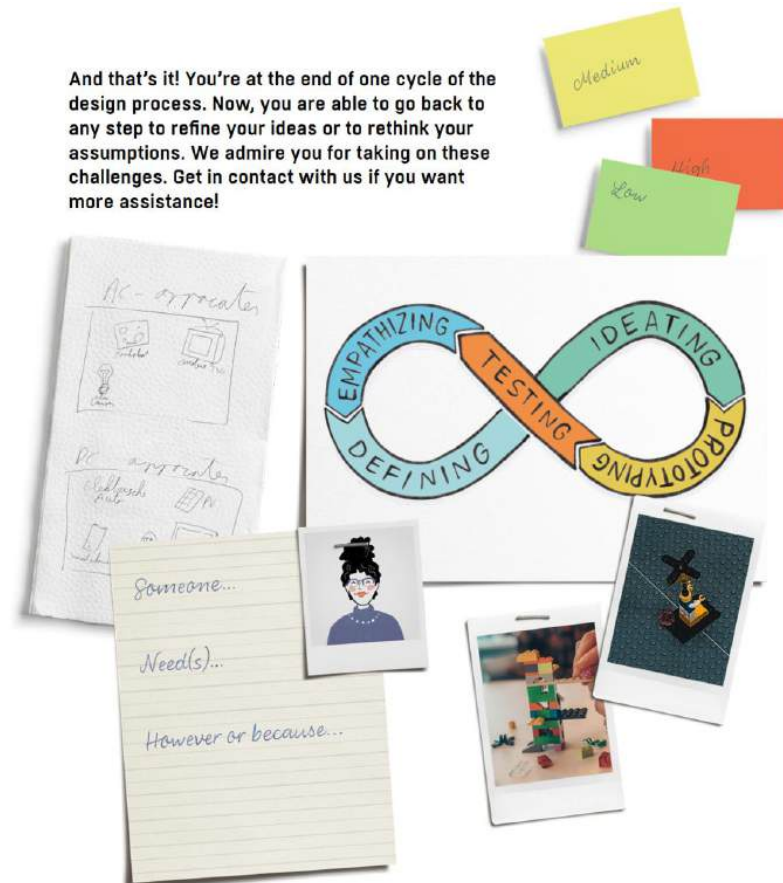
After prototyping and getting feedback, you may still have some obstacles that you are facing. Here are a few tips for how you might want to address these challenges:



83

Test prototypes

And that's it! You're at the end of one cycle of the design process. Now, you are able to go back to any step to refine your ideas or to rethink your assumptions. We admire you for taking on these challenges. Get in contact with us if you want more assistance!



All templates are available to download from

encluedeproject.eu/resources

84

Test prototypes

5

Future of Energy Citizenship



“No one is too small to make a difference” – playbook to be featured in partnership with UNYouth4Capacity at COP 29 – Azerbaijan

How will ENCLUDE keep mobilizing energy citizenship?



Interactive Platform: EnergyCitizenship.eu



EnergyCitizenship.eu

How to involve citizens in the energy transition?

Energy citizenship is a term used by activists, academics, and increasingly, policymakers to conceptualise the potential roles that citizens could (or should) play within the energy system.

This website collects research results from four Research and Innovation projects on energy citizenship funded by the Horizon 2020 programme of the European Union. Results have been curated into four pathways for different audiences which are presented below.

<https://energycitizenship.eu>

Including information
from **4 Horizon 2020**
projects



Knowledge base about energy citizenship



Learn

Energy Citizenship in the Making

A policy brief on pathways to support citizen engagement in the European energy transition

Learn More →

AUTHORS

ENCLUDE, DIALOGUES, EC2, ENERGY PROSPECTS

AUDIENCE

Policymakers

Learn

A Changemaker's Guide to the Energy Transition

A playbook that aims to take citizens step by step to design, implement and reflect on an initiative of their own related to the energy transition

Learn More →

AUTHORS

ENCLUDE

AUDIENCE

Citizens

<https://energycitizenship.eu/modules/>

Energy citizenship conceptualization



EnergyCitizenship.eu

About

Citizen initiatives

Modules

Results

Provide feedback



Target audiences

Expressions of energy citizenship

Energy citizenship can relate to both the rights and responsibilities that people have within the energy system. Traditionally, citizens were assumed to be only passive consumers of the system but there are increasingly more modes of participation including in issues related to energy access and production but also in the political and governance aspects of energy. In each of these modes, ENCLUDE researchers have identified multiple expressions of energy citizenship which can be explored by pressing on the icons on this page.

More details can be found in [a report by ENCLUDE researchers](#). Nevertheless, ENCLUDE is not the only project that has explored the energy citizenship concept. Click on the links below to learn more about the different perspectives explored by [EC2](#), [Energy Prospects](#), and [DIALOGUES](#).



Access



Consumption



Governance

Energy Access

This category concerns those on the margins of the energy system and it is linked to the framing of energy as a resource and as a source of wealth.



Excluded



Dispossessed



Academics

<https://energycitizenship.eu/about/>

Examples of citizen initiatives



EnergyCitizenship.eu

About Citizen initiatives Modules Results Provide feedback

Energy Initiatives

Greece

Open Filters Close Quotes

Pilot project on energy sector digitalization

The pilot offered residents of three cities in Greece the opportunity to familiarize themselves with new technologies, focused on the digitalization of the energy sector.

Energy management systems Smart meters

[Learn More](#)

Energy community in a large city

The community aims to develop solar PV parks to cover the electricity demand of its members.

Solar PV

Quotes

"Our goal is to exploit the 3 main sources which are: the sun, not only for electricity and for heat with solar panels but also through solar thermal applications with mirrors, wind in any case, and in fact, wind is the one that will have the largest share in energy production and biomass."

Technical aspects

"Our philosophy though is, in our cooperative, that most of the energy can be provided to small and medium [income] citizens, not big companies. Although we had some suggestions, we wanted to provide all of our generated electricity to small businesses, and poor families so that we can help as many people as possible."

Planned and achieved impact

Target audiences



Practitioners



Policymakers

https://energycitizenship.eu/interactive_map

Driving factors and impacts of citizen initiatives



EnergyCitizenship.eu

About

Citizen initiatives

Modules

Results

Provide feedback



On this page

Introduction

Research/ Policy questions

What are potential driving factors that could support the diffusion and further growth of Collective Energy Initiatives i...

What is the emission reduction (decarbonization) potential related to the further growth of CEIs around...

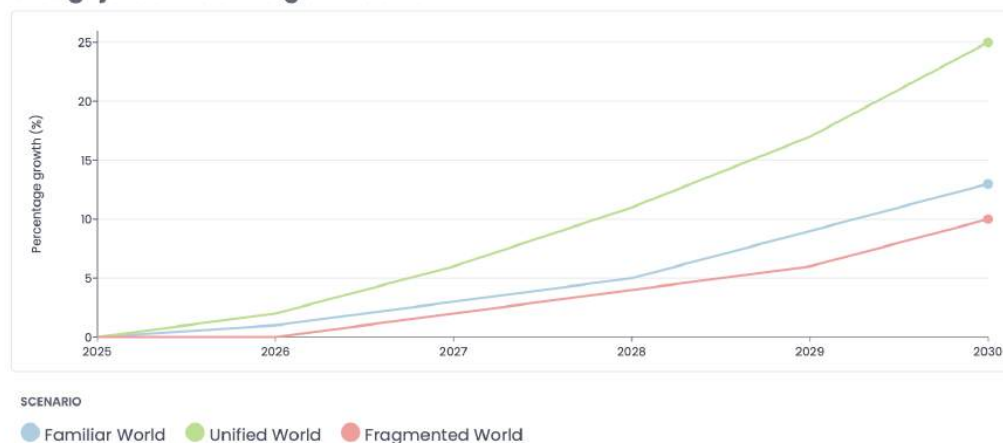
Citizen personas: what individual motivations are driving the further growth of Collective Energy Initiative...

The Green Guardian

The Security-Minded Sceptic

The Eco-Collaborators

Cloughjordan Ecovillage - Ireland



https://energycitizenship.eu/results/result_animo

Target audiences



Academics



Practitioners



Policymakers

Wider impacts of citizen-led transitions

[About](#)[Citizen initiatives](#)[Modules](#)[Results](#)[Provide feedback](#)

On this page

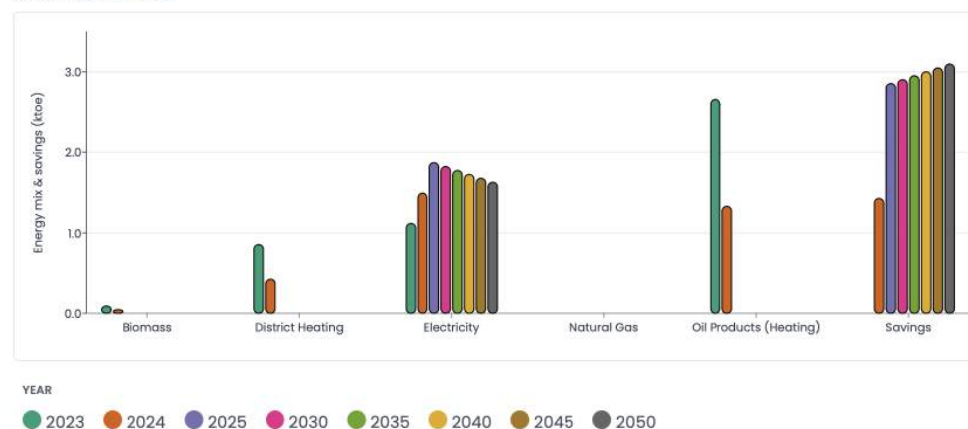
[Introduction](#)

[Research Questions](#)

"Can a citizen-led transition based on investments in energy efficiency solutions, and lifestyle and behavioral...

"What is the emission reduction (decarbonization) potential of different transition pathways at the municipality...

