

D5.3 Roadmap for Community Transition Pathways - Guidelines

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Disclaimer and acknowledgement

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Executive summary

The overall objective of WP5 is to study the interactions of citizenship phenomena across different geographical levels using the concepts of Community Transition Pathways (CTPs). CTPs are defined as collaborative systemic routes to transit communities from different initial engagement levels (unwilling, unaware, etc.) to more active levels of engagement towards energy. The objective of the CTP is to sustain and stimulate energy citizenship (EC) through a roadmap. GRETA, indeed, aims to design roadmaps (one per case) to successfully implement CTPs for supporting EC across geographical levels. These roadmaps would ultimately lead to an increased engagement of communities (at different levels from local to supra-national) in addressing decarbonization and contributing to the clean and just energy transition. The activities, designed to stimulate potential actors in shifting their awareness level from an unaware level to possibly an advocate one, have been based on steps to define energy goals, strategies and enabling conditions for EC in relation to the geographical levels and related factors.

T5.3 is specifically dedicated to providing and illustrating CTPs Guidelines to apply and refine the process in case studies (WP3). Therefore, D5.3 provides CTPs Guidelines with relevant information on their purposes and on how to read and use them, while also explaining what benefits and for whom good CTPs would carry when put into practice (Section 1). CTPs Guidelines intend to show the process of developing transition pathways in a fair and inclusive way by adopting a systemic and multiscale approach that includes both the top-down and the bottom-up perspectives. CTPs intend to enable both Policy makers and communities together in setting their strategies and in structuring profitable relations with the determinants of their specific contexts of application (e.g., policies, social, economic dimensions, etc.).

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Summary (for dissemination)	This deliverable provides guidelines for CTPs. It defines the purpose of these tools and explains how to use them. Section 1 explains the benefits of their adoption and who they are intended for. The CTPs Guidelines aim also to illustrate the process of developing transition pathways in a way that is fair and inclusive, adopting a systemic and multi-scalar approach that includes an interrelationship between top-down and bottom-up perspectives. CTPs aim to enable both policy makers and communities to define their strategies and structure fruitful relationships with the determinants of their specific contexts of application (e.g. policies, social and economic dimensions, etc.).
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Abbreviations and acronyms

CTPs: Community Transition Pathways

ECCs: Energy Citizenship Contracts

EC: Energy Citizenship

GRETA: Green Energy Transition Actions (also referred to as “the project”)

EJ: Energy Justice

JT: Just Transition

Document Short Glossary

This section aims to support a deep understanding of the deliverable, by providing some preliminary glossary terms.

Community Transition Pathways (CTPs)

Community Transition Pathways are routes that support individuals and communities in transitioning between different levels of citizenship engagement. CTPs establish roadmaps for decarbonization that explore and enhance positive energy citizenship behaviours. GRETA will investigate how CTPs can strengthen and regulate the relations among the actors involved in the transition through creation of Energy Citizenship Contracts (ECCs). These are a specialisation of the forthcoming climate city contracts, which form the basis of the “100 climate neutral cities by 2030” mission, proposed by the Mission Board for climate neutral and smart cities to the EC.

CTPs promoter or initiator

A CTPs promoter or initiator is a person or a group of people that initiate the process of constructing a CTP for a reference community. The promoter or initiator can be an individual or a group of citizens, one or a group of citizen associations, decision-makers, entrepreneurs, and many other types of energy citizens. Usually, they are already interested in the energy transition, perform sustainable transition actions, and can be considered as energy citizens, in the sense described in GRETA D1.1¹.

Community in Transition

A Community in Transition is a group of people that are in a climate and energy-related transition process. Specifically, they are in the process of building their Community Transition Pathways and the Energy Citizenship Contract.

¹ Energy citizenship as defined in GRETA D1.1: “Thus, like performative, environmental, and ecological citizenship, the idea of energy citizenship builds on a view of citizens as active participants, who are, however, specifically engaged in sustainable energy transitions. It is argued that citizens play an important role in transitions and should be conceptualised as “important stakeholders in the innovation process shaping new routines and enacting system change” (Schot et al., 2016, p.1). Citizens are not perceived as merely users of energy technologies and innovation, but participants in the energy system in a more comprehensive way (Devine-Wright, 2004)” (p.20)

Energy Citizenship Contracts (ECCs)

The GRETA Energy Citizenship Contracts (ECCs) are a specialisation of the forthcoming Climate City Contracts (CCCs) which form the basis of the “100 climate neutral cities by 2030” mission, proposed by the Mission Board for climate neutral and smart cities to the EC. As for the CCCs, the ECCs will be adjusted “to the realities of each case study through a multi-level and co-creative process; they will 1) include the goal and targets, 2) specify the strategy and the action plan for transition and 3) identify stakeholders and responsibilities. They will emphasise the high ambition, the participatory approaches and the multi-level governance collaboration that will trigger innovation and change towards climate neutrality.” In detail, in GRETA, the local community will need to outline its own Energy Citizenship Contract. ECC will strengthen and regulate the relations among the parties involved in the energy system within its specific context. ECCs, as outcome of GRETA CTPs (Community Transition Pathways), are packaged policy instruments embedding local goals and targets as well as broader – regional and interregional – strategies and plans: they support communities in achieving fair agreement guidelines for implementing energy citizenship.

Introduction

The European Union is committed to achieve climate neutrality by 2050 to fulfil its responsibility to respect the Paris Agreement and avoid catastrophic climate change. To this end, **society, policy makers and businesses must design pathways** to engage in a just energy transition to end the reliance on fossil fuels and build greener and more equitable futures for Europe.

Addressing low-carbon objectives calls for radical departures from existing socio-technical trajectories (Turnheim and Nykvist, 2019). This requires a profound transformation across all economic sectors (energy, industry, mobility, construction, agriculture, forestry...) and societies that must be guided by appropriate roadmaps and enabled by legislative and social instruments. In particular, **deep decarbonization involves coordination and cooperation among established sectors, new actors in the public and private sectors** and new knowledge produced within different policy levels (EU, National, Regional, Local). In order to achieve climate neutrality and build a socially just transition, it is crucial to propose ambitious but realistic pathways of significant change processes in society (Farla, et al., 2012; World Energy Council, 2019). Moreover, considering that cities and territories are the centres of economic activities, knowledge generation, innovation, and influence the quality of life of citizens who live or work in them, these will play a key role in decarbonization pathways through different initiatives and incentives. Furthermore, cities are responsible for 65% of energy consumption and for 70% of CO₂ emissions. Therefore, transition pathways must be shaped around cities, which are at the core of the ecological transition for both mitigation and adaptation actions.

This deliverable is structured into **2 Sections and 4 chapters**.

Section 1 contains the general guidelines on how to use the CTPs and for whom they are drafted. It is divided into Chapter 1 aiming to briefly discuss potentials and limitations of CTPs, their interactions with ECCs and the characteristics of a good CTP in the context of the GRETA project. Chapter 2, titled “Community Transition Pathways Guidelines – Orientations for different actors”, provides the general CTPs framework identifying general principles, instruments, and targets.

Section 2 contains the proper Guidelines divided in two parallel explications of the CTPs for two core target groups: Policy makers and local committees or associations. Chapter 3, indeed, defines CTPs for Policy makers and Chapter 4 defines CTPs for Local Committees and Association.

GRETA CTPs intends to enable both Policy makers and communities in setting up their strategies and in structuring profitable relations with the determinants of their specific contexts of application.

SECTION 1

1 Community Transition Pathways in the context of the GRETA project

1.1 The challenges and potential of transition pathways for climate neutrality

Community Transition Pathways (CTPs), as defined in GRETA project, are developed for communities formed inside cities and territories and across multiple geographical levels (from local to supra-national) that represent the core of the ecological transition with particular reference to both mitigation and adaptation actions. The CTPs implementation aims to support an increase of energy citizenship across geographical levels through **enhanced communities' empowerment and engagement** (at different levels from local to supra-national) in addressing decarbonization and contributing to the clean and just energy transition. For instance, CTPs might help: 1) **communities** to establish a clear path towards multiple levels of engagement within the energy system (i.e. energy communities, purchasing groups, mobility sharing groups and others); 2) **policy and decision-makers** to support the transition of cities and territories with cleared paths integrated into the already existing policy framework (i.e. Climate Neutral Cities, the Green New Deal, etc.); 3) **local associations and committees** to create deeper networks within citizens and other local actors to activate a just and inclusive transition.

In the literature, three main pathway frameworks can be identified: biophysical pathways (emissions, biodiversity, soil quality...), techno-economic pathways, and sociotechnical pathways, which focus on social, technological, and institutional dimensions of systemic change (Turnheim and Nykvist, 2019; Rosenbloom, 2017). Each type of pathway reflects a different focus on processes, constraints, strategies, and answers. They are generally intended as roadmaps able to support the concrete achievement of objectives in the short but also in the medium and long term.

Despite the spread of pathways across Europe and worldwide and their typologies, it is possible to recognise some criticalities and points of attention (Boulanger, 2022).

As pointed out by Wigboldus, van Eldik and Vernooij (2021), the concept of transition pathways, mainly originated from the field of system thinking, it often tends to be dominated by an analytical and instrumentalist approach that answers the question “how to make it happen”, usually overestimating the role of technology and innovations in transition processes. According to the same authors, a second problematic aspect is the fact that transitions are always considered positive, without critically interrogating them as complex, and often, conflicting processes. As highlighted by UNDP (2022), transition pathways can have distributional consequences, such as job losses in fossil fuels-dependent sectors/regions/communities. Like sustainability transitions, transition pathways are not neutral and “can be highly

political so that certain interests could be entangled or specific narratives could be excluded” (Wigboldus, van Eldik and Vernooij, 2021, p.8). Furthermore, they tend to overlook the relevance of normative functions, such as societal values and principles, which, instead, are crucial to shaping alternative socio-technical imaginaries of post-fossil societies.

In this regard, it is particularly relevant to pluralize knowledge and the array of actors that can effectively participate in decision-making processes, “recognizing that models are more pertinent as ‘learning machines’ than as ‘truth machines’” (Turnheim, Nykvist, 2019, p.8; Berkhout et al., 2002). This perspective would help to envision transition pathways as models that engage with uncertainty, openness, critical views and issues of choice for possible futures, rather than top-down solution-oriented paths (Turnheim et al., 2015). Considering different, plural ideas and narratives of orientation and trajectories of change may lead to diverse paths of transformation, less aligned to unhelpful “business as usual” and more attuned to emerging forms of concrete alternatives.

Inclusive transition pathways are recognized as crucial tools in sustaining and enabling responsible and just transitions to desired futures. Since **there is no “one size fits all” approach for sustainable transitions, transition pathways too must be elaborated with an approach that engages with different ideas of what transitions are and involves several practices of transitions.**

1.2 The Community Transition Pathways and the Energy Citizenship Contracts Community

The transition pathways are at the core of the GRETA project. GRETA, indeed, has adopted case studies with different types of energy communities at different geographical levels and contexts as a methodology for understanding current energy citizenship emergence conditions and for designing and testing mechanisms for change. The mechanisms explored in GRETA are Community Transition Pathways (CTPs), which are **routes for individual and community transition among different levels of citizenship engagement** (Fig.1).



Figure 1. GRETA general concept and methodology

On a wider level, CTPs establish roadmaps for decarbonization that explore and enhance positive energy citizenship behaviours across geographical levels. CTPs define a series of collaborative actions that a community can take to build transitions towards greener energy systems, describe the level of preparedness of the community towards decarbonization and include key steps for enabling and consolidating energy citizenship. Moreover, CTPs are thought as important instruments for Policy makers and communities to set their strategies and establish profitable relations. Indeed, CTPs are identified as relational roadmaps: they provide descriptions and considerations of relations among different actors and stakeholders, with socio-technical innovations, and with the contexts in which they take place (in their different geographical scales).

The process of CTPs elaboration will eventually lead to the co-creation of the Energy Citizenship Contracts (ECCs), which will formally regulate the relations among the actors involved in the transition. ECCs are based on the forthcoming climate city contracts, which form the basis of the “100 climate-neutral cities by 2030”² mission and are considered key interventions to face the ambitious goal of implementing citizens-centred and climate-neutral cities. Climate city contracts are conceived as non-binding contracts, in the form of a memorandum of understanding, that clearly states “the political commitment on the part of the city to its citizens as well as to the Commission and the national and regional authorities” (Roversi et al., 2022, p. 298). Inspired by Climate city contracts, ECCs – as the operative result of CTPs – are policy instruments, that integrate local visions, goals, and targets, as well as broader strategies and plans, that will ultimately support communities in establishing fair guidelines for energy

² Mission Board for climate-neutral and smart cities, 100 climate-neutral cities by 2030 by and for the citizens,
https://ec.europa.eu/jrc/communities/sites/jrccties/files/100_climate_neutral_cities_report.pdf.

citizenship. They contain tailor-made and commitment-driven agreements, shared duties and roles, legal operative frameworks, business and financial orientations, and time-bound steps of implementation, according to the goals set along the CTPs.

Moreover, ECCs are particularly relevant since they contribute to filling a gap in the existing literature, where energy contracts at the community level are still little explored. In GRETA, ECCs are thought of as innovative tools that can facilitate the achievement of CTPs' ambitions. CTPs and ECCs are inextricably interlinked instruments that constitute one of the main outputs of the project.