Unified World



Conversely, in a future characterized by **distrust** and **skepticism**, where individuals prioritize energy security and lower bills over combating against the climate crisis (i.e., "*Fragmented World*" scenario), the use of fossil fuel-based products remains entrenched in the energy mix **until 2050**. In this scenario, the vision of

https://energycitizenship.eu/results/result_bleed

Target audiences



Academics



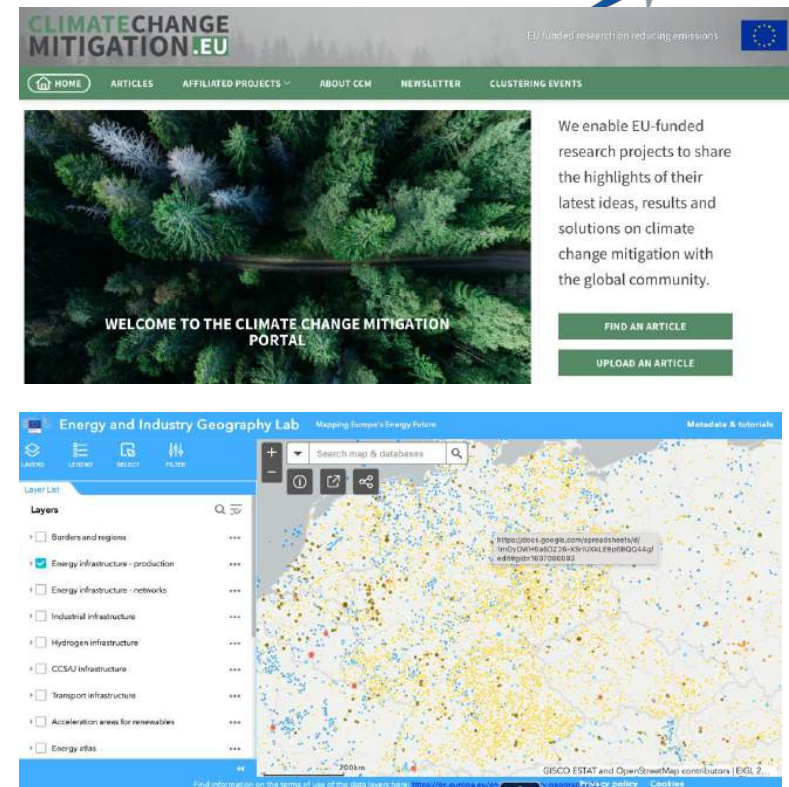
Policymakers

Future of Energy Citizenship (platform)



Ways to continue the platform:

- Future EU projects to “carry the torch” and add new materials (similar to climatechangemitigation.eu)
- Relevant EU initiatives e.g., [JRC's Energy and Industry Geography Lab tool](#)
- As part of a future version of the ENCLUDE Academy



Thank you!

BinBin Pearce

George Xexakis



ENCLUDE project has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreement No 101022791



www.encludeproject.eu

 [encludeproject](https://www.linkedin.com/company/encludeproject)

 [@encludeproject](https://twitter.com/encludeproject)



6 Appendix 4 – Posters shown at the final event

The posters of the final event are shown in the next 23 pages and can be also found on the links below:

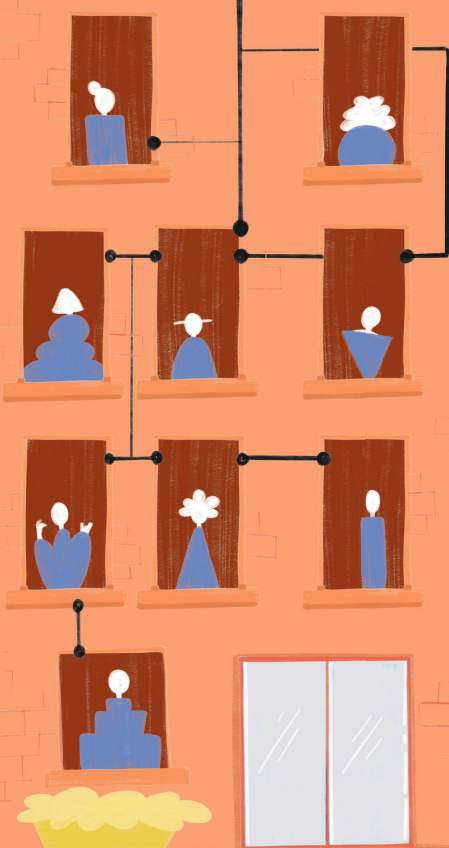
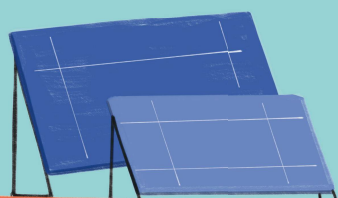
ENCLUDE (2024). Project results – September 2024 (posters). ENCLUDE.
[https://encludeproject.eu/sites/default/files/2024-09/ENCLUDE Final Event Posters_0.pdf](https://encludeproject.eu/sites/default/files/2024-09/ENCLUDE%20Final%20Event%20Posters_0.pdf)

ENCLUDE (2024). Project results – March 2024 (posters). ENCLUDE.
https://encludeproject.eu/sites/default/files/2024-03/results_exhibition_light_0.pdf

How to unite in

DIVERSITY

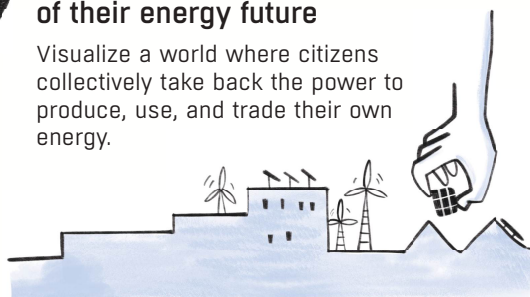
Collective Energy Initiatives
for a sustainable energy future



1

Empower Citizens and communities to take control of their energy future

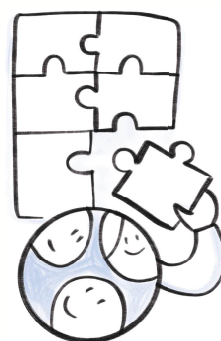
Visualize a world where citizens collectively take back the power to produce, use, and trade their own energy.



2

Recognize that there is no one-size-fits-all approach

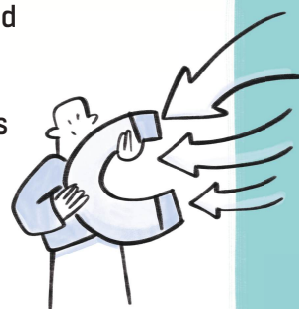
Active Energy Citizens shape a diverse range of initiatives—each unique, just like the people they serve.



3

Acknowledge that we need an energy system that reflects Energy Citizens' choices, needs and values

Whether driven by sustainability, cost savings, independence, or innovation, every citizen can find a way to participate and make a difference.



4

Learn more about how we built a case-study pool of 68 unique and remarkable collective citizen initiatives and identified their needs, goals, and barriers

In order to gain insights into initiatives' leaders and members perspective read our **Deliverable on survey and case-study results**.

To do a deep-dive into specific key topics (among others energy poverty, motivations for joining, funding, regulations, community culture) read our **Deliverable on emergence and consolidation factors**.

Both can be found here:
encludeproject.eu/resources/deliverables



HYBRID FOREST ENHANCED WEATHERING (EW) AS A SERVICE IN UGANDA

Enabling Forest Owners to Increase the Carbon Drawdown of their Land with an “All-in-one Enhanced Weathering Service”

BY
Cornelius Chen-Chen & Sam Odong

Background

- **Definition** EW accelerates the natural weathering of minerals like basalt and olivine to sequester CO₂.
- **Reaction Mechanism:** CO₂ reacts with water to form carbonic acid, which dissolves these minerals, releasing calcium and magnesium. These elements form bicarbonates that flow to oceans, precipitating as carbonates, permanently trapping CO₂.
- **Key Minerals**
Basalt and Olivine: Selected for their reactive properties and natural abundance.

Problem

- **High Potential, Significant Barriers;**
 - sourcing and processing minerals using clean energy
 - transporting and distributing these materials effectively
 - limited existing capacity for large-scale deployment.
 - establishing a reliable market where carbon credits can be sold efficiently.

Who Has This Problem(Target Customer)



Forest Owners



Buyers of Carbon Credits

Solution



Enhanced
Weathering
Potential
Assessment



Methodology
& Registry

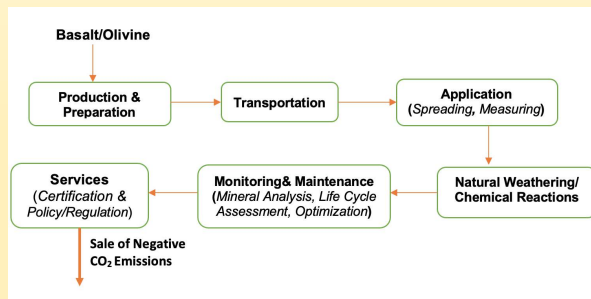


Logistics &
Operations



EW Credits
Marketplace

Process Flow



Impact

1 Million hectares of forest in East Africa (Uganda) (0.5%)
CO₂ capture per hectare: 4 tonnes
4,000,000 tonnes

- ❖ *SDG 2 (Zero hunger)*
- ❖ *SDG 12 (Responsible consumption & Production)*
- ❖ *SDG 13 (Climate action)*
- ❖ *SDG 14 (Life below water)*
- ❖ *SDG 15 (Life on land)*

Vision

Our vision is to support forest and landowners to increase carbon credit generation potential with complementary technologies

Business Model



USP



Forestry Credits

NCX, Pina.Earth



Biochar Credits

Puro.Earth, Carbonfuture



Enhanced Weathering Credits

No Services Yet

Forest Owners today have no access services allowing them to generate Enhanced Weathering credits

Energy Transition

- Supports energy transition by **offsetting emissions** from hard-to-decarbonize sectors (e.g., industry, transport).
- While renewables cut future emissions, EW actively **removes historical CO₂**.
- **Bridges the gap** toward net-zero emissions.
- Promotes **energy-efficient agriculture**, reducing the carbon footprint of food production.
- Generate **carbon credits**.



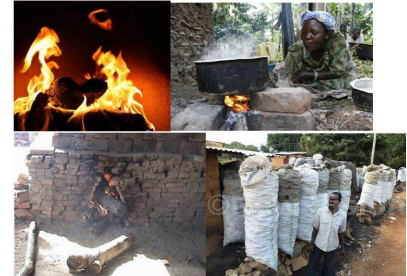
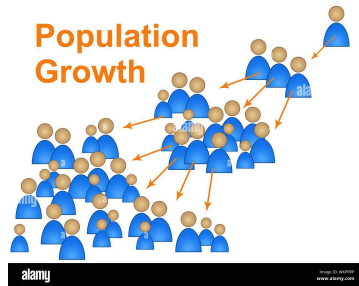
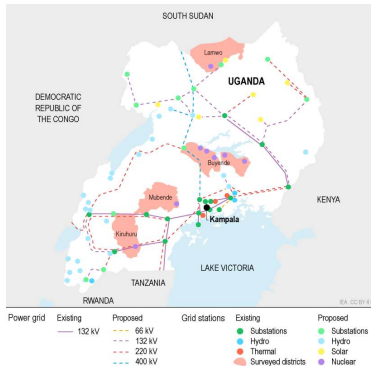
Contact; +256763843525

corneliuschenchen60@gmail.com

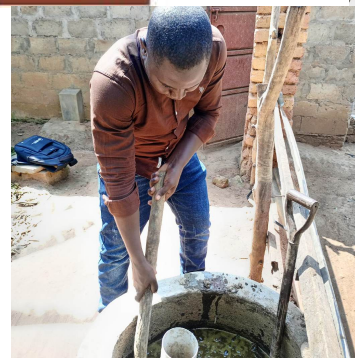
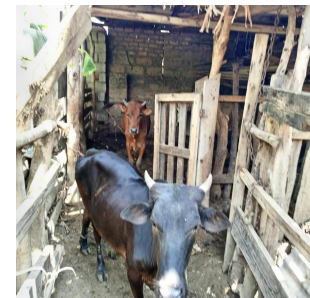
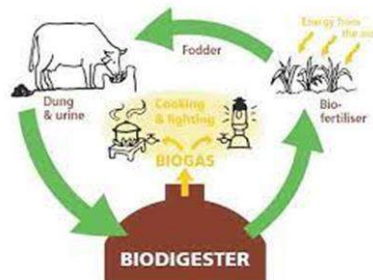
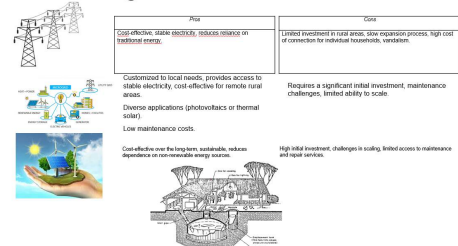


ENERGY CITIZENSHIP PROJECT.

DESIGN AND CONSTRUCTION OF MINI-BIOGAS PLANT FOR HOUSEHOLD USE.



Brainstorming solutions.



ACKNOWLEDGEMENT

I would also like to acknowledge with much appreciation the crucial role of the ENCLUDE ACADEMY for guiding me and quipping me with the necessary knowledge and materials that enabled me to successfully complete my project. A special thanks goes to Dr. BinBin for offering me an educative and financial support for my project.



ENCLUDE
Energy Citizens for Inclusive
Decarbonization



Horizon 2020
European Union Funding
for Research & Innovation



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LinkedIn: Sam Odong
X: @BigSam4991

Driving factors and citizen personas in support of the further diffusion and growth of Collective Energy Initiatives in Europe by 2030

Dimitris Fotopoulos, Vassilis Stavrakas, Nikos Kleanthis, Alexandros Flamos

Technoeconomics of Energy Systems laboratory (TEESlab), Department of Industrial Management and Technology, University of Piraeus, Karaoli & Dimitriou 80, Piraeus 18534, Greece.



Introduction

As Europe transitions to a sustainable energy system, achieving climate neutrality by 2050 hinges on the rise of collaborative **energy citizenship**. The ENCLUDE "**Band Together**" storyline highlights the collective actions that **energy citizens** are poised to undertake - such as forming energy communities, ecovillages, and other Collective Energy Initiatives (CEIs). These grassroots movements are driving localized green energy production and maximizing resource efficiency, with their numbers steadily growing in recent years.

To accelerate this progress, we analyzed and mapped out pathways for expanding CEIs, with the goal of better understanding and supporting their growth and influence. Our aim was to decode the mechanisms and motivations driving the establishment and spread of these innovative structures, helping them translate, replicate, and scale to a wider audience. To apply and test our approach, we selected **3 real-life CEIs** that differ in lifespan, population, and location:

- Cloughjordan Ecovillage in Ireland,
- EnergieC Midden-Delfland in The Netherlands,
- Belica Energy Community in North Macedonia.



Research questions

- ✓ Which are the **driving factors** supporting the diffusion and further growth of Collective Energy Initiatives in Europe by 2030?
- ✓ What is the **emission reduction (decarbonization) potential** related to the further growth of CEIs around Europe?

Methods

To model diffusion processes, the grAssroot iInnovation diffusion **MODEL** (ANIMO) was employed. Designed and developed in the context of the ENCLUDE project, ANIMO delves into how envisaged social innovations are adopted by, and disseminated among, a network of individuals, with diverse socioeconomic, behavioral, and lifestyle profiles. In this work, the model is employed to simulate the further growth and diffusion of the 3 collective energy initiatives under study.

Factors driving participation in CEIs

By categorizing the questions in ENCLUDE's questionnaire for energy community members, we extracted **4 character attributes**, deemed crucial in the decision-making process of joining a CEI. By processing the survey data gathered by the ENCLUDE case study work on participants' income, lifestyle, education, etc., the character attributes were quantified and inserted as parameters into ANIMO for the 3 CEIs under study.

The identified character attributes are:

Environmental Awareness: Captures individuals' knowledge and concern for environmental issues, often motivating them to participate in collective initiatives that address these challenges.

Energy Independence: Reflects individuals' desire for self-sufficiency and independence from the traditional power grid.

Sense of Community: Describes the feeling of belonging and connectedness, which strongly influences the willingness to engage in collective energy initiatives.

Financial Concern: Represents individuals' anxiety about their financial well-being, driving them to join collective energy initiatives for cost savings while also indicating their risk aversion.

Results

Personas

Based on these character attributes, we created **6 personas**, outlining profiles of citizens with **potential motivations** driving their **decision to join a CEI**.



The Green Guardian

Environmentalists prioritizing sustainability and energy independence. Concerned about traditional energy's impact, they seek to reduce their carbon footprint through on-site renewable energy and reduced grid reliance, aligning with their desire for energy autonomy.

The Security-Minded Sceptic

These individuals are mainly attracted to the financial benefits of an energy community. They value a strong sense of community and trust their neighbors' positive experiences, which can convince them of the financial advantages and encourage adoption.



The Eco-Collaborators

Community-oriented people that value collective action to address climate change. They are motivated by contributing to a larger environmental movement with like-minded neighbors and appreciate the focus on renewable energy to reduce their environmental impact.



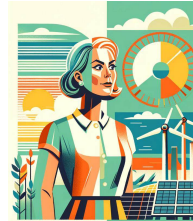
The Tech Trailblazer

Excited about technologically innovative aspects of energy communities, they value smart home integration & increased energy independence. The environmental benefits are a bonus, but their primary interest is in experimenting with and adopting the latest tech.



The Self-Reliant Saver

These individuals seek self-sufficiency, valuing energy independence and financial savings. They aim to reduce reliance on the traditional grid, generate their own energy, and are motivated by lower energy bills and shared investment opportunities.



The Eco-Conscious Saver

Environmentally conscious and financially savvy, these individuals want to reduce their carbon footprint and save money or earn income by joining energy communities. Demonstrating cost savings and other financial benefits related to CEIs can influence their decision.



Projected growth

Findings revealed a strong correlation between **population density** and the projected growth of the CEIs under study. Densely populated areas seem to facilitate faster CEI expansion,

likely due to the enhanced **ripple effect** of the "**word-of-mouth**" phenomenon.

This is clearly demonstrated in the case of the "EnergieC Midden-Delfland" energy community, which resides in the most densely populated area.

However, **population density alone does not ensure growth!**

Another critical factor influencing expansion is the degree of interconnectedness within a society - what we term **social connectivity**. Essentially, tightly knit communities, whether solely due to population size or strong social bonds, enable quicker dissemination of information about the benefits of collectivism, driving higher growth rates. Strong relationships among community members are essential for fostering communication and cooperation. The "Band Together" storyline emphasizes the power of communal action, calling for unity and collective effort.



Togetherness matters!

Conclusions

The results of this work reveal ways in which the presented approach can be useful in formulating policies to encourage the development or future growth of CEIs, as it can:

- ✓ **Identify and prioritize CEIs with the higher potential and optimize resource allocation**
- ✓ **Increase likelihood for citizen participation**
Through optimized interventions, targeted engagement & communication strategies as well as tailored initiatives
- ✓ **Impact of CEIs on reducing CO₂ at the local level**
Assist in motivating citizens and incentivizing investors
- ✓ **Optimized Infrastructure Development**
Anticipating community expansion allows for informed and proactive infrastructure investment decisions, avoiding delays and bottlenecks that could impede the growth of energy communities and ecovillages.



Read our Deliverable for more information!

See results in the ENCLUDE interactive platform!



Images presented were created with the assistance of generative AI and DALL-E 2.

Citizen-led transitions towards justice and inclusivity: A “green” rebranding of a Coal and Carbon Intensive Region into a city of the people, by the people, for the people

Vassilis Stavarakas, Dimitris Papanonis, Alexandros Flamos

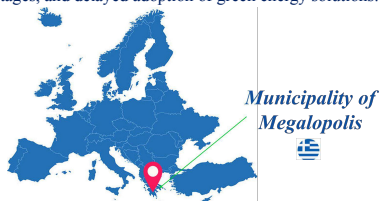
Technoeconomics of Energy Systems laboratory (TEESlab), Department of Industrial Management and Technology, University of Piraeus, Karaoli & Dimitriou 80, Piraeus 18534, Greece.



Introduction

The EU's strategic vision and national policies offer a unique opportunity to transform **Coal and Carbon Intensive Regions (CCIRs)** in line with sustainable development goals. However, these regions, often facing job losses, aging populations, and environmental challenges, may resist change. Successful transformation hinges on addressing structural, cultural, and perceptual barriers to foster local collaboration and achieve early justice gains, sparking broader positive impacts.

A notable example is the municipality of **Megalopolis** in **Greece**. Originally rural, Megalopolis became a lignite mining hub in the 1970s, hosting 5 different lignite power plants over the years, which have been providing the local community with several job opportunities and have been fostering local economy. The 2019 Greek National Energy and Climate Plan mandated phasing out lignite power plants by 2023, a very ambitious goal, which due to the extreme events of the past few years, led to a **new dependence on natural gas**. This transition risks long-term fossil fuel reliance, leading to higher energy costs, potential gas shortages, and delayed adoption of green energy solutions.



Over the past few years, local stakeholders have suggested a post-lignite trajectory for Megalopolis that includes renewable energy, eco-tourism, alternative agriculture, and infrastructure improvements. Key steps include establishing a secure legal framework for renewable energy investments and energy efficiency upgrades. Proposals also include forming energy communities and offering tax exemptions to attract investments in clean energy projects. *However, the plan's success heavily relies on citizens' willingness to invest in new technologies, highlighting the need for innovative business models and legal frameworks to demonstrate economic and environmental benefits.* Given the growing involvement of citizens and other actors in combating the climate crisis and transforming the energy system, this case study explores if a **citizen-led energy transition** in Megalopolis could lead to a “green” rebranding into a **city of the people, by the people, for the people**.