Specifically, through its case studies, GRETA produced new knowledge and behavioural models in support of the implementation of CTPs, each focused on addressing factors that might influence change. CTPs are formulated for each case study and include key steps for the transition, elaborated through the adoption of a systemic and multiscale approach, to support different actors and stakeholders in transitioning between different levels of energy citizenship information, awareness, and engagement, and to establish appropriate guidelines to follow for the enhancement of positive energy citizenship behaviours. Moreover, to make energy citizenship grow across Europe, GRETA CTPs aims to go well beyond existing transition pathways, adopting critical perspectives on constraints and barriers. Specifically, following GRETA's orientation towards social justice in energy transitions – energy is considered a social need and a socially-based practice – CTPs guidelines are based on a justice framework to reduce unfair processes and outcomes on different levels and spatial scales. As CTPs, ECCs are thought of as instruments that do not only frame responsibilities, duties and rights but also return benefits and their redistribution, re-framing energy as a citizenship component. CTPs are also characterised by their practical orientation.

1.3 What does an effective CTP look like?

It is argued that transition pathways are often too broad and too fragmented to be effective in achieving their goals and so are the analytical approaches that seek to understand their quality (Turnheim et al., 2015). Therefore, questions and dilemmas faced by decision-makers, practitioners, and local communities are hardly addressed.

Thus, it is important to envision pathways that can put into dialogues different dimensions, needs, perspectives and knowledge, resources and actions. For example, transition pathways should be able to put into relation “technological processes, social

beliefs, economic ideology, mainstream cultural views, investment patterns, infrastructure networks, and more”³.

The **Portuguese Roadmap for Carbon Neutrality 2050** (RCN2050, 2019; Carvalho, Riquito, Ferreira, 2022) is taken as example of relevant document in which the technological and economic feasible energy transition trajectories are defined together with a just social process, that can enable new jobs and economic growth, promote health benefits and pay attention to different territories. It is based on eight premises:

1. transition to a competitive, circular, resilient and carbon neutral economy
2. decarbonization vectors and lines of action
3. resilience and climate change adaptation
4. research and innovation
5. financing conditions
6. fair and cohesive transition
7. effective conditions for governance and integration of carbon neutrality objectives in all sectors
8. engage society, focus on education, information and awareness, increasing individual and collective action" (RCN2050, 2019, p.2415).

Moreover, this pathway underlines the necessity to build a fair and cohesive transition, based on a systemic transformation of the economic system; proper conditions for the adoption of effective governance models; regional and/or municipal roadmaps in line with RCN2050; citizens, policy makers, economic actors' engagement. In particular, the RCN2050 explains how to achieve its objectives for a total decarbonization of its economic systems by 2050:

- increase the energy efficiency in every economic sector;
- decentralize and democratize the energy production and highlight the role of consumer as active produce within the energy system;
- improve the civil construction sector and reduce energy poverty;
- improve sustainable mobility and transport;
- enhance practices of sustainable agriculture;
- enable the shift from a linear economy to a circular economy;
- empower local governments participation;
- improve research and innovation;
- enable businesses opportunities;
- promote the engagement of society in the process of transition to improve life quality.

³ Energyfutureslab.com (2021).

Since “transitions should be seen as deeply political projects (requiring high-level ‘political will’), as societal projects (including interactions with stakeholders and citizens to achieve support) and as cultural undertakings (requiring positive visions and discourses that create legitimacy and enthusiasm)” (European Environmental Agency, 2018, p.67), appropriate and feasible transition pathways should include these dimensions while also give space to openness, non-linearity and uncertainty of transitions, “with sufficient attention given to disagreements between groups about the pros and cons of different transition pathways” (European Environmental Agency, 2018, p.67). **Transition pathways should be the expression of deliberate change processes** guided by specific but flexible agendas, designed by multiple and diverse actors, experts as well as no-experts, and thought for specific contexts and environments. Moreover, pathways are crucial to outline timing, scope and scales of change, and to frame “what needs to be considered and what will matter when assessing whether a given idea or concept is capable of getting us from A to B”⁴.

That said, effective transition pathways:

- start from the recognition that the energy transition is a complex, multi-dimensional, non-linear process that must be carried out across different scales and be rooted in multi-level understanding of key barriers and opportunities for accelerating the energy transition, with particular emphasis on local communities and territories;
- aim for systemic transformation by designing potential transformative paths elaborated by different perspectives, multiple voices and plural knowledges across society in an optics of multi-level governance;
- aim for a just transformation that recognizes local communities, administrations and committees as key-stakeholders and transition laboratories for new practices and behaviors towards climate neutrality in a collaborative way;
- should be designed as a suitable combination of ambitiousness and feasibility. A good pathway can work when put into practice to achieve a desired outcome;
- reinforce public awareness on climate change and paths for tackling it. This should help to pay attention to the role of participation and activation as well as to the cruciality of political decisions and actions for accelerated change.

⁴ Energyfutureslab.com (2021).

1.4 Purposes and guiding principles of the CTPs

The Community Transition Pathways Guidelines is a resource that provides support and guidance to communities intending to start their own pathway to decarbonization focusing on an active energy citizenship approach.

It contains support and guidance relating to the concept of Community Transition Pathway and its operationalization, introducing key concepts, terminology, and components, and example case studies. It also provides a **Community Transition Canvas**, as operative instrument that can be used in cooperative workshops and/or in drafting the first steps and visions for the community in transition.

It is not necessary that each community follows all sections of the canvas or of the pathway. However, the outlined process is considered a suggestion for a complete roadmap to climate transition in the framework of energy citizenship. Each community has the possibility to craft their own pathway taking either the entire proposed guides or parts of it.

The Guideline may be updated in time during the GRETA project, as any supporting information becomes available.

This document collects in the **Annex** the completed Community Transition Pathways of the six GRETA case studies as operative examples and the full-size high-quality Community Transition Canvas.

The Guidelines have been compiled to provide both informative and generative support for communities considering starting or boosting a process of transition, framed by energy citizenship.

1.5 Guidelines: how to read and use them

The Guidelines are structured in two core sections. Chapter 3 provides the general instructions and framework of the CTP, while Chapter 4 includes some specification for policy makers, and Chapter 5 the guidelines for Local Committees and Associations. Both are structured in the same way, each with specificities. The documents can be read entirely but it can also be read in some of the parts, as highlighted into the following scheme (Figure 02).

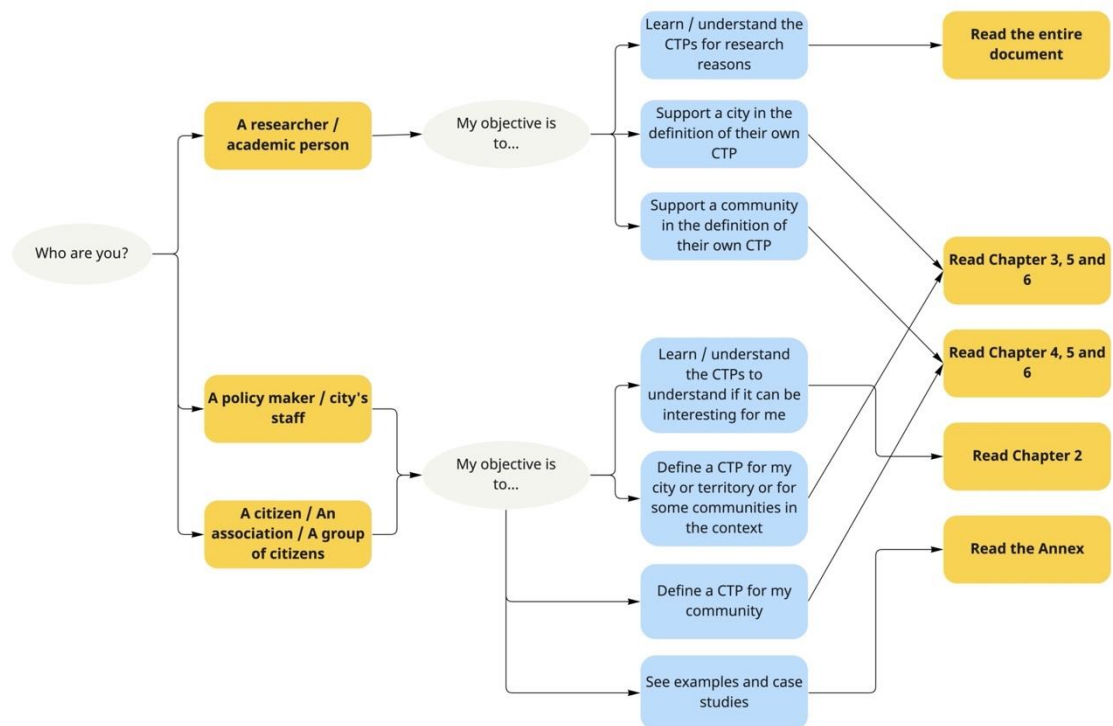


Figure 2. How to read this document.

2 Community Transition Pathways Guidelines – Orientations for different actors

2.1 Vision key instrument: the GRETA canvas for CTPs

The GRETA canvas (Fig.3) is a supportive instrument to brainstorm and structure the transition pathway. It can be used both as a stand-alone tool or inside co-design workshops. It is applicable to multiple targets and can be used by everyone involved in the process as promoter: citizens, associations, policy makers, entrepreneurs, others. It can be easily adapted to different groups' needs and ideas to provide a feasible path for energy citizenship.

Within the GRETA cases, it has been effectively used in many contexts and by different people. In some cases, as in the Bologna one, specific co-creation workshops have been created with the community. While in other cases, such as in the Coopernico case study, a more expert approach has been followed. In this section, the canvas is detailed, highlighting the different steps that are suggested to compose the CTP.

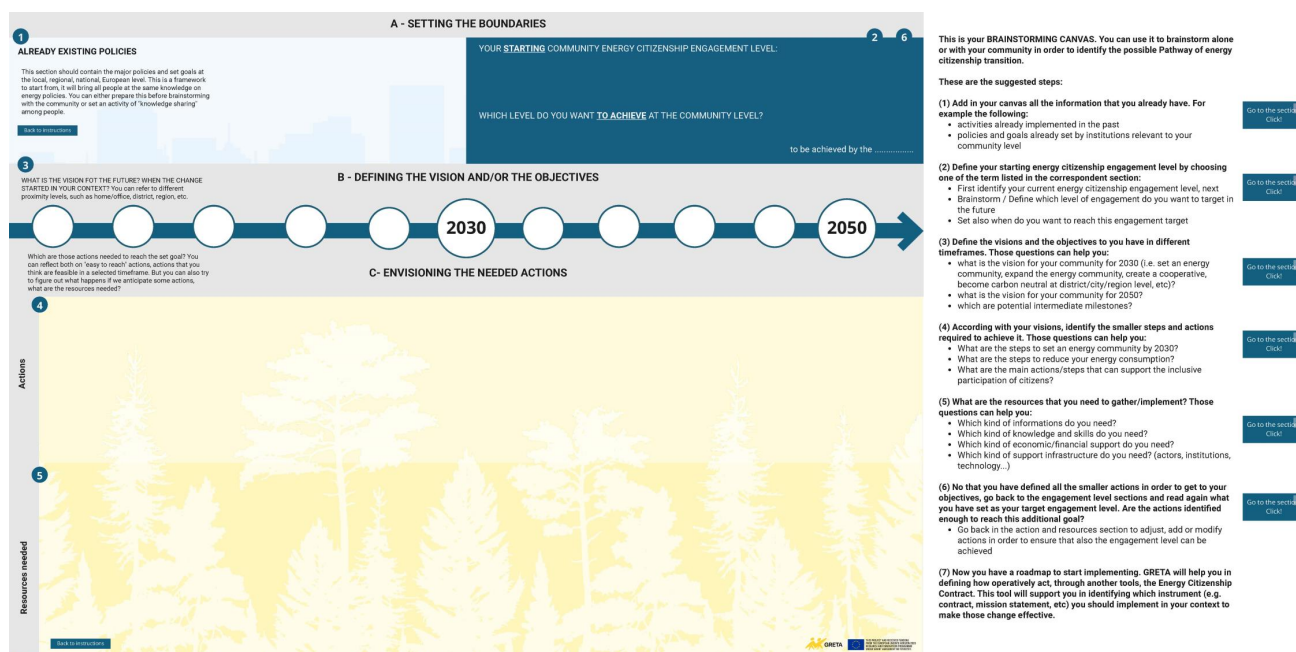


Figure 3. The CTP support canvas used in GRETA project

2.1.1 Step 1 - Setting the boundaries

A. Existing and ongoing policies and projects on energy transition

The first step in creating the CTP is to identify the characteristics and the main boundaries of the specific context and the specific involved community. It is important

to deeply understand the starting point of the community within which – or for whom – the transition pathway is built in order to provide a smooth process. Of course, some modifications can always be performed but a deep knowledge before starting is crucial. The canvas, as showed in Figure 3, proposes two core parts. The first one is the acknowledgement and identification of already existing transition or energy-related policies, in the selected area, if possible.

It is important to identify the existing policies, projects and other processes at the relevant geographical level, in order to have the opportunity to start from them or to combine the CTP efforts with existing or foreseen actions.

B. Identification of the community engagement level (state of the art)

The second part of step 1 is acknowledging the starting point of the community in relation to their energy citizenship level.