Research questions

- ✓ Can a **citizen-led transition** based on energy efficiency investments and lifestyle & behavioral changes **support a just & inclusive transition** in the Coal and Carbon Intensive Region of Megalopolis?
- ✓ What is the **post-lignite development trajectory** & the **potential benefits of a people-powered transition** that does not rely on traditional fossil fuels?
- ✓ What is the **emission reduction (decarbonization) potential** of different transition pathways at the municipality level?

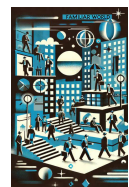
Methods

Using the **Dynamic high-Resolution dEmand-side Management (DREEM)** model, we simulated 3 transition pathways aiming to transform the energy landscape in Megalopolis. The premise of this modeling exercise is that citizens must first recognize the benefits of investing in new energy products and services to actively engage in the energy transition. DREEM's innovation lies in its versatility, enabling the assessment of not only technological infrastructure but also of business models and regulations that enhance the value of energy products and ensure fair compensation for all stakeholders involved.



“Future-world” narratives & Transition pathways

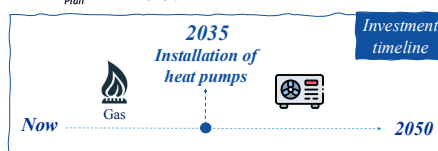
The modeled transition pathways were developed according to the ENCLUDE's “future-world” narratives, essentially exploring 3 different transition strategies followed by the local community in Megalopolis, based on different motivations and social beliefs. These are assessed in terms of their potential benefits and drawbacks regarding their economic viability and impact on citizens, as well as their environmental footprint.



FOLLOW EXISTING PLANS?

“A Familiar World”

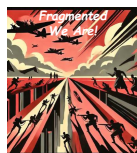
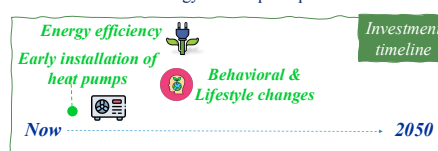
This transition pathway aligns with the **current national policy planning** in the municipality of Megalopolis and draws from the plan of substituting district and oil heating installations with **natural gas** by 2035. This means that citizens follow the current rates of decarbonization efforts and decide to invest in the technological solutions foreseen each time by policymaking at the national and the EU level.



PROACTIVE CLIMATE ACTION?

“A Unified World”

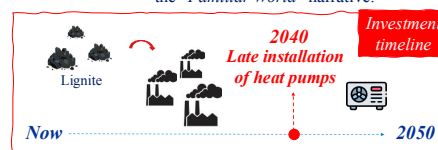
This transition pathway builds on the premise that **citizens come together united** in the battle against climate change and decide to **invest in green solutions** (energy efficiency upgrades and electrification, i.e., heat pumps) as soon as possible, while they are also willing to adopt behavioral and lifestyle changes when it comes to managing their energy consumption patterns.



DOUBLE DOWN ON FOSSIL FUELS?

“A Fragmented World”

This transition pathway envisions a future marked by distrust and skepticism, where individuals prioritize **energy security and lower bills** over climate action. Due to the potential worldwide disparities and the resulting energy crises, people turn to **conventional sources** of energy more and more, despite their increasing prices. The latter leads to the introduction of green solutions as heat pumps in 2040, at half the rate compared to the situation under the “Familiar World” narrative.



Results

Energy mix, benefits & decarbonization potential

In the “Unified World” narrative, citizen investment in green technologies could **rapidly phase out fossil fuels in Megalopolis by 2050**.

In contrast, the “Familiar World” narrative, driven

by existing decarbonization efforts and policy-driven investments, may also achieve residential decarbonization by 2050, **but at a much slower pace**.

As a result, while both narratives ultimately attain similar emission reductions, the “Unified World” achieves significant emission cuts by 2030 - a milestone the “Familiar World” narrative **doesn't reach until over a decade later**.

However, in a “Fragmented World” narrative,

fossil fuels persist in the energy mix in 2050, **hindering decarbonization efforts**.

Costs & Savings

The “Unified World” pathway, **despite higher upfront costs**, quickly leads to the lowest annual household expenses, projected to drop **below €1,000 by 2030**. Over time, households could save up to **4 times more** compared to the fossil fuel-dependent “Fragmented World” narrative.

Overall, a cumulative amount of **around €300 million** could be saved at the municipality level by 2050. Downscaling from the municipality to the household level, this is translated to total savings of **around €60,000 per household** (i.e., ~3 times the current GDP per capita in Greece).

Conclusions

Considering that local economy, which is currently mainly dependent on the energy and the mining sector, will undergo an abrupt pathway towards the phase out of lignite, and that by 2025 (when lignite-fired units are expected to close) employment and income levels could be significantly reduced, a **citizen-led transition** like the one studied, could decrease households' energy costs, limiting the effect of wage decreases, and thus providing a significant helping hand to the most vulnerable citizen groups.

Regions can achieve both sustainability and economic viability

A GREEN TRANSITION is not necessarily an EXPENSIVE one



Read our Deliverable for more information!

See results in the ENCLUDE interactive platform!



Images presented were created with the assistance of generative AI and DALL-E 2.



Combining “people-centered” storylines based on social innovations of energy citizenship with narratives of potential “future-world” evolutions towards transformative scenario design

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ENCLUDE
Energy Citizens for Inclusive
Decarbonization

Introduction

Since early 2000s scholars have been increasingly recognizing the **limitations of traditional top-down** approaches to climate and energy policy, which fail to account for the **social & cultural dimensions of energy use and production**. Addressing this, the concept of **energy citizenship** has emerged and gained in recent years considerable attention due to its potential to bridge the gap between energy transition policies and social participation, by emphasizing the significance of participatory and democratic processes in decision-making.

Motivation

Discourse surrounding energy matters has predominantly centered on technical and economic considerations, often overlooking discussions on inclusive and democratic governance. This is also reflected in contemporary energy modeling practices and scenario-based research, where focus is primarily placed on the technological optimization and economic implications of the energy transition, often **disregarding social and environmental aspects**, and treating them as external narratives, only to be considered “**on-top**” of modelling results, serving merely as a perspective for discussing scenarios and narratives. Underrepresentation of such elements combined with disproportionate emphasis on technoeconomic factors can lead to **oversimplified models and scenarios that fail to inform policymakers about the multiple dimensions crucial for achieving a sustainable and inclusive energy transition**. In this respect, there is a growing body of research seeking ways to integrate social sciences into scenario-based exploration.

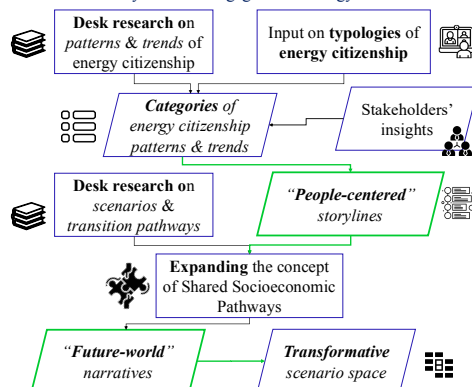
Scope

To this end, we present a framework for **transformative scenario design** based on **social innovations of energy citizenship** and **potential evolutions of the future**, which encompasses a broad spectrum of uncertainties and embraces the depth of complexity of the energy landscape, at the **local, the regional, the national, and the transnational level**. The developed framework does not only consider regulatory influences and technological advancements, but also delves into the **social, cultural, and behavioral** manifestations of **energy citizenship**, envisioning energy futures that **go beyond the comfort zone of current scenario-based research and examine out-of-ordinary extremes**.

Methods

To build the **scenario design framework**, we started with an **extensive desk research** into various **patterns & trends of energy citizenship**. This allowed us to **capture and map** the full range of citizen involvement in the energy transition. **Considering stakeholders’ insights**, we then grouped **patterns & trends** into **thematic storylines** that highlight both **individual and collective actions**.

Transformative scenario design should outline the transition to a decarbonized energy system while accounting for potential challenges and vulnerabilities humanity might face. To do this, we broadened the concept of the **Shared Socioeconomic Pathways**, to capture how various types of “**environments**” may influence the ways citizens engage in the energy transition.



Results

The “**People-centered**” storylines

➤ Individual level



Power to the People

“A decentralized energy system where citizens become more actively engaged to the energy transition, investing in green technological solutions and relevant infrastructure”.

Associated
patterns &
trends

- Investing in individual technologies, e.g., rooftop PV systems; battery energy storage systems; energy efficiency technologies; electric vehicles (EVs)



Habitual Creatures

“How daily habits of citizens and small changes in their lifestyles and behaviors can contribute to the decarbonization of the energy system”.

Associated
patterns &
trends

- Incremental adjustments, e.g., thermostat adjustments; housing efficiencies: LED bulbs, standby mode appliances; shorter showers.
- Housing choices | Diet
- Leisure | Travel

➤ Collective level



Band Together

“Citizen collective actions, such as the formation of collective energy initiatives (CEIs), like energy community and ecovillages, where optimized and localized energy production and resource utilization can take place”.

Associated
patterns &
trends

- Communal technologies
- Communal investments
- Communal living
- Communal travel, e.g., car-pooling.
- Communal holidays



People to the Streets

“Political activism surrounding climate change and citizen participation in social movements and civil society initiatives advancing democratic visions of energy transition”.

Associated
patterns &
trends

- Public awareness campaigns
- Advocacy and lobbying
- Shareholder activism
- Community lawsuits
- Protest and demonstrations

The “**Future-world**” narratives



A Familiar World

“The future-world evolution in its present state, with the current rates of decarbonization and the baseline scenario specifications as foreseen by current policy documents, relevant announcements, and political decisions made at the EU level”.



“A Unified World”

“A future-world evolution in which society, governments, and nations around the EU, but also at the global level, come together and unite against climate change, as the biggest crisis of our age. Policymaking processes all around the world promote acceleration of decarbonization through transnational collaboration and investments in green solutions as soon as possible”.



“A Fragmented World”

“Potential evolutions of undesired societies, which tend more and more to “dystopia” in the sense of extreme, or even exaggerated worst-case scenarios, e.g., more totalitarian regimes arise, more social inequalities, more control over people through the usage of propaganda, censoring of information or denial of free thought, gradual loss of individuality, enforcement of conformity, rise of individualism and anti-collectivism, etc. This narrative assumes that policymaking processes emphasize more regional and national security rather than combating the climate crisis”.

Conclusions

By combining the “**people-centered**” storylines with the “**future-world**” narratives, a **2-dimensional scenario space** is created. This **transformative scenario space** allows for the development of comprehensive scenarios that capture the multifaceted nature of the energy transition dynamics surrounding energy citizenship.

To the best of our knowledge, this is the first time that a structured framework for the design of transition scenarios towards the **operationalization and the holistic understanding** of the decarbonization potential of **energy citizenship** is presented, also accounting for the **uncertainty and the dynamic character** of events surrounding the **potential evolution of the future**. The **novelty** of our work lies in the flexibility that the developed framework provides to potential users towards exploring “**what if**” scenarios of the decarbonization potential:

- attributed to **individuals’** decision-making, while keeping constant potential future evolutions of the surrounding environment,
- attributed to **different changes** of the surrounding environment, as governmental and societal decisions, etc., while keeping constant individuals’ decisions and choices, isolating future conditions’ potential for climate change mitigation, and
- attributed to **variance in both individuals’ decisions and choices and surrounding environment’s conditions**, enabling deep exploratory assessments of different potential futures, also accounting for future uncertainties and unexpected events.

See the framework in action on the ENCLUDE interactive platform!



Read more about the proposed scenario design framework here!

Images presented were created with the assistance of generative AI and DALL-E 2.



“Power to the People” transitions by 2050 in different European Union cities: Empowering prosumerism and citizen investments in photovoltaic and storage systems

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Introduction

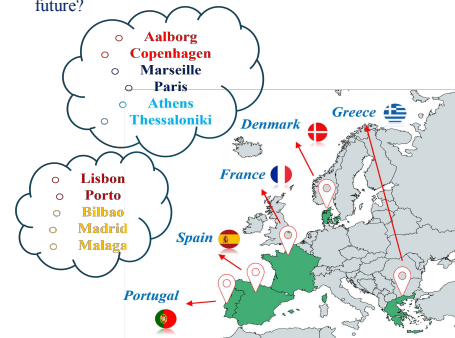
Imagine an EU where every household plays a pivotal role in shaping a sustainable future, where rooftops gleam with solar panels, transforming solar irradiation into clean energy. This is not a far-off dream, but an attainable reality through the power of **prosumerism**. As the EU pushes toward its ambitious goal of **climate neutrality** by 2050 through multiple packages, residential sectors stand at the forefront of this transition.

Empowering prosumers- who produce, consume, and even sell renewable energy- is more than just a trend; it's a game-changer. By fostering **local** and **national adoption of small-scale solar PV systems**, prosumers can help decentralize energy generation, reduce carbon footprints, and promote energy independence. Across the EU, these localized energy producers hold the key to accelerating the shift toward a low-carbon future, enabling the residential sector to become both energy-efficient and climate-neutral.

In a rapidly evolving energy landscape, the EU's commitment to empowering prosumers can transform homes into mini power stations, sparking a continent-wide energy revolution; one that brings the 2050 climate goals within reach, powered by the sun and **driven by the people as active EU energy citizens**.

Research questions

- ✓ How could different **policy schemes** empower prosumerism and further citizen adoption of small-scale PV systems by 2030 in different cities across the EU?
- ✓ What is the **emission reduction (decarbonization) potential** of different transition pathways at both local and national levels in different cities across the EU?
- ✓ What are the potential **benefits of prosumerism for European citizens** under different potential evolutions of the future?



Methods

By matching different energy citizenship trends and patterns with the Dynamic high-Resolution dEmand-sidE Management (DREEM) model, we calculated **economic benefits** for prosumers in different cities of



Denmark, France, Greece, Portugal, and Spain taking into account existing regulatory frameworks in these spatial contexts.

Citizens must first see the **tangible** benefits of investing in new energy solutions to truly take part in the green transition through prosumerism. This is where DREEM stands out, by using the model to not only assess the technical side of energy infrastructure but also explore different **business models and regulations**. By doing so, it maximizes the value of energy products and guarantees fair returns for all actors involved, ensuring that everyone benefits from a cleaner energy future.

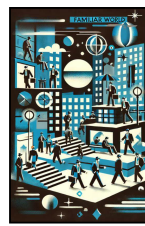
Furthermore, we have combined cutting-edge technology with real-world energy citizenship trends through the Agent-based Technology adOption Model (ATOM). By obtaining realistic uncertainty bounds and splitting the total model's output uncertainty in its major contributing sources, ATOM offers a glimpse into the future of residential energy transitions.



With ATOM, we don't just predict adoption rates; we also estimate the carbon emissions that could be slashed by empowering prosumers. It's a **data-driven blueprint** for a cleaner, greener EU, where individuals take charge of their energy futures.

“Future-world” narratives & transition pathways

Modeling exercises were conducted according to **3 different possible evolutions of the future world** that could shape the EU's energy landscape.



THE ROAD WELL-TRAVELED

“A Familiar World”

European citizens stick to what they know, steadily adopting rooftop solar PVs based on tried-and-true benefits. With a solid understanding of how solar panels can lower their bills and reduce their carbon footprints, they make the shift at a pace that mirrors national and EU policy planning at their countries.

ONE PLANET, ONE FIGHT!

“A Unified World”

In a world where knowledge is power, European citizens are making smart choices for their homes and their future. Armed with a clear understanding of the economic savings and environmental perks of rooftop solar PV systems they are seizing the opportunity to harness the sun. With electricity prices and costs of solar technology and battery energy storage systems (BESS) falling, the moment is ripe for action.



A WORLD SPLIT ON CLIMATE ACTION

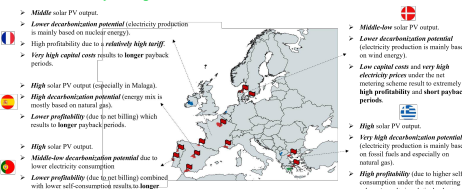
“A Fragmented World”

In a fragmented world, where tensions run high and priorities shift, European citizens hesitate to embrace rooftop solar PV systems. The increasing costs of solar PV and BESS further dampen enthusiasm, leaving households reluctant to invest. In this divided landscape, the potential of solar energy goes untapped, as uncertainty and lack of trust overshadow the benefits of going green.

Results

Economic & environmental benefits of prosumerism at the local level

Cross-country comparison



Modeling outcomes showed that the profitability of empowering prosumerism through citizen investments in small-scale/ rooftop PV systems at the local level and the EU cities under study depends on the policy schemes of use and capacity of the PV system. More specifically

- Current **net metering** schemes appear more financially attractive when citizens invest in capacities of around **3kWp**, which provide the lowest payback period (roughly an average of 3.5 years across all case studies under the “Familiar World” narrative).

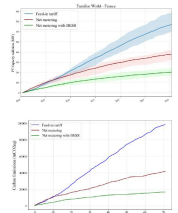
- Current FiT schemes tend to yield higher profitability when citizens invest in larger PV systems' capacities (>4kWp), especially when featuring a high fixed price for remuneration, as citizens are incentivized to generate greater electricity volumes to channel to the grid.

- Current net billing schemes in Portugal and Spain fall short when it comes to empower citizen investments and people-powered transitions based on prosumerism, as excess electricity is currently sold back to the grid at its wholesale price rather than at its retail price, resulting in longer payback periods.

Small-scale solar PV adoption & decarbonization potential at the national level

Prosumers are mostly keen on investing in rooftop solar PV systems when under **FiT** with large amounts of fixed prices.

However, **uncertainty is larger in FiT** due to its “static” nature compared to the “dynamic” nature of net metering.



Prosumers have a **clearer perception** about the **profitability** of their **investment under net metering** where profitability of investing is linked to the amount of electricity prices that citizens are called to pay.

A 100% subsidy on the BESS costs affects (positively) the “**psychology**” of prosumers, even when compared with a 90% subsidy; as observed in the case of Greece.



In all EU cities, rising with the sun, opportunities rise too!

Conclusions

The results of this work reveal ways in which the presented approach can be useful in formulating policies to empower prosumerism, as it can:

- ✓ **Recognize** that citizens as prosumers have the **power to influence and shape the future of electricity supply**, even in a possible “**dystopian**” future world.
- ✓ **Prioritize** the need for **long-term fixed prices for feed-in tariffs** since short-term may have a negative effect on the psychology of prosumers.
- ✓ **Identify** the need for **even more generous subsidies on BESS costs** for enhancing grid stability and flexibility.



Prosumers are protected from possibly elevated electricity prices!



Read our Deliverable for more information!

See results in the ENCLUDE interactive platform!



Images presented were created with the assistance of generative AI and DALL-E 2.



Combining “Power to the People” with “People to the Streets” storylines towards people-centered and 100% renewable-based national energy systems

Nikos Kleanthis, Vassilis Stavrakas, Alexandros Flamos

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Introduction

Citizens in Greece could drive the **transition** to a **100% renewable national energy system** by supporting decentralized energy planning, which emphasizes local ownership and decision-making. By advocating for small-scale renewable energy sources like rooftop solar PV, communal energy projects, and efficient self-production schemes, they can help **reduce reliance on large energy corporations** and **ensure** that energy remains **closer to the people**. This grassroots approach ensures that energy benefits are distributed more **equitably**, fostering **community** empowerment, and making the energy transition more **inclusive**.

In addition, citizens in Greece could influence policy developments at different scales by participating in public debates and organized **movements** against **centralized, fossil-fuel-based** energy models. By raising awareness through **protests, social media**, and community **engagement**, they can pressure policymakers to prioritize renewable energy investments that reflect local interests and climate and environmental concerns. This collective citizen action can help shift the focus away from centralized, top-down approaches that often overlook the **needs** and **preferences** of local communities.



Citizens can also contribute by pushing for energy policies that promote decentralized, renewable energy systems. By voicing opposition to **large-scale, top-down** renewable projects like onshore wind farms that may not align with local priorities, they can advocate for a more democratized energy system. Supporting the development of a 100% renewable energy mix, the energy transition in Greece is not only environmentally sustainable but also **socially just and aligned with citizen values**.

By embracing decentralization, advocating for local renewable solutions, and demanding policies that prioritize people over corporations, Greece can transition to a 100% renewable energy system that's built by and for its people.

Research questions

- ✓ How does **citizen participation** in power sector planning and decision-making affects the capacity requirements and the resulting **electricity mix** of **decarbonization pathways** under different potential evolutions of the future?
- ✓ How do **costs** and the **carbon footprint** of **centralized** and **decentralized systems** compare between different future-world evolutions?
- ✓ What are the potential **socioeconomic benefits** derived from **citizen-led investments** and how do these benefits compare among different policy mixes and potential future evolutions of the surrounding environment?

Methods

The **Open-Source energy Modeling SYStem for GReece (OSeMOSYS-GR)** is a country-specific implementation of the OSeMOSYS model generator.