The GRETA project foresees several engagement levels, the main ones being the following, as defined in D1.1 and in the GRETA proposal (p.5):

- Unaware
- Aware
- Involved
- Active
- Advocate

A community can be almost homogeneous and recognize itself as one of them, or it can be more heterogeneous and recognize itself in multiple engagement levels – this happens especially with big areas and big communities. In the second option, it is important to acknowledge the diversity and the presence of multiple facets, but it can be useful to try to identify two or three main levels, as a simplification. This simplification is necessary to have the possibility to design a vision and to envision a transition pathway in which the community in its entirety can move from one level to another.

C. Identification of the foreseen engagement level in a selected timeframe

The third part of step 1 requires understanding which is the desired engagement level in a selected timeframe. GRETA's main hypothesis is that citizens and/or communities can transition between engagement levels, as a result of a change in conditions. To support citizens in this transition, the last preliminary step of the Community Transition Pathway is to identify what is the desired change in the engagement level as this will frame the identification of the activities and actions that can be proposed within the pathway.

As an example, if the community is mainly unaware and the desired outcome is that in four years it becomes aware (1 step of advance), it will probably be sufficient to propose informative and communication-based activities. However, if the desired outcome is to support the community in becoming “active” or “advocate”, more in-

STEP 1 – some key supporting questions

- What type of community am I working with?
- Is this community based on a geographically bounded neighbourhood or district?
- Is this community digital or virtual?
- What is the geographical dimension of the community?
- Is this community in a context having some specific proximity elements? Also check GRETA D5.1 for further information on this.
- Is this community already involved in some energy transition processes or not?
- Who composes this community?
- What I expect to obtain within this Community Transition Pathway? In particular, what is the foreseen energy citizenship level that I would like the community to achieve? In which

depth activities are necessary.

2.1.2 Step 2 - Defining the vision and/or the main objectives

As detailed in the canvas (Fig.2), Step 2 allows CTP promoters to define a vision of transition and to set intermediate milestones in some timeframes. The objective of this step is to identify a short-, mid- and long-term objective to be pursued with specific actions within the pathway. The canvas, in addition, suggests also to identify some 2030 and 2050 objectives. The following aspects should be considered:

- this step is intended for defining high value goals, not small steps (that will be defined in the next step);
- a vision should be something that the community really want to achieve but maybe do not know exactly how. It is possible to “dream big” in this step as more reality-based and smaller steps will be defined later;
- the shortest milestones in time will probably be easier to identify and the canvas will probably be denser in the short and medium timeframe. This is totally fine, as we can better estimate and think about goals in short-medium terms than in the long term;
- it is totally fine if the community does not have a 2050 goal. This will depend on the specificities of the community itself.

When the vision and some milestones are set, it is time to go deeper into the smaller actions that will allow the vision to become reality.

STEP 2 – some key supporting questions

1. What is the image of the community where I would like to live, in relation with energy and climate aspects?
2. In this “dream community”, what are the relations among people and climate? What are the relations among people and energy?
3. What would I like my community look like in 2030? And in 2050?
4. How can this vision be translated into specific objectives?
5. Which are the timeframes in which I would like to see the vision become reality, excluding 2030 and 2050? Is there a unique timeframe or multiple? Are there before or after 2030? Before or after 2050?

2.1.3 Step 3 - Envisioning the needed actions

The third step will support the promoter and the community to precisely identify the proper pathway of transition, considering all the needed smaller steps to achieve their vision and their objectives. This is the step more adapt to be tailored to the necessities of each community. However, some crucial elements and pillars are identified in the canvas as minimum aspects to be taken into consideration. The canvas itself is divided into two minimum spaces: Actions and Needed Resources. These are the minimum two elements in which the pathway should be structured, remembering the following aspects:

- Actions should have the dimension needed in the specific community in transition. These can be small scale and local, or more complex and a regional or national scale. This will depend on the specific community. In the Annex several examples from the GRETA case studies are provided;
- Resources should be linked with the actions identified. Remember that resources can be of any types (funding, people, knowledge, skills, tools, technologies, etc).

Six other transversal pillars are the following:

- Dedicated technical team;
- Educational energy and climate programme;
- Social justice programme and initiatives;
- Communication strategy;
- Networks with relevant stakeholders;
- Monitoring data and results.

These are specifically deepened at the end of the document in a dedicated chapter.

STEP 3 – some key supporting questions

- Consider the first objective you set in the timeframe. What are the multiple smaller steps that are required to achieve it?
- Do you need some resources to start with this action? Are there any missing people, knowledge, funding, skill, regulations?
- Do it for all the objectives you set in the timeframe.
- Look at the entire roadmap you created: do you think something is still missing? Complete it.
- Are there any key actions that really need to be taken and that are priorities? Circle or highlight them: these will be the minimum actions that you should work on first.

2.2 Benefits

The Community Transition Pathway is a supportive instrument for enabling communities to proceed in their transition toward climate neutrality and toward a more active role into the energy system. It is intended as a personalized roadmap that communities need to tailor and create on their own, with the support of additional actors and stakeholders. The CTP is a tool composed by steps that, if followed, will enable the community in transition to know which steps and resources need to be put in practice to start an integrated and holistic road to the transition. This document should be drafted looking at the broader context, as it is important to combine it with other potentially available instruments, policies and projects.

If used in this way, the benefits of the CTP are multiple:

- It supports the community in deciding for themselves and in taking actions toward the energy and climate transition.
- It supports the community in identifying partners, mediators and involving them for the specific actions they want to take.
- It empowers the community in understanding their own unique roadmap and the smaller steps needed to achieve its own vision.
- It guides the community in identifying a personalized vision, able to create a sense of belonging and being inclusive.
- It supports the community in creating stable relationships with other relevant actors in the transition in a win-win process.
- It supports the community in stabilizing, through Energy Citizenship Contracts, their own visions, relations, needs and potentialities.

SECTION 2

Section 2 details the general CTPs Guidelines, as provided in Chapter 2, for two core targets: Policy makers and Local Committee and Associations. The selection of these two specific targets relies in the importance that these two targets have in the climate transition and in being references for communities. However, it is important to note that the CTPs and the associated canvas can be used also by other actors in the energy system. The guidelines have some elements in common, that repeat themselves and are more general, and specific points of attention for each of the two targets. This Section will specify these elements of attention, following the general structure provided in Chapter 2, which is here more briefly exposed. These chapters, consequently, need to be read together in order to have a complete perspective on the instrument.

3 CTPs Guidelines for Policy makers

3.1 Community Transition Pathway key definitions, objectives, and structure

This paragraph describes the main pillars composing the Guidelines for policy makers. The box recalls some key definitions and assumptions.

Who are the policy makers in the context of this Guideline?

Policy makers are defined as: “[...]a representative of the preferences of the institution, and [...] individuals who are subject to internal and external pressures and demands. As a representative in a government or political party, the policy maker decides on new courses of action or sets of regulations adopted by the government, businesses, or other institutions designed to influence and determine decisions or procedures (i.e., policies). Other behaviours of the policy maker are deciding on subsidies, promoting change and investments, and the regulation of innovations” D1.1 p.48. Policy makers can be also considered as “decision makers” hence identifying, all those who have a strategic decision role in their reference institution.

This part of the Guidelines will support Policy makers that aim to activate to empower citizens and other local stakeholders by accompanying their transition through the different GRETA’s engagement levels of energy citizenship. These Guidelines will help policy makers through recommendations and a step-by-step guide that can be applied through multiple types of activities and events from locally based workshops, to internal task forces, to urban assemblies.

These guidelines consider Policy makers as **promoters of the CTP**. The pathway can be applied at different geographical levels: from local to urban or regional or cross-national, depending on the specific situation. Policy makers will support the community in defining a shared medium-, long-term **vision for the case study** to fulfil the climate neutrality target. The vision must be on one hand, coherent with the most recent normative, and, on the other hand, adaptable to the available funding to be associated with implementable actions, based on the sustainability principles of urban development and climate transition process, that will cut across all the sectors, such as housing, transport, health, education, urban planning, energy, economy. While approaching this process of Pathway definition, the policy maker can consider being supported by other experts, both internal and external, to provide multi-disciplinary and multi-level guidance.

3.2 Step-by-step guidelines

3.2.1 STEP 1: Setting the boundaries

A. Existing and ongoing policies and projects on energy transition

The first step for Policy makers in creating the CTP is to identify the characteristics and the main boundaries of the case study context and community. It is important to understand the starting point of the community within which the transition pathway is built, to provide a smooth process.

Policy makers can already provide some parts of the canvas completed before involving the community, for example, by identifying the most important existing policies, projects and other relevant processes. It is also possible to identify beforehand some key objectives and goals set in precedent documents and institutional resolution.

The completion of this part of the pathway should involve at least some representatives of the community to mix a top-down and a bottom-up approach and to guarantee the identification of common objectives and action steps. Multiple rounds of public consultation and task force work on the pathway should be foreseen, to validate the final pathway.

B. Identification of the community engagement level (state-of-the-art)

The second part of step 1 is acknowledging the starting point of the community regarding their energy citizenship level (as seen in chapter 2).

A community can be identified as falling homogeneously within one engagement level, or it can be part of multiple ones. It is important to acknowledge the diversity and the presence of different engagement levels to better address actions and resources.

The transition should be inclusive and “**no one must be left behind**”, hence considerations on energy poverty and inclusivity, but also on negative deviations such as NYMBism (not in my backyard) and denial expressions should be considered as complementary elements to the mainstream.

C. Identification of the foreseen engagement level in a selected timeframe

The third part of step 1 requires understanding the desired engagement level in a selected timeframe. This point is critical as it asks policy makers to commit to a precise engagement objective and to drive the subsequent actions in relation to this main goal.

STEP 1 – some key supporting questions for Policy makers as promoters of the CTP

- To what extent are you open to change approaches to local governance?
- Do you have all the needed knowledge in your team?
- Who should we open this approach or process to?
- How will the citizens and communities' engagement happen? What formal and/or informal structures will support this engagement?
- What resources and structures will be required in term of internal work, skills and knowledge to do this successfully?

3.2.2 STEP 2: Defining the vision and/or the main objectives

The second key step of the Pathway is to identify a vision for the transition. This vision can be applied to the case study, at local but also at other geographical levels, starting from the district and ending with cross-national. The bigger the level, the major will be the complexity of the pathway. Policy makers should always refer to the community selected (being it based on a neighbourhood or at the city level or even digital) as the starting point from which to derive the vision for their context. It is possible (and suggested) to directly complete this step together with the community or with community representatives or it is also possible (less recommended) to propose a vision to the community and ask for comments and modifications. Furthermore, it is recommended to support a multi-layered and disciplinary vision, where multiple aspects (not limited to energy) are included. On this vein, it is recommended to not limit the vision to feasibility. This part will be covered in the next step. It is important in this phase to collect all the ideas, aspirations and needs as they can come useful in the future.

3.2.3 STEP 3: Envisioning the needed actions

Step 3 supports policy makers in identifying the proper transition pathway, considering all the needed steps to achieve their vision and objectives. The canvas asks for the identification of aspects to be taken into consideration: **Actions and Needed Resources**, built in relation to the objectives and the vision set in the previous step.

These are the minimum elements in which the pathway should be structured, remembering the following aspects:

- Actions should be tailored to the community dimension. These can be small-scale and local, or more complex and on a regional or national scale. In the Annex several examples from the GRETA case studies are provided.

- Resources should be linked with the actions identified. Remember that resources can be of any type (funding, people, knowledge, skills, tools, technologies, etc).

This step could be supported by iterative rounds of completion incorporating multiple expertise.

This step should combine both the community and the policy maker's experience and expertise. It can be effective to be supported by experts in participatory activities, especially if large communities are involved

Other relevant actors should also be included, such as local associations and local committees.

At the end of the process, it is crucial to prioritise the most important actions and resources to be allocated.

4 CTPs Guidelines for Local Committees and Associations

4.1 Community Transition Pathways key definitions, objectives and structure

This chapter describes the main pillars that constitute the Guidelines for Associations and Local Committees. The box recalls some key definitions and assumptions.

Who are Associations and Local Committees in the context of this Guideline?

Associations and local committees are formal and informal groups of citizens that work together to achieve collective goals to improve the quality of life of their neighbourhood, district, areas and/or targets. They can extensively vary in purpose, dimension, formalisation. In the context of GRETA, they are examples of energy citizens that, as important reference actors on a territorial scale in relation to socio-cultural, economic and environmental aspects, might work to empower individuals and communities to become active participants in the energy transition.

This part of the Guidelines is meant to support **associations and local committees** that aim to activate individuals and local communities and accompany their transition from different engagement levels of energy.

In this paragraph, the local committees and associations are considered **promoters of the CTP**. This is the case where local committees and associations aim to empower their own community and decide to create or co-create a pathway of transition, for example, in the case of people living in building blocks or condominiums that decide to create an energy community or a group for sharing services or sustainable means of transportation.

In this context, the local committee or association has the main role of collecting communities' needs and ambitions and translating them into a shareable form, both to other members of the community and to the local institutions. Within communities is possible to simplify the different steps, for example, focusing on three levels for the vision and for the consequent actions and resources:

- Global
- Neighbourhood
- Building / House

This approach has been tested for example within the Bologna case study and resulted quite effectively also in communicating the different levels and challenges to non-experts.

4.2 Step-by-step guidelines

4.2.1 STEP 1: Setting the boundaries

A. Existing and ongoing policies and projects on energy transition

As the first step it is important to deeply understand the starting point of the community within which the transition pathway is built, to provide a smooth process.