OSeMOSYS-GR accurately models the unique characteristics of the Greek power system for the period 2021-2050. Each year is broken down into 48 time slices, reflecting different parts of the day, spread across the months of the year. The model simulates the capacity requirements for, and the electricity generation from, different technologies, both fossil-fired, like lignite, natural gas, and oil power plants, and RES-based, such as hydro, onshore and offshore wind, utility, commercial, and rooftop solar PV, biomass, and geothermal. It also incorporates various flexibility options including pumped hydro, battery systems, and hydrogen systems powered by electrolyzers and fuel cells.

“Future-world” narratives & transition pathways

This modeling application was conducted considering **3 different possible evolutions** of the **future world** which can shape energy landscape in Greece.



FOLLOW EXISTING GOVERNMENTAL PLANS?

“A Familiar World”

Citizens depend on national political decisions to invest in green solutions. By keeping people informed about the energy shift, the government slowly builds support, easing the rollout of RES projects. As awareness grows, opposition fades, and the path to decarbonization becomes clearer.



ENERGY CITIZENS IN ACTION!

“A Unified World”

Citizens come together united in the battle against the climate crisis and collectively oppose to the use of fossil-fuels in the energy mix, thus leaving more room for RES. They quickly become prosumers, driving rooftop solar adoption through shared responsibility with governments and companies. Decentralized planning fosters even more citizen-led initiatives. With this collective push, decarbonization happens faster than expected, surpassing national-level projections.



ENERGY SECURITY BEFORE CLIMATE CRISIS?!

“A Fragmented World”

In this future, the energy crisis lingers, and thus citizens become distrustful and prioritize energy security over climate action. They back governmental plans that rely on fossil fuels, whether it is imported gas or domestic lignite. Prosumers emerge very slowly, driven more by peer pressure or economic necessity rather than a commitment to combating climate change. Rising energy costs further slow down the shift, making widespread prosumerism a distant goal.



Changes based on policymakers'/citizens' decision-making

Decentralized Planning



In this scenario, citizens take matters into their own hands. In the “Familiar World”, they break free from the “business-as-usual” mindset, joining forces with policymakers to co-design a future that is less dependent on fossil fuels and driven by decentralized energy solutions.

Meanwhile, in the “Unified World”, citizens unite against climate change. They collectively oppose to the use of all fossil fuels in the energy mix and push for a greener energy system through small-scale RES.

Centralized Planning



In the context of a “Unified World”, citizens unite against climate change and oppose the use of all fossil fuels in the energy mix, but they do not resist to large-scale RES project implementation.

Fossil fuel-dependent Planning



In the context of a “Fragmented World”, citizens are mostly concerned about their energy security and are supportive of basing energy planning on existing lignite and/or gas infrastructure.

Business-as-usual



In the “Familiar World”, future energy planning follows the “business-as-usual” specifications. Citizens do not oppose the implementation of nationally planned energy projects.

Results

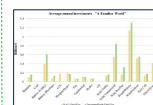
Electricity mix & power generation by 2050

Citizens' opposition to **large-scale energy projects** leads to larger capacity expansion of small-scale solar PV installations combined with storage and smaller capacity expansion of onshore and offshore wind.



A **decentralized power sector** will require more **short-term flexibility**, especially behind the meter, to improve night-time use of electricity, thus increasing self-consumption rates.

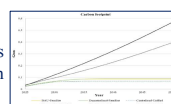
Capital costs & investments by 2050



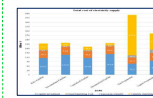
Decentralization of electricity generation will require significantly **higher capital investments in VRE** compared to more centralized system alternatives.

Carbon footprint by 2050

“Fossil Fuel Dependency” case poses the risk of resulting in extremely high total power sector **carbon footprint**.



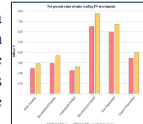
Total costs of electricity supply by 2050



“Fossil-fuel dependency” may lead to extremely high variable system costs, in case of future **energy crises**, that would lead to unbearable domestic electricity prices and increase **energy poverty**.

Socioeconomic benefits for citizens

The “Decentralized” case presents a more **democratized and equitable future** in which socioeconomic benefits are distributed between a larger share of citizens and thus **more people can catch up** with the **energy transition**.



In the “Fossil-fuel dependency” case only a **minority of citizens (innovators)** will highly profiteer by investing in rooftop PV systems due to the skyrocketing wholesale and retail electricity prices.

Conclusions

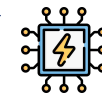
The results of this work reveal ways in which the presented approach can be useful in formulating policies on shaping the future energy system, as it shows that:

- ✓ Investment timing is a key factor for the energy transition since the earlier citizens start implementing solar rooftop PV investments **the higher the potential socioeconomic benefits** are going to be.
- ✓ “Centralized” energy systems lead to more **individualistic** and **unfair** futures in which socioeconomic benefits are distributed between a smaller share of people and thus **more people tend to be left behind** amidst the energy transition.



Read our Deliverable for more information!

See results in the ENCLUDE interactive platform!



Images presented were created with the assistance of generative AI and DALL-E 2.



Deriving Energy Citizens Profiles for Effective Energy Policies: Clustering Analyses on Quantitative and Qualitative Data

1. Introduction

- In the transformation of the energy system, the role of its citizens is becoming increasingly important through their engagement, involvement, and shaping of the future energy landscape.
- Identify groups of citizens (clusters for decarbonization) at different scales of analysis is key to inform a just energy transition.
- To this aim, clustering models (e.g., through Machine Learning (ML) methods) were developed and tested using existing and new EU citizens' datasets.

2. Analytical Framework

- A machine learning model was applied to quantitative data from the ECHOES ("Energy CHOices supporting the Energy Union and the SET-Plan") project to identify distinct clusters of citizens.
- Index-based clustering method was applied to qualitative data from the ENCLUDE data of citizens who have participated in energy initiatives.
- The k-means clustering method was adopted for both qualitative and quantitative data, using the elbow method to find the optimal number of clusters
- The ECHOES energy consumption of citizens was based on Life Cycle Analysis (LCA) for the mobility and housing sectors.
- The CO₂ footprint of ECHOES citizens was estimated on both sectors for clustering.
- Within-clusters statistics were then analyzed based on different sociodemographic and psychological attributes (e.g., age, education, car fuel efficiency, and climate change perception) to extract 'profiles'.
- Index-based clustering of ENCLUDE data was based on answers to questions in 4 categories: **Energy poverty, Mobility, Housing, and Climate Change Perception**.
- The overall data analysis framework is presented in [Figure 1](#).

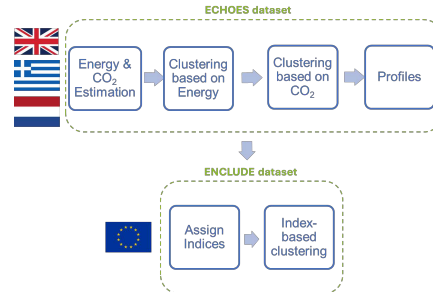


Figure 1 Overall data analysis framework for qualitative and quantitative data sets

3. Quantitative Data

The clustering results based on CO₂ footprint data for the UK are presented in [Figure 2](#), with [Figure 3](#) showing the citizens profiles emerging from the corresponding within-cluster analysis. The same procedure was implemented for Greece and The Netherlands.

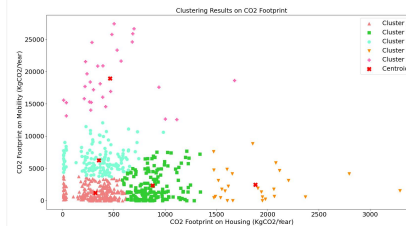


Figure 2 Clustering Results for the UK based on CO₂ footprint

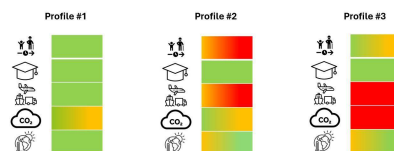


Figure 3 Energy citizens profiles for the UK, capturing age, education level, carbon intensity of energy consumption and attitude to climate change.

- Profile #1 mainly consists of citizens with low levels of CO₂ footprint on housing and mobility. This profile represents 65% of the population, with mostly young people with college degrees and low CO₂ emissions.
- The citizens in Profile #2 represent 30% of the respondents, who are both young and old people with medium to high CO₂ footprint on housing, but low CO₂ footprint on mobility.
- Profile #3 represents 8% of the population, consuming more energy on mobility and with a high level of CO₂ emissions on mobility.

4. Qualitative Data

ENCLUDE data were clustered via defined indices based on answers to questions in 4 categories: **Energy poverty, Mobility, Housing, and Climate Change Perception**.

4 indices for energy poverty index (EPI), energy on housing index (EHI), energy on mobility index (EMI), and climate perception index (CPI) were defined and rescaled to 0-100 for each respondent based on relevant questions to each index. The clustering results are presented in [Figure 4](#).



Figure 4 Spider plots of index-based clustering results for each of the four clusters

- Citizens of Cluster 1, with the highest EMI, mostly live in villages and are mostly young people and people older than 50, with a secondary education level.
- Citizens of cluster 3, with the highest EPI, are mostly old people living in villages where most of them are employed.

5. Conclusion

- Clustering can help to identify groups of citizens with similar energy consumption behaviours and their associated carbon footprint.
- Insights into sociodemographic and psychological attributes can be used to draw comprehensive narratives for energy models towards more realistic decarbonization scenarios which allow end-users (including policymakers) to identify optimal options.
- This proposed framework can be applied to more countries and/or new data sets to bridge to energy and scenario models at different scales (from community to district, city, national and super-national).



ENCLUDE
Energy Citizens for Inclusive
Decarbonization



encludeproject.eu/resources/deliverables

PROJECT RESULTS

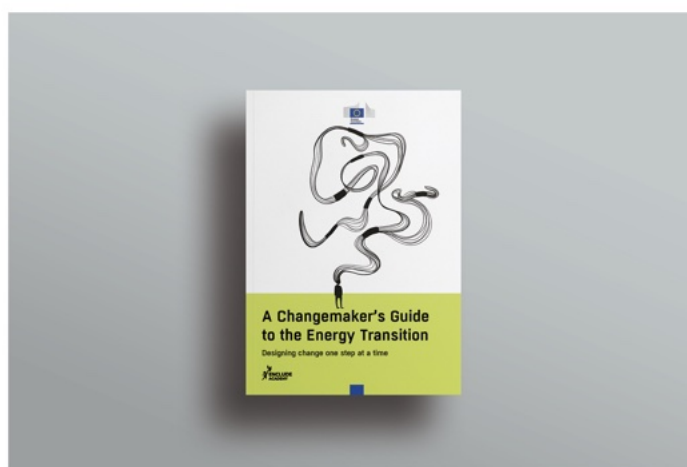


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A CHANGEMAKER'S GUIDE TO THE ENERGY TRANSITION

Designing change one step at a time

This playbook aims to **take you step by step** to design, implement and reflect on an initiative of your own related to the energy transition..



Who is the playbook for?

This playbook is **for anyone looking to contribute to or already engaged in the energy transition**. It is tailored for those interested in launching or already working on community projects related to energy systems and decarbonisation.



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A CHANGEMAKER'S GUIDE TO THE ENERGY TRANSITION

Designing change one step at a time

You do not need to start with any specific expertise. All you need is a curiosity to understand others around you and a willingness to do something in your community or surroundings.



This playbook may also be useful for civic organisations and local authorities who want to empower citizens to work together towards change. Wherever you are, the book hopes to be a **helpful guide at your side while you become or continue to be a changemaker.**



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A CHANGEMAKER'S GUIDE TO THE ENERGY TRANSITION

Designing change one step at a time

You may still be wondering if this guide is for you. Here are a few assumptions that may prevent you from acting or you may face whenever you start a community action.



"Why spend so much time designing, we should better act quickly"

You may have a great solution in mind, but if it doesn't answer to the right problem-s it may be useless. Design thinking will require to dedicate time to define the issue-s you need to face. But in the end it is time saved. It will help you be sure what you do is efficient.

In other words be sure to understand what is the real problem before you try to develop anything. Otherwise, you may implement a solution you have already decided is right – and you are likely to find out it is right for an irrelevant problem. .



"It is too complicated, experts should do it"

There are lots of different forms of energy and even more ways to catch it and use it. You are not requested to invent a brand new machine, but rather trying to find the appropriate solutions to your context.



"It is hard to gather people around this topic, it is not they priority"

We develop here some categories of motivations: Energy is linked to everything, it is a mean to achieve other things and could be a ground for discussion:

- Climate;
- Cost reduction/efficiency;
- Learning;
- Collaborating and meeting with new persons.



"I don't know where to start, it looks like a big thing"

Follow this book one step at a time, at your speed ! The playbook will help you organise your work.



"I don't understand everything, I need more information"

All along this guide you will find resources and testimonies from people who have been through the same issues.



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A CHANGEMAKER'S GUIDE TO THE ENERGY TRANSITION

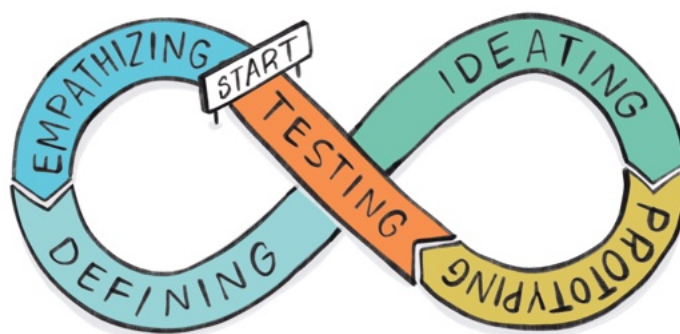
Designing change one step at a time

How to use this playbook?

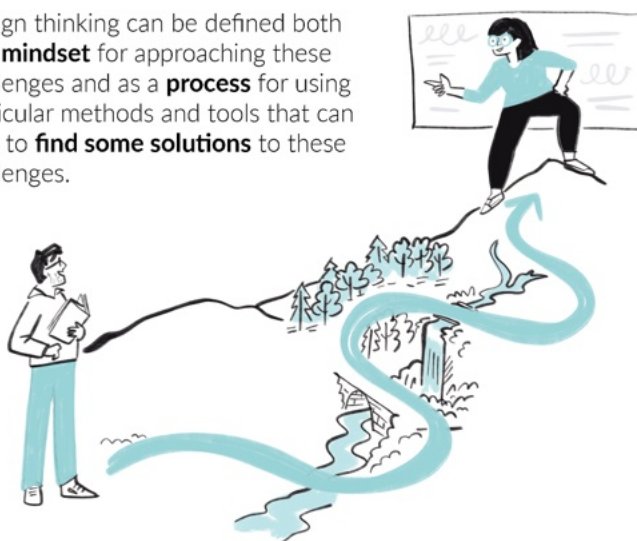
The playbook is based on the mindset and steps of **human-centered design thinking** to initiate a project for your community.

Design is the process used to **get us from where we are to where we want to be**. It is particularly useful when we are confronted with a problem that may be complex or not so well-defined, or when we know that the solution we will need is one that will need to evolve or adapt to a changing situation.

The Playbook will lead you through **five stages of design thinking**:

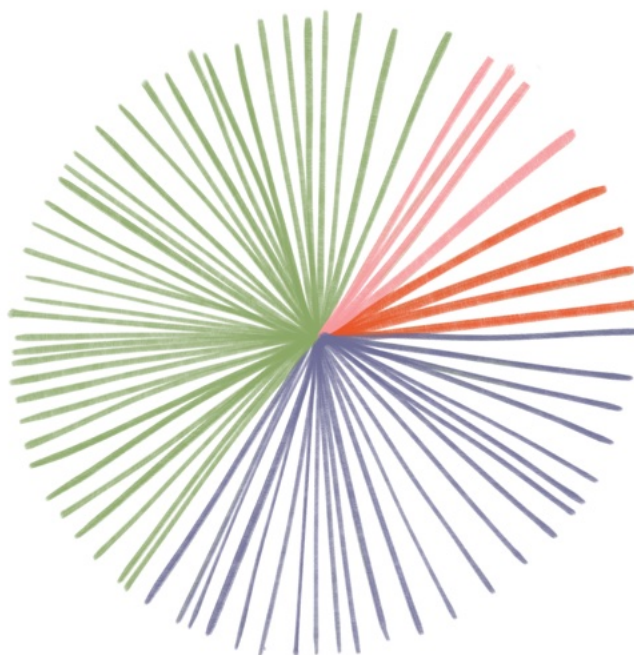


Design thinking can be defined both as a **mindset** for approaching these challenges and as a **process** for using particular methods and tools that can help to **find some solutions** to these challenges.



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CASE STUDIES POOL SPLIT INTO FOUR GROUPS BASED ON THEIR CHARACTERISTICS



ENERGY COMMUNITY AND ECO-FARMS (37)

Associations of citizens based on open participation (at least in the starting phase) and in control by their members, with the purpose of **providing benefits for the community** and engaged with the generation, distribution, optimisation, or storage of renewable energy, with energy efficiency or eco farming.

POLITICAL AND SOCIAL MOVEMENTS (FOUR)

Political grassroots initiatives or protest movements with the aim of **changing regulations and legislation** in the energy sector of a region or country and/or expressing opposition to a particular action/decision.

COLLECTIVE TARGETED ACTIONS (13)

Companies or groups of persons with the aim of supporting communities and/or individuals in **pursuing behavioural and/or technological changes** to reduce energy use, increase energy efficiency, or achieve other such improvements in the field of energy.

TESTING CONDITIONS (FOUR)

Companies or groups of persons **testing the functioning of social and/or technical innovations** for generation, optimization or storage of energy under real conditions.



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REASONS FOR THE CREATION OF CEIS

Energy communities vs Collective targeted actions

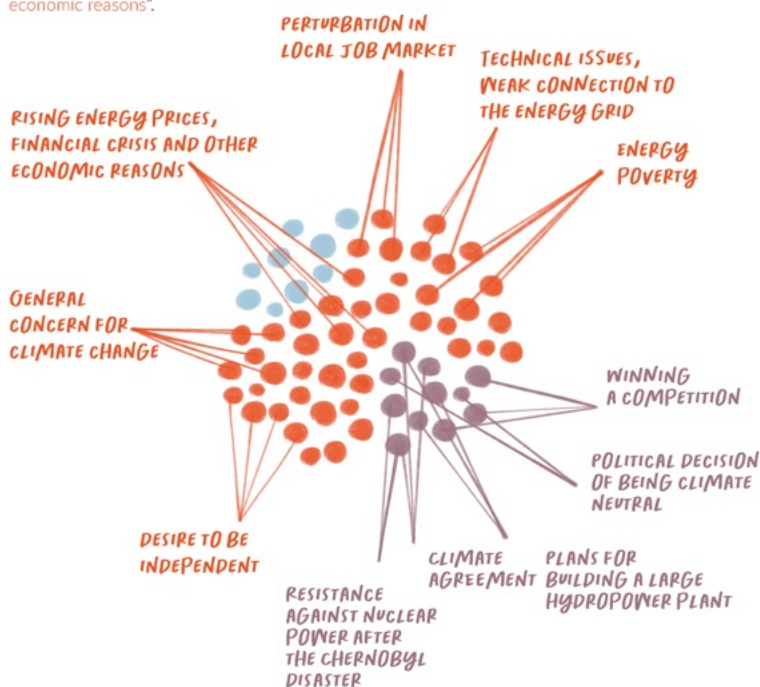
We aimed to understand the reasons behind the establishment of various Collective Energy Initiatives (CEIs), particularly exploring whether specific events such as floods, heat waves or natural disasters played a role in their creation. The data we have collected for 68 European case studies shows that:

	11 were influenced by a particular event
	48 were not influenced by any particular event and named other reasons
	9 case studies did not answer the question

Almost ¾ of the European case studies were not influenced by any particular natural or political event. However, five other reasons were listed, the most important of which were "Rising energy prices, financial crisis and other economic reasons".

A remarkable difference thereby can be observed: It seems that while the creation of ECs was strongly influenced by the "Desire to be independent" and by a "General concern for climate change", these factors were not mentioned by the CTAs.

The most important factor for the latter were the "Rising energy prices, financial crisis and other economic reasons".



This was partially echoed in a survey conducted with case-study members. In the case of ECs, contributing to climate-change mitigation was identified as the most important motive. Saving money and achieving self-sufficiency were also mentioned. However, members highlighted the significance of "doing something together with other members" as one of the main motives, emphasizing the central role of community aspects for ECs.

In contrast, for CTAs, further analysis confirmed the stronger role of personal benefits.



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WHICH TECHNOLOGIES ARE MOST USED BY CEIS?

How has technology impacted the development of CEIs?

Technology is an indispensable part of many energy activities. As certain technologies become more accessible to citizens (cheaper, easier to find, maintain and operate), a rise can be expected to the development of related collective energy actions. To assess how technology has impacted the development of CEIs, we examined which technologies are more commonly used by CEIs.