Local committees and associations can already provide some parts of the canvas completed before involving the community, for example, by already identifying the most important existing policies, projects and other processes that are relevant.

B. Identification of the community engagement level (state-of-the-art)

The second part of step 1 is acknowledging the starting point of the community in relation to their energy citizenship level.

A community can be almost homogeneous and recognizable in one main level, or it can be more heterogeneous over multiple engagement levels. In the second option, it is important to acknowledge the diversity and the presence of multiple facets. This analysis is necessary to have the possibility to design a vision and to envision a transition pathway in which the community in its entirety can move from one level to another.

This is the step where to take into consideration one of the main objectives of the European Commission, that transition should be inclusive and that **“no one must be left behind”**. Considerations on energy poverty and inclusivity, but also on negative deviations such as NYMBism (not in my backyard) and denial expressions should be considered.

C. Identification of the foreseen engagement level in a selected timeframe

The third part of step 1 requires understanding which is the desired main engagement level in a selected timeframe. This point can be critical as it asks people to autonomously set a precise engagement objective and to drive the subsequent actions in relation to this main goal. If this step results hard for citizens, it is also possible to draft it and refine it at the end of the process.

STEP 1 – some key supporting questions for Local Committee and associations as promoters of the CTP

- What type of community am I working with?
- Is this community based on a geographically bounded neighbourhood or district?
- Is this community digital or virtual?
- What is the geographical dimension of the community?
- Is this community in a problematic context? Also check GRETA D2.1 for further information on this.
- Is this community already involved in some energy transition processes or not?
- Who composes this community?
- What I expect to obtain within this Community Transition Pathway? In particular, what is the foreseen energy citizenship level that I would like the community to achieve? In which timeframe?

4.2.2 STEP 2: Defining the vision and/or the main objectives

As mentioned, **establishing visions helps actors to achieve their goals**. Using the GRETA Canvas as an instrument, visions should be elaborated in different timeframes and the main objectives and goals of your association/local committees regarding energy citizenship set in the short, medium, and long term. This vision should be the result of consultations, participatory activities and initiatives conducted among associations' members and with targeted people to establish a strong consensus on its content based on co-creation of strategies both as a mindset and as a method.

As explained, **visions are also informed by relevant existing policies**. Knowing the policy context on different geographical and administrative levels is the very first step to elaborate a vision and a set of milestones in different timeframes. Defining timeframes is important to elaborate a short-, mid-, and long-term vision and consequently decide which actions to implement at a specific time.

For example: if local committees and associations would like to build or participate in an energy community, a proper vision should state the timeline and the objectives of that process, emphasizing the aims (economic benefits, positive social effects, reducing GHG emissions...).

STEP 2 – some key supporting questions for Local Committees and Associations as promoter of the CTP

- What is the image of the community I would live in, in relation to energy and climate aspects?
- In this “ideal community”, what are the levels of knowledge about/relations with climate?
- And knowledge about/relations with energy?
- What would I want my community to look like in 2030? And in 2050?
- How can this vision be translated into specific objectives?
- What are the timeframes in which I would like to see the vision becoming reality, excluding 2030 and 2050? Is there a unique timeframe or multiple timeframes? Are they before or after 2030? Before or after 2050?

A guiding question can be: what is/are the vision/s for your association/local committee by 2030? [i.e. increase opportunities to address energy problems, build an energy community or become part of an energy community, improve the effectiveness of environmental-related activities, increase the presence on the territory to support energy citizenship. Establishing visions helps associations/local committees to build clearer and more structured paths towards their local engagement goals.

4.2.3 STEP 3: Envisioning the needed actions

Step 3 supports the community in drafting a proper pathway of transition, considering all the needed steps to achieve their vision and their objectives. This is the step keener to be tailored to the necessities of each community. However, some crucial elements and pillars are identified in the canvas as minimum aspects to be taken into consideration: **Actions and Needed Resources**.

Actions should have the dimension needed in the specific community. These can be small-scale and local, or more complex and on a regional or national scale, depending on the specific community.

Resources should be linked with the actions identified. Remember that resources can be of any type (funding, people, knowledge, skills, tools, technologies, etc).

This step could be supported by multiple rounds of completion and multiple expertise.

STEP 3 – some key supporting questions for Local Committees and Associations

- Consider the first objective you set in the timeframe. What are the multiple, small steps required to achieve it?
- Do you need some resources to start with this action? Are there any missing people, knowledge, funding, skill, regulations?
- Do it for all the objectives you set in the timeframe.
- Look at the entire roadmap you created: do you think something is still missing? Complete it.
- Are there any key actions that need to be taken and that are identified as priorities? Circle or highlight them: these will be the minimum actions that you should work on first

Some additional recommendations are the following:

- The pathway should be built in relation to the objectives and the vision set in the previous step.
- It is important at the end of the process, to identify the most important actions and resources to be allocated to identify any priority.

5 Six pillars to be considered while drafting the CTP both for policy makers and local committees and associations

This chapter identifies six main pillars that frame the GRETA CTP and that should be considered while building the pathway. They operate as final recommendations. The six pillars are the following:

- The importance of a dedicated technical team
- Potentialities of educational energy and climate programmes
- Social justice programme and initiatives
- Defining an appropriate communication strategy
- Create stable networks with relevant stakeholders
- The importance of collecting data and monitoring results

1. **The energy transition requires new actors to actively participate** in shaping decision-making processes and actions (plurality of actors engaged: citizens, policy makers, suppliers). But participation in the energy transition demands new knowledge, new skills and new resources. Therefore, it would be important to establish sub-groups, and task forces that would be dedicated to studying specific topics, themes, policies, and rules that are relevant to the new knowledge required and that would attend formative events (webinars, workshops...). Clearly, this demands additional time and other kinds of resources that are not always available but recommended.
2. **Energy and climate education initiatives** contribute to improving understanding and build new knowledge and awareness of socio-environmental issues as well as better energy/environmental culture and can foster the emergence of further actions meant to address energy issues (energy poverty, clean energy, energy saving...) and climate issues through collective actions and/or manifestations. Initiatives and events (such as a series of seminars or more participatory workshops) on energy and climate topics can activate people in the direction of energy citizenship but also strengthen the awareness of already active people who might start advocating for energy and climate justice. Moreover, such initiatives might help to underline the political roots of the present crises, thus highlighting the interdependency between behavioural change and structural political change. Workshops and seminars intended to create better awareness on socio-environmental issues should be conducted in an open manner, meaning that scientific knowledge should be combined with local knowledge about sustainability (such as sustainable practices adopted, daily experience, perception...). Initiatives organized together with the formal education system (schools, universities...) are recommended.
3. **The energy transition should be a just energy transition**, meaning that transformations should not be a burden for the most vulnerable people, communities and territories.

Therefore, social justice principles should inform energy transition processes as well as energy citizenship. In this regard, local committees and associations are crucial to incorporate those principles in their territorial work and activities. A just energy transition depends on appropriate policies, able to acknowledge and respect principles of distributive, recognition and procedural justice. At the same time, associations and local committees can activate on the ground to support social justice-oriented initiatives and measures. For instance, it is important to link energy to other relevant non-energy or non-climate benefits (jobs, quality of life, air pollution...) to make the energy transition as tangible as possible. Energy poverty, for example, represents a big issue when addressing the energy transition through a justice lens. Being a structural problem, energy politics is pivotal in tackling and reducing it, but associations and local committees could organize events and initiatives with the aim of shedding light on that problem. Moreover, next to communication and dissemination activities, non-governmental local actors can concretely engage in solidarity and mutual-aid initiatives and/or campaigns in favour of their neighbourhood.

4. **Developing new skills and knowledge about communication** is recognized as another crucial aspect to make CTPs more effective in achieving their objectives. In this case, better communication is required both on a horizontal and vertical level. This means that local committees and associations should be able to use appropriate styles and terminologies to be easier to understand by both levels and increase their opportunities to effectively spread their messages. Effective communication contributes to the success of the project.
5. **The process of establishing and strengthening networks with other associations and institutional actors** is identified as a key-step for making CTPs more effective on the local level and support CTPs in enabling energy citizenship. Networking is crucial for a multi-level and poli-centric governance that is a fundamental principle of the energy transition. Representatives and members of local committees and associations could participate in formal events and meetings with other associations and institutional actors or could organize meetings on specific energy and sustainability topics to build stronger relationships with those actors and establish potential partnerships. At the same time, it is relevant to consolidate the relationships within associations and local committees (for example, it is important to reduce the intergenerational gap within groups).
6. **Monitoring data and results is important** to make CTPs effective on the ground. The monitoring processes can be directed to observe available data, to check missing data and ask for further information on it. Monitoring processes are also relevant to highlight the results and outcomes of specific projects (such as energy communities). Monitoring, regularly reviewing and communicating about results, outcomes and potential delays regarding energy projects are small but crucial actions, especially to enhance local communities' motivation and provide opportunities to make changes in their project. Moreover, facing tangible results improves communities' satisfaction and is rewarding for their commitment.

6 Considerations on local engagement and participation

Associations and local committees have a double role in the transition towards zero-carbon cities and societies. While they can be more engaged as energy citizens, they can also work as facilitators to support citizen participation. The co-creation of strategies to enhance the energy transition is vital for their success. Following GRETA's work with its case studies and different engagement experiences, it is possible to highlight some key-aspects for a good participatory governance system:

- **Transparent, accessible and informed communication:** lexicons and terminology are important features of an effective communication towards different audiences, especially when addressing complex issues such as the ecological transition. This communication must be dialogical and open to different views with the aim of co-creating knowledge based on aspirations, values, needs, and affections of citizens.
- **Decision-making:** openness, flexibility and inclusion are pivotal for a just energy transition, especially from a procedural perspective. Indeed, decision-making processes should be conducted with openness to different views with the aim to establish ingroup norms and goals that reflect the diversity of the participants. The sense of influence and efficacy in decision-making is another key of its success.
- **Trust:** a strong sense of trust within the association/local committee but also in associations/local committees' work is essential to enable good and effective participation. To this end, it is important to provide participants with feedback and follow-up about the projects on which they deliberate. Participants need to know what happens with their proposals that require investments in terms of time and commitment. Providing feedback on achieved goals or explanations about obstacles to achieve them is vital to strengthen the sense of trust in participatory processes both towards external actors and towards other community members/participants.
- **Justice:** engaging people in the energy transition should be done by recognizing those potentially excluded as well as the reasons of exclusion. Those can be structural (political and cultural barriers, lack of rights, gender issues...) or more related to daily life such as the lack of time for participating in decision-making processes. It is important to share the

Some key supporting questions:

- To what extent is your association/local committee open to changing the local governance system?
- Do you have all the required knowledge in your supporting team?
- Who should your association/local committee open the governance system for?
- How will the engagement happen? What formal and/or informal structures will support this engagement?
- What resources and structures will be required to do this successfully?

potential benefits of the engagement, acknowledge existing rights, fight for those who are not recognized yet and increase engagement opportunities for all.

- **Collaboration and cooperation towards common goals:** collaborating with other associations and local committees, co-organizing meetings and events, being in touch and cooperating with other territorial actors are further aspects to acknowledge in order to enhance a proper participatory system on the local scale.

Conclusion

The Guidelines on Community Transition Pathways are meant to support different kinds of energy citizens to achieve their energy-related goals, such as strengthening the levels of energy citizenship and implementing actions towards energy systems' decarbonization. This document aimed at stressing out the different phases and the several steps of a good CTP, which results from the appropriate combination between ambitiousness and feasibility. Moreover, the GRETA Guidelines help to demonstrate that CTPs are not just a technical matter, but also a political and socio-cultural one, reflecting the nature of the energy transition as a political and socio-technical process.

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Annex A. CTPs first drafts on GRETA case studies

The Earnest App Case Study

Community Transition Pathway

Writing done by: FhG ISI

Contributions from: CLI and CTP workshop participants at the University for Applied Science (h_da) Darmstadt, Germany & interview partners at the local, regional and national level in regard to sustainable mobility

Short information on the case study:

Case study name	The Earnest App - a virtual community for sustainable mobility in Darmstadt
Typology and geographical level of the case study	Digital & local/regional
Main proximity domains for the case	<input type="checkbox"/> Spatial proximity (urban structure, climatic area, resource availability, energy infrastructure closeness, cluster and activities closeness) <input type="checkbox"/> Policy proximity (political agendas, administrative structure, regulatory framework) <input checked="" type="checkbox"/> Social proximity (community dimension, collaboration mechanisms, knowledge & learning, energy awareness) <input checked="" type="checkbox"/> Technical proximity (energy system, technological readiness, technological appliances, enabling structures) <input type="checkbox"/> Economic proximity (energy system economic structure, energy system enabling economics, value redistribution & inclusion mechanisms, cluster economy)
Starting Engagement Level in the case	<input type="checkbox"/> Unaware <input checked="" type="checkbox"/> Aware (<input checked="" type="checkbox"/> interested or <input type="checkbox"/> indifferent) <input type="checkbox"/> Involved (<input type="checkbox"/> adopting, <input type="checkbox"/> unwilling, <input type="checkbox"/> member) <input type="checkbox"/> Active (<input type="checkbox"/> sponsor, <input type="checkbox"/> frontrunner, <input type="checkbox"/> denial) <input type="checkbox"/> Advocate (<input type="checkbox"/> championing, <input type="checkbox"/> leadership, <input type="checkbox"/> activism, <input type="checkbox"/> NIMBYism)
What is the targeted Engagement Level in the case?	Active (sponsor or frontrunner)

By when?	2023
What is the targeted Engagement Level in the case for the end of GRETA project?	Active (sponsor or frontrunner)

Community Transition Pathway summary

The Executive Summary

The Earnest App case study explores how the regular use of a sustainability app can foster energy citizenship among members of a virtual community. The case study is virtual but conducted with participants living in or around the city of Darmstadt – a city with 160.000 inhabitants located in the state of Hesse in Germany. In cooperation with students from the University for Applied Science in Darmstadt (h_da), the case study explores how a virtual energy community – connected by the shared experience of using an app – affects citizens' awareness and behaviour in regard to their mobility and energy consumption choices in everyday life.

The case study participants use the Earnest App – a freely available digital app providing information and advice about energy and CO2 emissions. The Earnest App is an informative, interactive and game-like online tool that provides information, quizzes, and small challenges including push-up messages for its users to begin (or continue) to question their current energy and mobility behaviour. It aims to encourage reflections on energy behaviour and – based on a growing understanding of the systemic consequences of mobility and consumption choices – seeks to incite gradual behavioural change toward a more climate-friendly everyday life. Case study members exchange their experiences with the app regularly online – as part of a virtual community.

The Earnest App case study identifies three main visions and outlines the community transition pathways to achieve goals attached to these visions. Vision #1 seeks to increase knowledge about energy consumption/energy savings among community members by means of adapting public school curricula to include sustainability as a core subject. Vision #2 wants to see energy consumption in everyday life by setting CO2-free emission as a goal in important transport hubs throughout Germany by 2050. And vision #3 addresses the challenge to increase commitment to community goals and activities among its members. All three visions have individual behavioural changes at their core but also require some major local, regional and national policy changes to help with funding and infrastructure development.

Moreover, some key resources are needed to achieve these visions and these have implications for social justice considerations such as diversity, accessibility, distribution, and affordability of and for vulnerable groups. This report addresses these through the following categories of resources: (a) knowledge/expertise; (b) human resources, (c) financial resources, and (d) infrastructure/material resources.

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1 Workshop process

To develop the Community Transition Pathways (CTPs) for and with the Earnest App virtual community, we integrated the development of the pathways into the Community Level Indicator (CLI) workshops that were also conducted within the GRETA project. This allowed us to develop (1) community goals, (2) steps to reach these goals, and (3) a timeframe during which to reach these goals directly with participants of our virtual community. Moreover, information from the qualitative interviews conducted for task 3.1 also fed into the development of the CTPs.

The workshops took place on two different dates in the summer of 2022 (one in May and one in early July) and were conducted in person. This two-step approach allowed to kick-off the process of defining what it means to be a community and potential community goals with a more open-ended discussion first and redefine CLIs and pathways in a second step. The two workshops were one of the few occasions (some) members of our virtual community would meet us to discuss topics around their community and energy and mobility behavior face-to-face throughout the duration of the case study.

The Earnest App case study is unique in that the community did not exist prior to the GRETA project and will not continue to exist past the duration of the GRETA project. It was designed to study the role of a mobile app within a virtual community in the setting of energy citizenship emergence and development. How case study participants perceive their construct of a virtual community is therefore an important question of this study. Moreover, while all case study participants live in and around the city of Darmstadt, which provides an important geographic and policy context for the case study, the case studies focused on the impact space-independent, digital content of an app might have on energy citizenship behavior. In addition to the digital-community-with-members-in-social-proximity characteristic, participants in the case study focused heavily on young people. This unique case study design might also explain the selection of the community goals (further explained below) that focus on creating and increasing "community commitment" and "knowledge and awareness" about sustainable mobility topics through, for example, "education".

We started the first workshop with a long discussion about the features and characteristics of energy communities, and in particular virtual energy communities. The interaction started off with the assumption of most workshop members that the characteristics of a virtual energy community will vary significantly from those of a non-virtual one. However, in the process of discussion, workshop members identified two main features important to both "types of community." The first was an understanding of community, which was characterized by terms such as "cooperation," "support," "engagement," "social responsibility," and "commitment." All of these terms appeared in both the definition of a virtual community and that of a community in the non-virtual realm. Some discussion ensued whether commitment to and identification with a virtual community presents more of a challenge than to the more traditional form of a physical community. However, while the group identified some disadvantages of communities in the virtual realm (fewer shared activities, no face-to-face interaction), they also highlighted their advantages (accessibility (for some), ease of participation, not specific to a time and space). The second feature dealt with the

theme or topic (i.e. the purpose) of that community. In the case of the workshop participants, they defined their energy community around terms like "environmentalism," "sufficiency," and "energy savings."

After discussing and defining the term "community" for our case study, the workshop participants collected community goals. This was a brainstorming exercise with no further instructions at all. However, once the goals were collected, we asked workshop participants to sort them according to the geographical level (individual, local, regional, national, global) and timeframe (now, 5 years, 10 years, 50 years). As the picture here shows, more individual goals were sorted into short-term timeframes, while more national and global goals were thought to take longer to achieve.



The second workshop began with an intermediate step. We asked the workshop participants to consider the goals we previously collected through a social justice lens: *How do the community goals contribute to social justice? Where did we not consider social justice issues so far? How can we change this, i.e. what (conditions) have to change to achieve social justice?*

Finally, we asked the workshop participants to identify their top-three community goals. Subsequently, we divided the workshop group in three sub-groups and asked them to think about how to achieve the identified three goals (one goal per group) by first answering the following questions:

- What (kind of) behaviour is needed to achieve the goal?
- What in-between steps can we think of to achieve the goal?
- What resources and information do we need?
- What is the timeframe to achieve the steps and the final goal?

This sub-group session was followed up by another brainstorming session in smaller groups about specific CLIs (*How do we know that we achieved the goal? How can we measure this?*).

This concluded our two workshops with Earnest App case study participants. The Community Transition Pathway canvas (Miro board) was developed by the FhG ISI researcher team based on the experience and output of the two workshops, on the one hand, and by including information from qualitative interviews with community members, civil society members, business and policy representatives conducted for task 3.1, on the other hand.

2 The starting point: acknowledging the current policies and the background of the case

Our case study focuses on energy behaviour with a special focus on sustainable mobility behaviour, for example by using public transport, bicycle or electric vehicles. The average energy citizenship engagement level of our case study participants at the starting point of our study can be described as "aware". Most of the participants are interested in everyday life activities through which they can reduce their energy consumption and CO2 emission. Some participants already engage in everyday behaviour addressing sustainable (mobility) issues. For others, engagement with the Earnest app was a first step in this direction. The engagement level the case study would like to achieve by the end of the GRETA project (which is equivalent to the end of this specific energy community) is "active" with case study participants implementing some energy saving (mobility) behaviour in the everyday life and engaging in (communication) activities to disseminate this information/behaviour in their communities (outside of the energy community).

A rich network of actors on the local, regional as well as national level shapes the conditions for energy citizenship emergence in our specific case of a virtual community that engages in sustainable mobility in and around the city of Darmstadt in Germany. This includes actors from the fields of policy, businesses and society. Figure 1 (below) provides an exemplary selection of the actor landscape relevant for this case study. This is not to be understood as a comprehensive list but rather allows discussing the roles that different actor groups on different governance levels take for shaping the conditions for energy citizenship emergence. Since the country has a federal system - with the national, regional, and local level as the most important political divisions - it is important to consider the specific level actors are active in and/or have influence

Figure 2 below shows a selection of policies that provides the background for the development of energy citizenship in our specific case of sustainable mobility and e-mobility. It includes both policy strategies and policy instruments such as economic incentives and regulations. Furthermore, it shows the interplay between different policy levels – while policy strategies on the European and national level formulate targets for energy and mobility transitions these are further specified in policy instruments. Regional and local level policies specify overall targets and develop concepts for their implementation. This is, however, not to be understood as a comprehensive list of policies related to sustainable mobility. Especially on the European level, policy changes are currently negotiated as part of the Fit-for-55 packages with the aim to reduce greenhouse gas emissions by at least 55% by 2030. Also on the national level, policies are currently changing and are being adopted to raising energy prices. Therefore, the policy landscape related to energy citizenship for our specific case of sustainable mobility is imbedded in a dynamic process and shaped in a complex interplay between diverse actors on different policy levels.

Figure 1: Actor Landscape

	Policy actors	Businesses	Societal actors
National level	<p>BNetzA: Federal Network Agency for Electricity, Gas, Tele-communications, Post and Railway</p> <p>NOW: National Centre for Charging Infrastructure</p> <p>BMDV: Federal Ministry for Digital and Transport</p>	<p>Earnest App: Uptodate Ventures GmbH</p> <p>CO2online non-profit consulting company mbH</p> <p>BEM: e.V.: Federal Association eMobility</p>	<p>FUSS e.V.: Professional Association for Pedestrian Traffic Germany</p> <p>ADFC: General German Bicycle Club</p> <p>autofrei leben! e.V.: registered association for car-free living,</p>
Regional level	<p>HMWEVW: Hessian Ministry of Economy, Energy, Transport and Housing</p> <p>Strom bewegt: Electro-mobility Hesse</p> <p>AGNH: Local Mobility Working Group</p>	<p>RMV: Transport association Rhein-Main</p> <p>DADINA: Local transport organization for the district Darmstadt-Dieburg</p> <p>entega AG: regional energy provider</p>	<p>LaNEG Hessen e.V.: Regional network of energy cooperatives</p>
Local level	<p>Mobility Office, City of Darmstadt</p> <p>Netzwerk Elektromobilität: Electromobility network city of Darmstadt</p> <p>Department of Transport, Consumer Protection, Safety, District of Darmstadt</p>	<p>Energiegenossenschaft Darmstadt-Dieburg e.G: Energy cooperative Darmstadt-Dieburg</p> <p>EG DA: Energy cooperative Darmstadt</p> <p>HEAG mobilo: local mobility provider</p>	<p>Radentscheid Darmstadt: bicycle referendum</p> <p>Transition Town Darmstadt</p> <p>KlimaEntscheid Darmstadt: Climate protection referendum</p>



Figure 2: Policy Landscape

European Level		National Level	
Strategies Paris Agreement European Green Deal White paper Transport climate & energy framework 2030 ...		Strategies Climate Protection Plan 2050 Climate Protection Plan 2030 Master plan Charging infrastructure Government program for electromobility ...	
Policy instruments 2014/94/EU : alternative fuels infrastructure 2019/631/EU : CO2 emission performance standards 2018/858/EU : approval of motor vehicles 2008/50/EG : ambient air quality & cleaner air for Europe 2009/28/EG : Renewable Energies Directive 2019/1161/EU : clean road transport vehicles 2018/844/EU : energy performance of buildings ...		Policy instruments EEG : Renewable Energy Source Act BImSchG : Federal Pollution Control Act LSV : Charging station regulation StromStG : Electricity Tax Act BGB : Tenancy Law SchnellLG : Fast Charging Act EmoG : Electromobility Act ...	
Regional Level		Local Level	
Policies of the federal state of Hesse IKSP : Integrated Climate Protection Plan Hesse HEG : Hessian Energy Act HGO : Hessian Municipal Code ...		Policies of the city of Darmstadt Climate protection concept Concept for a demand-oriented charging infrastructure Bike strategy Darmstadt ...	

source: https://www.bmvi.de/SharedDocs/DE/Anlage/G/buendnis-fuer-moderne-mobilitaet-gesetzeskarte-elektromobilitaet.pdf?__blob=publicationFile



3 Vision, Goals and Actions in the short-, medium- and long-term perspective

As mentioned above, the Earnest App case study is unique in that the community did not exist prior to the GRETA project and will not continue to exist past the duration of the GRETA project. It was designed to study the role of a mobile app within a virtual community in the setting of energy citizenship emergence and development. Nevertheless, three main community goals were identified for the community and thought about if (hypothetically) the community would continue to exist and be active. "Community" here is understood as the members of the case study (i.e. the app and online-forum users who interact and would continue to interact through the shared app experience and beyond if the case study would continue to exist.

Vision #1: Increase knowledge about energy consumption/energy savings among community members

Much of the community's experience with the Earnest App resolved around gaining new knowledge/information or be reminded about already existing knowledge about sustainable (mobility) behavior. In addition to this, the app provides tips for practical activities to actually change everyday behavior on an individual basis. Knowledge and information about energy consumption and energy savings plays an important role in the community experience. Vision #1 addresses this experience and includes the objective to expand it beyond the members of the current community as well as beyond the direct use of an app.

The goal to be achieved by 2050 for this vision is to have integrated "sustainable living as a core of public school education" in Germany. While this goes beyond the virtual space the community currently occupies, this goal is still very much aligned with the setting of virtual (energy) community as it is not attached to specific localities - except for the physical of virtual classroom. The most important intermediate milestone to achieve the goal would be to change/adopt the school curricula in all 16 states of Germany (Germany is a federal political system). The vision thus addresses change on the regional level on a nationwide scale.

Actions needed:

Short-term: (1) aggregate and make available existing (expert knowledge); (2) create a public website; (3) establish organizational structures (office, networks, staff, etc.)

Medium-term: (4) seminars for activists/teachers etc., (5) make available public funding opportunities for states and schools to engage in activities and change curricula

Long-term: (6) change/adopt school curricula

Vision #2: Reduce energy consumption in everyday life

Reducing energy consumption and (in many cases therefore) CO₂ emissions in everyday life, particularly in the mobility sector, was an important part of the Earnest App case study. Vision #2 addresses this.