↓ It was found that a large majority of the ECs use solar photovoltaic (PV) systems as main technology. Seventeen cases mention only PV as used technology. Additionally, renovations are more common in CTAs than ECs.

PV

solar photovoltaic,
either household level or
larger-scale installations

WIND

wind turbines (mainly on-shore, only one off-shore)

OTHER PRODUCTION OR DISTRICT HEATING

other large-scale electricity/heat/fuel production, such as
hydro, geothermal biomass, biogas, tidal or wave energy,
hydrogen, and/or district heating systems

BATTERIES

electric energy storage of any scale

HVAC, HEAT PUMPS

household-level energy systems other than PV, including
heating, cooling and ventilation systems such as heat
pumps and solar heating or other efficient household-level
appliances

RENOVATION

building renovation including insulating, replacement of
lamps with LED, etc.

SMART SYSTEMS AND MONITORING

monitoring devices, smart meters, energy
management systems, IoT hardware or software,
smart appliances

ELECTROMOBILITY-RELATED

Electric vehicles, EV chargers, EV bikes

OTHER NON-ENERGY

related for instance to water management or eco-farming

↑ Finally, 19 cases use smart systems or monitoring, out of which 12 cases include different types of smart technologies other than just smart meters. The latter cases mainly include CTAs that specifically focused on the implementation of such smart systems or awareness raising via monitoring of energy. It is not as common to find smart technologies in ECs, other than smart meters.

The further analysis revealed that both CTAs and ECs acknowledge the advantages of PV panels, citing easy installation, minimal maintenance, and adaptability to local conditions. CTAs highlight funding availability as a crucial factor influencing the choice of PV technology, while ECs show greater technology diversity.

Despite a willingness to explore new technologies, CTAs note the scarcity of information and discussions as obstacles to improvement, a concern not explicitly raised by ECs during interviews.

● Energy Community and Eco farms ● Political and Social Movements
● Collective Targeted Actions ● Testing Conditions

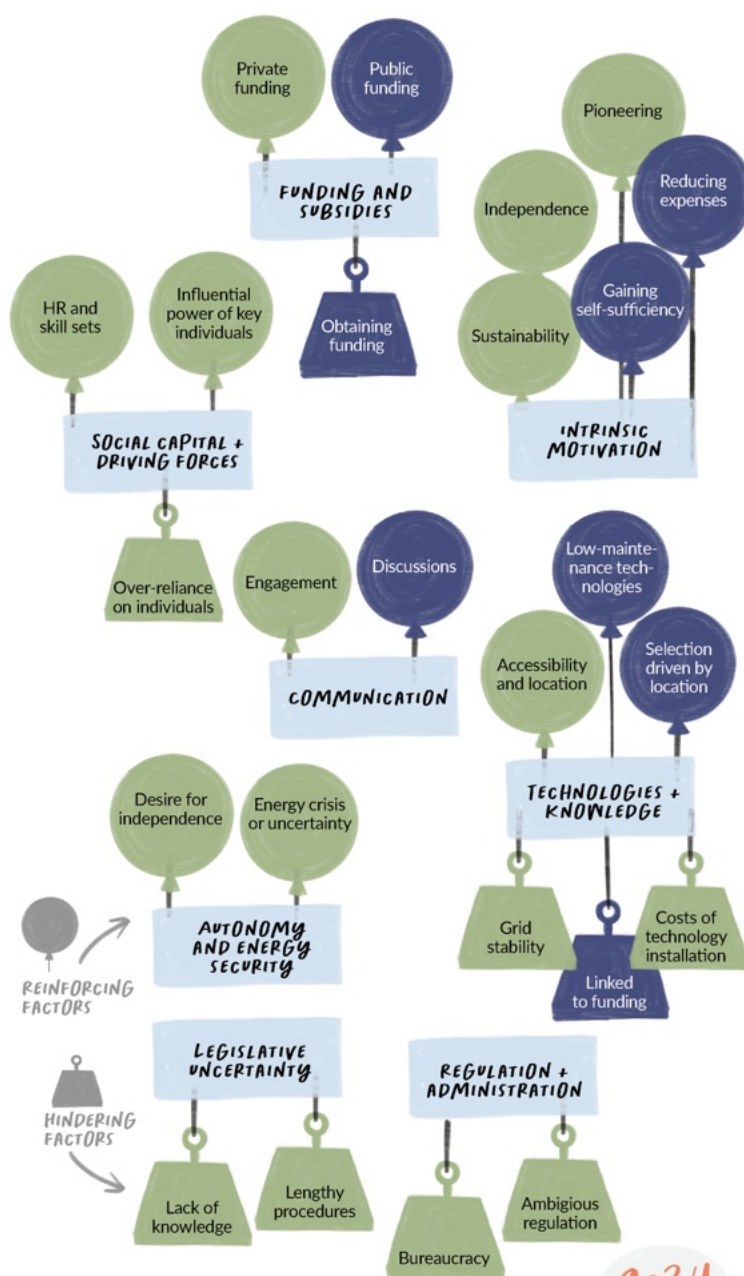
EMERGENCE

What are factors influencing emergence of CEIs?

Our research aims to uncover factors shaping collective energy citizenship emergence and consolidation.

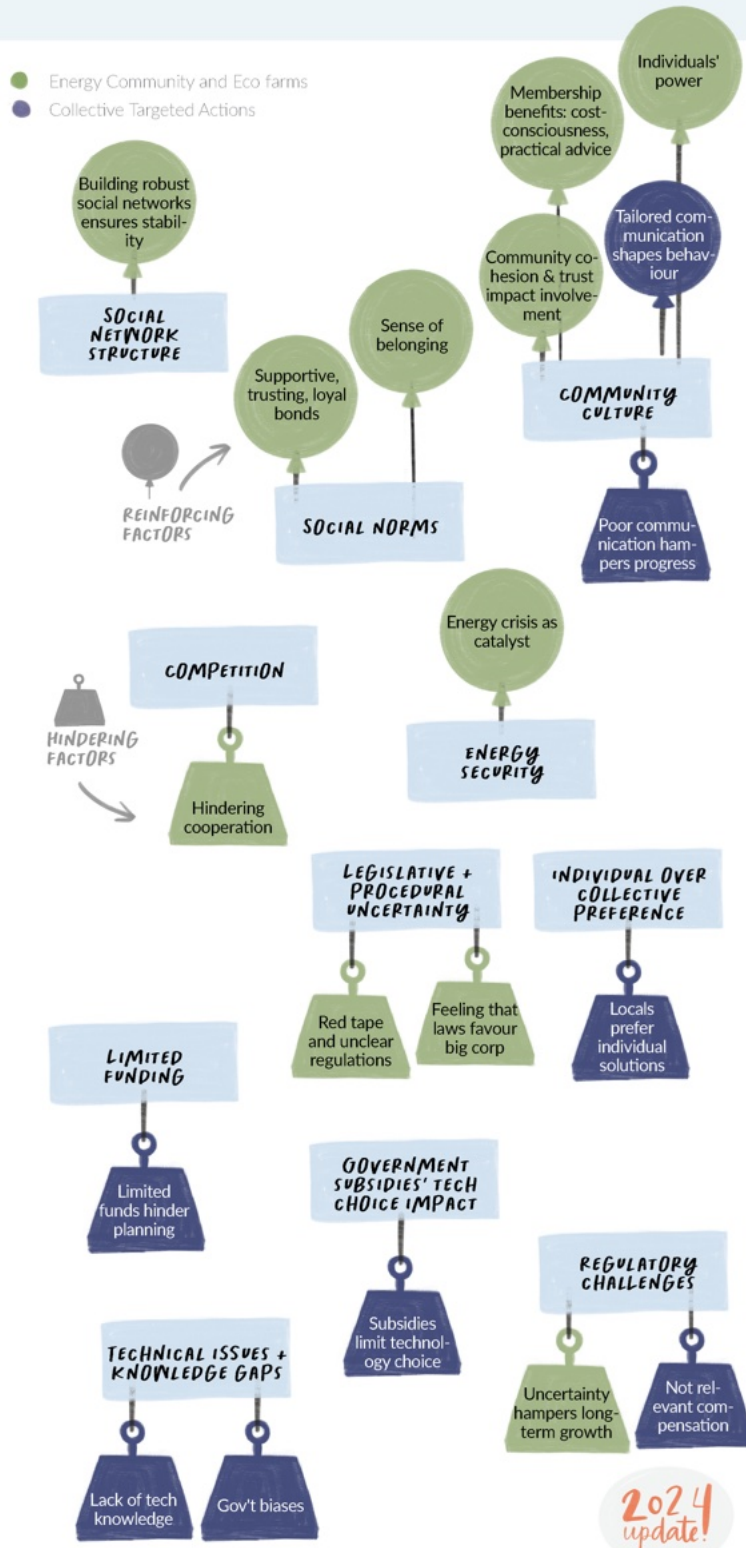
Our study provides nuanced insights into positive and negative influences on collective energy initiatives, contributing to strategies for expanding and accelerating new initiatives.

- Energy Community and Eco farms
- Collective Targeted Actions



CONSOLIDATION

What are factors influencing consolidation of CEIs?



CITIZENS AT THE HEART OF THE ENERGY TRANSITION

Uncovering motivations and barriers
for Collective Energy Initiatives

ENERGY COMMUNITIES AND ECO-FARMS (ECS):

Activity	Production, storage, distribution or optimization of sustainable energy, including sustainable farming practices that reduce energy and water needs.
Ownership	The ownership of assets is rather equally shared between members.
Drivers	Community aspects are central to the case, such as clear rules for decision making and choosing of leadership, clearly defined roles, and democratic participation. High pro-environmental motivation.



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CITIZENS AT THE HEART OF THE ENERGY TRANSITION

Uncovering motivations and barriers for Collective Energy Initiatives

COLLECTIVE TARGETED ACTIONS (CTAs):

Activity	Implementation of solutions for the production, storage, distribution or optimization of energy, including energy efficiency solutions, renovation, as well as trainings and demonstrations aiming to create awareness on energy issues.
Ownership	Participants have very limited contribution to the decision making / participation is not primarily based on the principles of community, decision-making is primarily top-down.
Drivers	High pro-environmental motivation.



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CITIZENS AT THE HEART OF THE ENERGY TRANSITION

Uncovering motivations and barriers
for Collective Energy Initiatives

POLITICAL AND SOCIAL MOVEMENTS (PMs):

Activity	Influence policy makers towards certain goals connected to energy production, distribution, storage or optimization.
Ownership	No technical projects are implemented.
Drivers	Lower environmental motivation than members of ECS and CTAs, stronger focus on self-sufficiency .



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