The goal to be achieved by 2050 for this vision is CO₂-free public transport in all major transport hubs in Germany (major regions and cities). This goal goes beyond the existing virtual community of the case study as it needs to be implemented locally, regionally and nationally in physical spaces. There are several important milestones that were identified to reach this goal: (1) change own mobility behavior, (2) use CO₂-free public transport, and (3) share actions in other regions/cities. The idea is to start with activities in and around the city of Darmstadt (the location of the participants of the virtual community). The vision is interesting as it addresses both behavioral change on the individual level as well as policy and infrastructure change that need actions from actors on the local, regional and national level.

Actions needed:

Short-term: (1) use the Earnest App, (2) change own mobility behavior, (3) share knowledges with others, (4) reduce room temperature at home; (5) use only public transport & bikes

Medium-term: (6) gain access to heating system in household/building / talk to landlord, other tenants

Long-term: (7) use and lobby for less/no fuel-based cars; (8) use and lobby for locally produced products/stores; (9) install heat pumps and solar panels in house/building

Vision #3: Increase community commitment

An important question for every community is how to create and maintain the commitment of its members to participate and actively contribute to the goals and activities of the community itself. This is equally true for a virtual community for which - on the one hand - participation might be easier for (some) members as participation is not tied to a specific physical space and locality. On the other hand, virtual community might experience commitment challenges precisely because they are taking place online, which *might* create more of a social distance among its members.

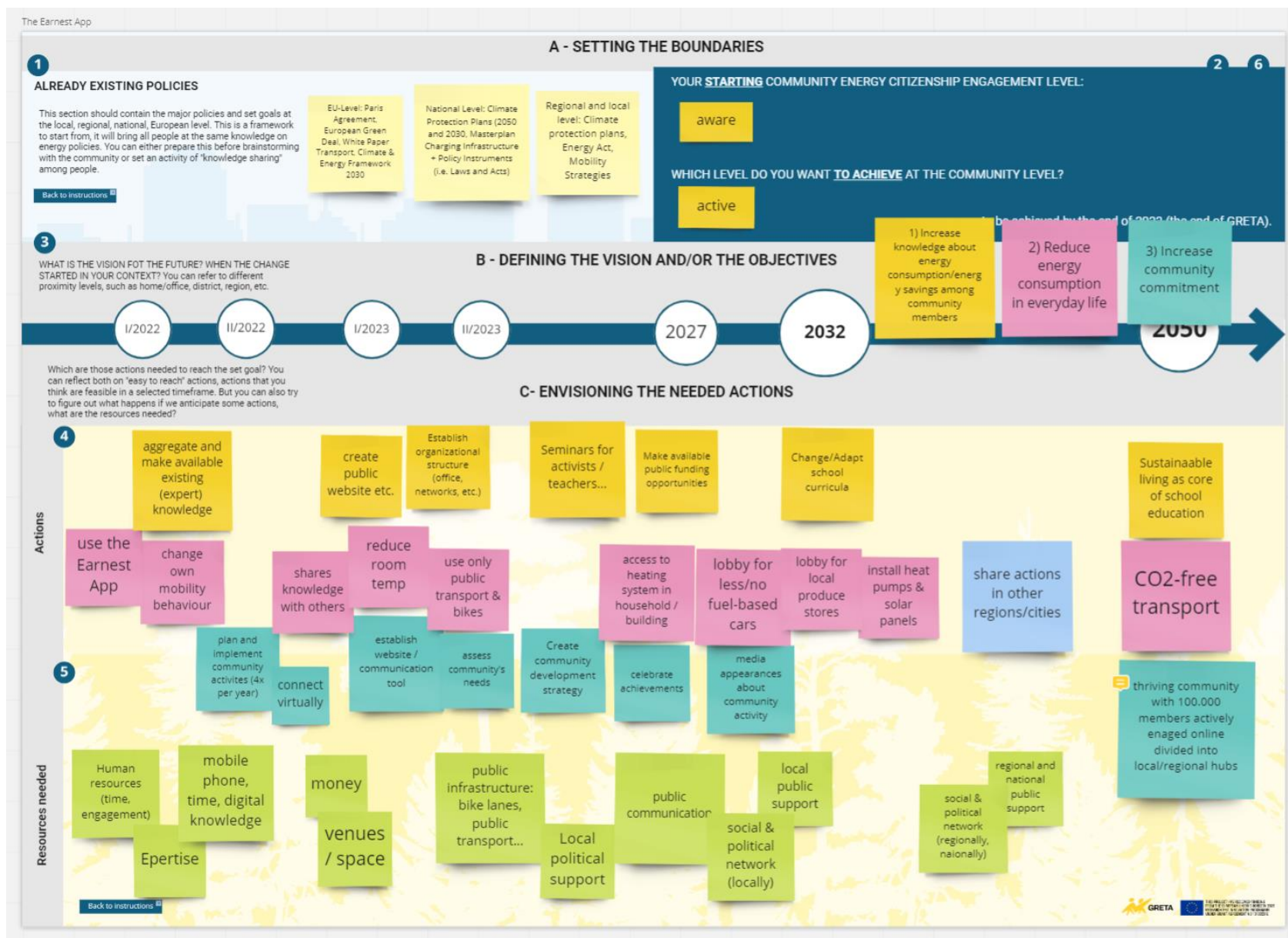
The goal to be achieved by 2050 for this vision is a thriving online community with about 100.000 members actively engaged. One of the findings of this case study indicates that even for virtual communities, a sense of physical belonging and shared physical spaces might be an important factor to foster and maintain community commitment. This could take place through local/regional hubs through which members of the virtual community can share experiences they make in the physical world (i.e. experiences with the local transport system, local restaurant scene, etc.) even if the interaction of the community members remains in the virtual realm. The vision thus addresses change on the (energy) community level.

Actions needed:

Short-term: (1) plan and implement community activities (about 4x per year); (2) connect virtually; (3) establish website/communication tool; (4) assess community's needs

Medium-term: (5) celebrate achievements, (6) media appearances about community activities

Long-term: (7) continue regular activities and outreach/dissemination



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4 Resources & Social Justice Considerations

The following is a summary of the resources needed to achieve the visions identified above. The section is divided into (a) knowledge/expertise; (b) human resources, (c) financial resources, and (d) infrastructure/material resources. These categories are neither exclusive nor comprehensive.

Knowledge/expertise:

Knowledge and expertise about a certain topic (sustainability education, mobility, energy savings, etc.) is needed for all three visions identified in this report. It is important to acknowledge that this includes expert or **scientific knowledge** but also so called **local or community knowledge** about practices and themes. The division between these two types of knowledge is fluid. Moreover, knowledge exists in multiple ways and formats (from written or visualized documents to oral history) and is usually interpreted and used in situated contexts.

From a social justice perspective, local and community knowledge is often disregarded when it comes to the energy, mobility, and sustainability sector. Policymakers, businesses but also civil society actors value so called scientific knowledge over local and community knowledge, particularly from vulnerable groups in society. Local knowledge is situated and, while particularly relevant to understand issues of diversity and intersectionality, often dismissed as subjective and anecdotal rather than scientifically objective. To achieve the visions outlined in the CPTs (particularly vision #1) both types of knowledge are relevant.

Human resources:

Labor and knowledge require personnel to be put into action. The visions identified above all require intensive human resources at various stages (etc. collecting knowledge, preparing and disseminating knowledge, coordinating members, activating networks etc.).

From a social justice perspective, three aspects are particularly important in regard to human resources in the context of the CTPs outlined here. First, energy communities need to take diversity seriously when it comes to the socio-economic background of both their members and staff. Second, to achieve the three visions outlined here, various different skillsets are needed to be included in the process. Some of these skillsets require official qualifications (university degree etc.) while others do not. Human expertise and skills (with and without degrees) should be valued. Third, human resources cost money (see financial resources below), but they also require time on the part of the individuals engaging with the activity. It needs to be considered that not all individuals, depending on their economic and personal (family) situation (among other factors) have the time to be actively engaged in individual, community and regional transition processes. Active energy citizenship, however, should not be dependent on a good financial income and free time to spare.

Financial resources:

Whether it is private funding or public funds, financial resources are also required to achieve the goals of all three activities: to set up an office and staff it, conduct seminars, set up and maintain a website, invest into public infrastructure, etc.

From a social justice perspective, the availability of financial resources is an obvious factor contributing to inequality. In the case of the CPTs here, public funding could address this by, for example, prioritizing projects, such as the implementation of a new curricula, in regions that experience higher social inequality and lower average household income than others. Moreover, payment strategies for public transportation need to be put into place, such as subsidizing public transport for members of vulnerable groups.

Infrastructure/material resources:

The case study focuses on individual behavioral change but many of the identified activities require the setup of working infrastructure to enable or facilitate sustainable (mobility) behavior, increase knowledge about it and foster community commitment. Infrastructure requirements in the three visions range from digital infrastructure (websites, mobile applications, interactive tools) to individual mobile phone or bike ownership to the availability of public transport systems.

The availability, distribution, affordability and access of and to infrastructure and material resources is one of the key elements of the energy transition from a social justice perspective. This is also true for virtual energy communities. While they might make access easier (for some socio-economic groups, such as young students), participation requires a certain kind of knowledge (digital expertise) as well as resources (mobile phones/computers etc.) that not all parts of the population might have access to. Social justice issues also emerge in the area of public transportation - in regard to access and distribution as well as affordability - or in the (non-)ownership and (lack of) knowledge about how to ride a bike. Findings from the interviews support the crucial role that good infrastructural conditions play for encouraging sustainable mobility behavior. According to interview partners, infrastructure provision has to be ahead of the actual demand to allow security. E.g. more charging points for electric vehicles would be a precondition for citizens' trust and investments in electric vehicles.

5 Final remarks

Formulating Community Transition Pathways in the specific case of a virtual community allowed interesting insights. First, while case study participants share aspects of social proximity in the virtual realm, local proximity in form of a shared sense of place and the possibility to meet physically were still considered important aspects for encouraging the community aspect, such as active engagement and commitment. While the evidence of this is limited to this specific case, this might point to interesting insights regarding GRETA's different levels of energy citizenship engagement. Are feelings of a shared sense of place and the possibility to interact face-to-face crucial for behavior to go from aware to active or even to advocate?

The visions formulated by the energy citizens in the workshops seem to refer to different activity levels and show how different resources and policy conditions are needed to achieve different levels of engagement. Vision #1 refers to knowledge generation and shared knowledge, which sets the basis of increased engagement by becoming aware of sustainability issues. This vision addresses young people in the broader public and requires advocates to work towards a change of regional and national policy. Vision #2 calls for individual actions to save energy. This goes beyond the level of "aware" by asking for "active" energy citizenship. While eventually, the vision hopes to achieve change on a nationwide scale, it first and foremost calls for local and regional policy and infrastructure development. Finally, vision #3 seeks to achieve high level of intra-community interaction and engagement levels that seem to somehow straddle between activism and advocacy. While achieving this vision will also require policy changes (for example in regard to funding), the actual change here seems to lie with the energy citizens and their behaviour. While all visions build on each other, the differences in the pathways of how to achieve these visions are interesting insofar as different actors (e.g. policy makers, researchers, businesses, citizens) can act as gatekeepers and shape the circumstances for enabling energy citizenship at different levels of engagement.

Finally, the Community Transition Pathways make clear that it requires a range of different actors - not just energy citizens but also businesses, civil society and policymakers - to reach community goals. Moreover, social justice considerations need to be taken into account - even for pathways developed by a specific community (Who was sitting at the table? Whose voice was heard? Whose situation was taken into consideration? Who has access to knowledge and other resources? Whose knowledge is taken seriously?).

Coopérnico

Community Transition Pathway

Writing done by: Lurian Klein [CWD]

Contributions from: Ana Rita Antunes [Interview with Coopérnico's coordinator]

Short information on the case study:

Case study name	Coopérnico
Typology and geographical level of the case study	National
Main proximity domains for the case	<p>[for the entire overview, check D5.1 but in brief you should identify the main proximity domains of the energy citizenship in your case, e.g., availability of technologies (tech proximity), social value proximity, etc... Choose everything that apply]</p> <p><input type="checkbox"/> Spatial proximity (urban structure, climatic area, resource availability, energy infrastructure closeness, cluster and activities closeness)</p> <p><input checked="" type="checkbox"/> Policy proximity (political agendas, administrative structure, regulatory framework)</p> <p><input checked="" type="checkbox"/> Social proximity (community dimension, collaboration mechanisms, knowledge & learning, energy awareness)</p> <p><input checked="" type="checkbox"/> Technical proximity (energy system, technological readiness, technological appliances, enabling structures)</p> <p><input checked="" type="checkbox"/> Economic proximity (energy system economic structure, energy system enabling economics, value redistribution & inclusion mechanisms, cluster economy)</p>
Starting Engagement Level in the case	<p><input type="checkbox"/> Unaware</p> <p><input type="checkbox"/> Aware (<input type="checkbox"/> interested or <input type="checkbox"/> indifferent)</p> <p><input type="checkbox"/> Involved (<input type="checkbox"/> adopting, <input type="checkbox"/> unwilling, <input type="checkbox"/> member)</p> <p><input checked="" type="checkbox"/> Active (<input type="checkbox"/> sponsor, <input checked="" type="checkbox"/> frontrunner, <input type="checkbox"/> denial)</p> <p><input checked="" type="checkbox"/> Advocate (<input type="checkbox"/> championing, <input type="checkbox"/> leadership, <input checked="" type="checkbox"/> activism, <input type="checkbox"/> NIMBYism)</p>

What is the targeted Engagement Level in the case?	Although many members already showcase clear signs of being advocates of the energy transition, the idea is to have the vast majority is this highest level of engagement in Coopérnico. Hence, it can be said that the engagement levels among Coopérnico's members is a mix between active and advocate
By when?	[2026]
What is the targeted Engagement Level in the case for the end of GRETA project?	Although many members already showcase clear signs of being advocates of the energy transition, the idea is to have the vast majority is this highest level of engagement in Coopérnico

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1 The brainstorming Canvas

The process undertaken to design Coopérnico's CTP was to interview the coordinator of the cooperative, as she represented the most well-fitted gatekeeper bridging the interactions between the cooperative members and the project consortium. The brainstorm canvas was only used in a static way (i.e., as a picture) during the CTP design exercise with her.

Coopérnico started its citizen-oriented activities with a feed-in-tariff model which is a very important support mechanism and has leveraged many energy cooperatives around Europe (Portugal abandoned this model though). At present, Coopérnico has been working on investments in decentralized collective self-consumption and Renewable Energy Community schemes in a model of sharing the returns among those who consume this renewable electricity locally – thus supporting governments and citizens, municipalities and parish councils who want to create Renewable Energy Communities in Portugal. This path is very defined and now the cooperative has financial support to do so.

The next challenge is to diversify the energy production mix and deal with the social and environmental issues that these new sources of production bring. Hence, it can be said that Coopérnico intends, on the one hand, to diversify its sources of renewable energy generation because the cooperative understands that the energy transition will not be made with just one renewable energy mode – the transition lies in the diversification of forms of renewable production. On the other hand, to reconcile renewable production with its own challenges (intermittence and environmental impacts) - Coopérnico members are environmentalists who are not willing to invest in production with major environmental impacts (as the case of mega solar projects) – all this must be put on the table and equated.

2 The starting point: acknowledging the current policies and the background of the case

As previously stated, it can be said that the engagement levels among Coopérnico's members is a mix between active (frontrunners) and advocate (environmentalists). That is because Coopérnico has in its genesis decentralized production to increase the renewable production in the country - in a logic of bottom-up, citizen-oriented investments rather than leaving it in the hands of private companies – giving citizens the opportunity to help the country in the energy transition.

The main enabling legal frameworks in Portugal at present that allow Coopérnico to operate are:

1. Decree-Law No.15/2022, January 14, 2022 - Transposition of the Electricity Markets Directive on CECs (Citizen Energy Communities).
2. Decree-Law 162/2019, 25 Oct 2019 + Regulation 266/2020, 20 Mar 2020 that underwent a recent change under Regulation 373/2021, 5 May 2021 – Transposition of the concepts of collective self-consumption schemes and Renewable Energy Communities.

Coopérnico already had internal discussions on how they can have more active members to participate in the cooperative's activities, and the conclusion reached is that they need to further grow and start allocating a specific budget to hire a professional to do the engagement work with the cooperative members (who will always be volunteers, which is an added challenge) – it takes further investments in human resources and technological development, since there is already available platforms that enhance the voluntary participation of community members; Coopérnico must take a leap – the direction of the cooperative is voluntary, the coordination of the local groups is voluntary, etc. but for this leap to happen Coopérnico needs someone from the technological team to continue this work.

Illustratively, SOM ENERGY (A Catalan energy cooperative) has a platform entitled "Participa" where they organize several online events (also used by the municipality of Barcelona), which incentivises participation of citizens and members of the cooperative – this is the nature of the leap Coopérnico needs to take to spur activism among its members.

Also, in terms of the cooperative's targets for 2026, Coopérnico hopes to have 5MW of installed renewable capacity and 2,500 clients in the energy retail market – at present it has 2MW of installed capacity.

3 Vision and Objectives in the short, medium and long term perspective

As previously stated, Coopérnico's vision for the future is to have 5MW of installed renewable capacity and 2,500 clients in the energy retail market by 2026 – at present it has 2MW of installed capacity. By 2030 they want to grow the installed capacity to 10MW. By 2050 Coopérnico expects that the distribution network is once again at the hands of cooperatives or municipal companies (i.e., the non-profit sector of the economy).

However, the Director Plan for the management of the cooperative runs until 2023 (elected in 2020). There's no vision beyond that.

For 2030, Coopérnico wants half of the councils in Portugal to have energy cooperatives for renewable self-production, along with them becoming energy retailers – all cooperatives working together and operating in energy markets to be able to be in a level playing field with private companies. Hence, the overarching idea is that renewable cooperatives can organise themselves into a federation of cooperatives. When there are many cooperatives at the territorial level, a second-degree cooperative is formed where cooperatives become first-degree cooperatives, instead of their members. Illustratively, there are already the examples of CONFECOOP (a more general federation of cooperatives), CONFRAGI (federation of agricultural cooperatives), European federation of renewable energies, to name a few.

4 The Actions and the Priorities

In terms of brainstorming on the federation of cooperatives, the actions needed are: (i) to have more renewable installed capacity, and (ii) policy developments more adapted to the reality of cooperatives to put them in a level playing field in the energy market.

As Coopérnico (and cooperatives in general) are not profit-driven (thus distributing its value among its members), it becomes difficult to come into play with private companies that only aim at profits and thus do not transfer to its clients the same benefits as Coopérnico's.

Apart from that, Coopérnico is already entitled to operate flexibility services (related to the sale and purchase of surplus renewable generation) thanks to the new Legislative Framework.

In terms of attracting more clients for the retail services, either Coopérnico has more renewable installed capacity to lower the energy prices, or the energy market becomes no longer marginalist. Coopérnico is elected by DECO (The Portuguese Association for Consumer Protection) as energy consumers' 1st choice as energy retailers – hence the cooperative only does not have any more customers in view of the current energy prices. Therefore, for the energy price to fall, either the market ceases to be marginalist or we increase our renewable generation capacity.

In this line of thought, for Coopérnico to increase its renewable generation capacity, it needs more points of connection to the energy network, and a new paradigm for the access of cooperatives to the energy auctions (i.e., policies that reflect more concrete goals for citizen participation in renewable energy production in Portugal, so that the energy auctions are not only in the hands of the big utilities – i.e., same level playing field].

5 Resources

Resources from the point of view of networks / interactions with other institutional actors:

- Municipal cameras – recognize cooperatives as a partner to increase supply security in their territory, increase the popular acceptance of new renewable installations, and help increasing renewable installed capacity.
- Legislators, regulator, government – recognize cooperatives as a relevant actor in the energy sector with goals other than private institutions' goals, and who need different conditions to access the energy production and retail market. What we needed is a favorable legal framework to kick-start the first projects (as we did with the feed-in-tariff scheme) – i.e., to provide the means for citizens to join Coopérnico's projects. The cooperative does not seek subsidies, it actually needs a legal framework so that cooperatives can enter the market on an equal footing with other traditional players. However, with additional financial resources Coopérnico could hire someone to lobby, but this is not absolutely necessary for the transition to happen.

Resources in terms of economic support – not needed, the renewable generation is profitable – especially if scaled up.

Resource in terms of knowledge and skills – Coopérnico must develop all the skills the energy sector requires in the logic of a cooperative, always trying not to increase costs for its members (i.e., making too many omelets with few eggs) – in other words, there's the need to understand what a photovoltaic system entails (in terms of installation, operation and maintenance), considering that decentralized production is a challenge; build trust where you have systems in place; learn how to do invoicing, customer success (we currently have Customer Relationship Management (CRM) partner companies), etc.

Also, cooperatives are made by citizens and we need to find ways to scale up – imagine that there is a specific fund for cooperatives to kick off their projects with more subsidized interest than banks (it wouldn't be a subsidy per se but an economic support for cooperatives) – that would create a level playing field with private companies that have capital, develop new services and technologies, and hire human resources, but which intensive capital is being returned to shareholders rather than back to their clients.

Cooperatives will never have intensive capital as they are non-profit institutions – everything is done with small-scale investments, and with not enough specialized human resources hired in the development team. Hence, cooperatives need to find a balance between the investment necessary to provide services at the level of private companies and that works in the same way, without perhaps the same marketing appeal - cooperatives do not need marketing because they involve and

retain customers for what they offer that is always more beneficial than the offer made by private companies].

.....

6 Final remarks

In summary, what Coopérnico ideally needs to further engage its members to the highest possible level is more renewable installed capacity and specialized human resources to scale up its impact and reach a level playing field in the energy market with private companies – all of that backed up by the appropriate enabling legal frameworks and a federation of cooperatives that equip and empower cooperatives in the sustainable, citizen-led energy transition.

Based on that, the final remark provided by Coopérnico's Coordinator is that those goals are reachable, however much lobbying is needed and those things do not happen overnight.

UR BEROA

Community Transition Pathway

Writing done by: TECNALIA

Contributions from: The pathway has been completed through a workshop organised in June 2022 together with UR BEROA energy cooperative members and office staff, as well as by information gathered through UR BEROA stakeholder interviews.

Short information on the case study:

Case study name	UR BEROA
Typology and geographical level of the case study	Presential and local
Main proximity domains for the case	<input checked="" type="checkbox"/> Spatial proximity (urban structure, climatic area, resource availability, energy infrastructure closeness, cluster and activities closeness) <input type="checkbox"/> Policy proximity (political agendas, administrative structure, regulatory framework) <input checked="" type="checkbox"/> Social proximity (community dimension, collaboration mechanisms, knowledge & learning, energy awareness) <input checked="" type="checkbox"/> Technical proximity (energy system, technological readiness, technological appliances, enabling structures) <input type="checkbox"/> Economic proximity (energy system economic structure, energy system enabling economics, value redistribution & inclusion mechanisms, cluster economy)
Starting Engagement Level in the case	<input type="checkbox"/> Unaware <input type="checkbox"/> Aware (<input type="checkbox"/> interested or <input type="checkbox"/> indifferent) <input checked="" type="checkbox"/> Involved (<input type="checkbox"/> adopting, <input type="checkbox"/> unwilling, <input checked="" type="checkbox"/> member) <input checked="" type="checkbox"/> Active (<input type="checkbox"/> sponsor, <input checked="" type="checkbox"/> frontrunner, <input type="checkbox"/> denial) <input type="checkbox"/> Advocate (<input type="checkbox"/> championing, <input type="checkbox"/> leadership, <input type="checkbox"/> activism, <input type="checkbox"/> NIMBYism)
What is the targeted Engagement Level in the case?	For UR BEROA as a cooperative the targeted level would be advocate (championing).

	For most of the members of UR BEROA, the target would be active (sponsor)
By when?	2025
What is the targeted Engagement Level in the case for the end of GRETA project?	For UR BEROA as a community, the targeted level would be advocate (championing). For most of the members of UR BEROA, the target would be active (sponsor)

Community Transition Pathway summary

The case study examines UR BEROA, a cooperative providing energy to its 550 members living at Bera Bera neighbourhood in Donostia-San Sebastian, Spain. The cooperative was established in 1985 for the purpose of providing district heating and hot water for the residents of the neighbourhood. Over the years, UR BEROA has successfully implemented solutions to produce cleaner energy and currently, the facilities consist of three natural gas boilers, a cogeneration engine, a biomass boiler, and solar panels. UR BEROA is currently taking another step towards decarbonisation with the installation of photovoltaic (PV) system providing electricity to around 100 households.

Overall, the goal of the cooperative is to drive a shift towards higher level of decarbonisation. The cooperative aims to significantly grow its member base, increase the energy services it provides, and implement collective renewable energy-based self-consumption. The first steps towards the desired future are targeted to be finalised over the next five-year period by 2027. The first phase consists of communication and commercial activities targeted to current and potential members of the cooperative, further viability studies to examine the economic and environmental feasibility of PV, electric vehicle and hydrogen projects, and measures to improve the household energy-efficiency of the UR BEROA members by leveraging collective actions by the cooperative.

To achieve the ambitious goals, both the UR BEROA members and the management office of UR BEROA need enhanced understanding of issues related to energy technology development trajectories and their adaptation to community scale. They also need to master the public policy in terms legislative framework and potential public subsidies available for the investments related to the extension of the activities. The implementation of the actions planned requires significant financial resources and collaboration among a broad spectrum of actors ranging from the members of the cooperative, other residents in the Bera Bera and surrounding neighbourhoods, public administration, project promoters, technology solution providers, etc. all orchestrated by the management office of the UR BEROA cooperative.

This document presents the first draft towards the Community Transition Pathway (CTP) for the UR BEROA case, briefly addressing the background and policy context of the case, providing an overview of the vision, goals, and related actions as well as first approximation of the resources needed to accomplish the goals.

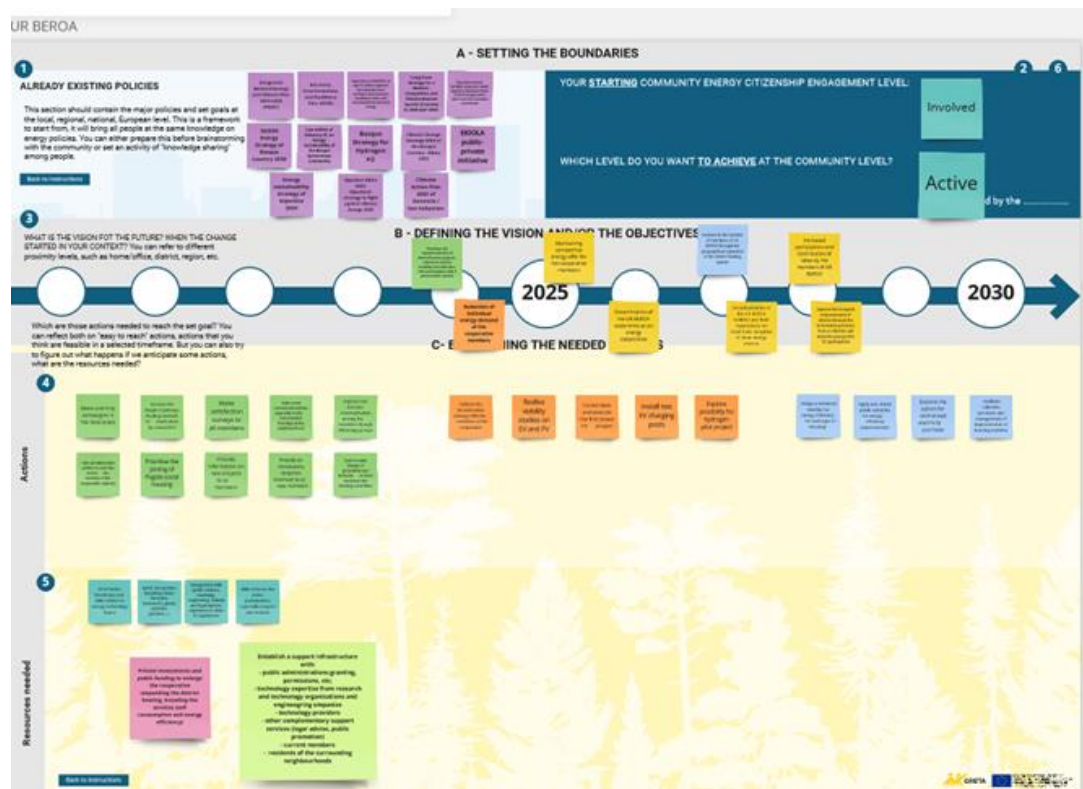


Figure 4: Community Transition Pathway - Brainstorming canvas for the UR BEROA case study

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1 The brainstorming Canvas

The Community Transition Pathway (CTP) for UR BEROA case study is developed together with the UR BEROA cooperative members. A joint workshop for defining the CTP and Community Level Indicators (CLIs) was organised in Donostia-San Sebastian on June 13, 2022. The workshop brought together 16 participants including members of UR BEROA cooperative and administrative staff from the UR BEROA office. The workshop participants included active members of the cooperative who had been involved since the establishment of the cooperative, as well as members of UR BEROA management board, but also joined newer members who had shorter history with the cooperative.

The workshop had a double objective: to jointly define future goals and corresponding actions for UR BEROA, and to define indicators at the community level that can be used to monitor progress towards the established goals. The workshop had introductory sessions, in which the TECNALIA team explained the objective and working methods; group work sessions, in which the participants worked together in three groups, each made up of 5-6 people; and plenary sessions, in which the results of the group work were presented.

The workshop utilised a draft roadmap 2035 that compiled a set of goals and actions for UR BEROA in the next years. Those goals were defined in backcasting exercise based on a potential future scenario for UR BEROA's system⁵. The roadmap was prepared by the UR BEROA cooperative members in a workshop organised in 2021, in the context of previous cooperation between UR BEROA and TECNALIA⁶. At the start of the workshop the three groups were given a task of reviewing the goals of the roadmap and their timeline, as well as adding new goals, if deemed necessary. As a result, a total of eight goals and their year of completion were defined. The participants then had the option to vote for the goals they considered to be a priority. As a result of the voting, three goals were set as a commonly agreed priority. Next, the participants were asked to think about actions how these three goals could best be achieved. The last session was about ideation of indicators at the community level that could be used to monitor progress towards the established three goals. The indicators were defined in four dimensions: technical, environmental, economic, and social.

The first approximation of the resources needed for the achievement of the goals is done based on the stakeholder interviews conducted for WP1 of the GRETA project

⁵ COMETS Project, [Deliverable 5.2 Report on Scenarios and Roadmaps for CAIs](#)

⁶ [COMETS Project](#), Task 5.3: Participatory case studies - Roadmaps

and brainstorming among the Tecnalia team. This part of the CTP is pending to be revised and validated by the UR BEROA cooperative.

2 The starting point: acknowledging the current policies and the background of the case

The case study examines UR BEROA, a cooperative providing energy to the Bera Bera neighbourhood in Donostia-San Sebastian, Spain. The cooperative was founded in 1985 to provide hot water and community heating to the residents and improve the energy efficiency of the neighbourhood. Since its establishment, the cooperative has successfully introduced cleaner energy sources and ways to measure the energy consumption of each household. Now, the cooperative is slowly making its way toward decarbonisation. UR BEROA is currently made up of 550 members and it supplies services through district heating based on a cogeneration system. The facilities consist of three natural gas boilers, a cogeneration engine, a biomass boiler, and solar panels that generate hot water. UR BEROA is currently taking another step towards decarbonisation with the installation of 222 PV panels that will produce 99.90 kWp and will provide with electricity around 100 households (103,200 kwh/year).

Overall, the goal of the cooperative is to drive a shift towards higher level of decarbonisation. The cooperative aims to significantly grow its member base, increase the energy services it provides, and implement collective renewable energy -based self-consumption. These operations will require introducing strong collaboration between several actors presented in the table below.

Table 1: Key actors of UR BEROA case study

Type	Description
Citizens	<ul style="list-style-type: none"> Current members of the UR BEROA cooperative Homeowners of Bera Bera neighbourhood and surrounding neighbourhood that are potential future members of the UR BEROA cooperative
Policymakers	<p>Local level:</p> <ul style="list-style-type: none"> City Council of Donostia-San Sebastián Fomento San Sebastián (municipal company responsible for the socioeconomic development strategy of Donostia-San Sebastian) <p>Provincial level:</p> <ul style="list-style-type: none"> Gipuzkoa Provincial Council <p>Regional level:</p> <ul style="list-style-type: none"> Basque government - Department of Economic Development, Sustainability and Environment Basque Country Regional Energy Agency (EVE) <p>National level:</p> <ul style="list-style-type: none"> Spanish Ministry for Ecological Transition The Spanish Government's Institute for the Diversification and Saving of Energy (IDAE)
Suppliers	<ul style="list-style-type: none"> UR BEROA cooperative management office Current and future technology and technical suppliers of UR BEROA

The decarbonisation endeavours of UR BEROA are driven ahead by various policies in different governance levels. The national, regional, provincial, and local policies promote energy communities, decarbonisation, and active citizens participation in the energy system with different mechanisms and instruments, which UR BEROA can potentially benefit in its evolution towards a greener energy cooperative.

At national level, Spain is devoted to reach climate neutrality by 2050, transposing the international and EU-level agreements to national agenda. In the national context the energy communities are supported by three different lines of aids: CE-Aprende , CE-Planifica and CE-Implementa, endowed with a total of 100 million euros within the framework of national Recovery, Transformation and Resilience Plan. These three lines of subsidies will be complemented by a network of Community Transformation Offices coordinated by the IDAE and distributed throughout Spain.

At regional level, there is also an active support of energy communities, being the EKIOLA initiative the main support mechanism to achieve the policy objectives set in the Basque Country. This initiative, promoted by the Basque Government through its regional Energy Agency (EVE) and private investors, focuses on the creation of energy communities at local level, with the support of local administrations.

At provincial level, the favourable policy framework —mainly the Energy sustainability strategy of Gipuzkoa 2050—is underpinned by several financial support mechanisms, such as subsidies for the creation of new energy communities, as well as investment by energy communities in photovoltaic installations. UR BEROA is currently setting up its first photovoltaic project, which will generate 100 kW and will provide service to 100 families. UR BEROA is expecting to leverage from the provincial financial aids.

The San Sebastian City Council has been one of local administrations that have triggered the creation of an energy community at municipal level. Although it does not directly affect UR BEROA, it shows, along with other abovementioned policy frameworks, the political will of fostering citizen engagement in the energy transition in San Sebastian.

The table below presents a list of key strategies, policies and laws framing the policy context for the UR BEROA case.

Table 2: Case study related policies - UR BEROA

Policies related to UR BEROA case study
National level
Long-Term Strategy for a Modern, Competitive and Climate-Neutral Spanish Economy in 2050
Integrated National Energy and Climate Plan 2021–2030
Royal Decree 244/2019, of April 5, which regulates the administrative, technical and economic conditions of the self-consumption of electrical energy

Royal Decree-Law 23/2020, of June 23, which approves measures in the field of energy and in other areas for economic reactivation

Recovery, Transformation and Resilience Plan

Regional level

Climate Change Strategy 2050 of the Basque Country - Klima 2050

Energy Strategy of Basque Country 2030

Law 4/2019, of February 21, on Energy Sustainability of the Basque Autonomous Community

Basque Strategy for Hydrogen H2

EKIOLA public-private initiative

Provincial level

Gipuzkoa Klima 2050: Gipuzkoan strategy to fight against climate change 2050

Energy sustainability strategy of Gipuzkoa 2050

Local level

Climate Action Plan 2050 of Donostia / San Sebastian

The members of the UR BEROA cooperative are already very energy-aware, but we wish to see them even more actively involved in sustainable energy actions. In addition, the cooperative will be facing various challenges in the next 15-20 years. Some of these involve the introduction of new activities linked directly or indirectly with energy, such as new electric mobility services in the neighbourhood and self-consumption projects. Another challenge is presented by the cooperative needing to address generational renewal. UR BEROA, created 40 years ago, is largely led by its founding members. New generations and residents have the challenge of sustaining the cooperative and increasing the energy awareness and engagement of its members. We will also seek collaboration and support from other actors, particularly local and regional authorities, and energy agencies, who will play a key role in building the path towards decarbonising UR BEROA.

3 Vision, Goals and Actions in the short, medium and long term perspective

The overall vision of UR BEROA is to make the activities more sustainable in terms of making a shift towards a higher level of decarbonisation and energy efficiency as well as increasing the member base of the cooperative. The cooperative aims to increase the energy services it provides beyond the current district heating system and implement collective renewable energy-based self-consumption and energy efficiency measures to reduce the energy demand of individual cooperative members. To achieve this vision a set of goals and corresponding actions have been defined.

In what follows, a list of goals, year of achievement, votes showing the prioritisation level as well as corresponding actions are presented. Results from the actions planned are expected to be accomplished in short-term by 2024 (two goals) and 2027 (one goal). The goals themselves are inherently longer-term i.e., the geographical expansion of the district heating system in terms of technical expansion of the network and will take longer than five years, but the preparatory actions and binding agreements on the expansion can be achieved in shorter term. Similarly, the diversification projects related to EV, PV, and hydrogen can achieve intermediate results in next years, although having significant activities e.g., in hydrogen co-generation will take much longer.

Goal 1: Increase in the number of members of UR BEROA through the geographical expansion of the district heating system. Year of achievement: 2027. Prioritisation: 17 votes

The cooperative members considered the expansion of activities of UR BEROA to a surrounding neighbourhood of vital importance. Increasing the number of households in the common district heating system would allow UR BEROA to balance the heating supply and demand better, as well as ensure future sustainability of the cooperative. Especially, the residents of Bera Bera neighbourhood who currently are not members of UR BEROA cooperative, as well as the Pagola social housing neighbourhood close by, were considered as priority candidates for becoming new members. Also, lack of active participation of members to activities of the cooperative and lack of involvement of younger generations and women in the UR BEROA management board and general assembly were considered as weaknesses to be tackled. Although this goal was considered the most pressing one, it was recognised that its completion takes time, probably even more than the planned year of achievement 2027.

Actions needed:

- Increase the length of primary heating network to reach close by consumers

- Take administrative actions to ease the access of new members inc. revision of the cooperative statutes
- Make publicity campaigns in the local press
- Make more commercial actions, especially to the non-member housings in the neighbourhood
- Prioritise the joining of Pagola social housing
- Provide an introductory reception brochure to all new members
- Make satisfaction surveys to all members
- Provide information on new projects to all members
- Improve and increase communication among the members though WhatsApp groups
- Seek to make change of generation and inclusion of more women in the steering committee

Goal 2: Planning and implementation of diversification projects, particularly those related to electric mobility and collective self-consumption with a photovoltaic system. Year of achievement: 2024. Votes of prioritisation: 11

Diversification of the energy cooperative beyond the provision of heating and hot water was the second most important goal. The diversification projects discussed included the generation of electricity through photovoltaics (PV) and especially the creation of a Renewable Energy Community, the provision of electric vehicle (EV) charging stations, and explorative projects on hydrogen as an energy carrier. Some of the diversification projects are already in planning and testing stages and some of them, such as the generation of electricity through PV and the implementation of a pilot project to produce green hydrogen, have already been validated by the general assembly of the cooperative. The achievement of these goals was considered to be rather immediate, in year 2024.

Actions needed:

- Validate the diversification strategy with the members of the cooperative
- Realise viability studies on EV and PV
- Consolidate and execute the first phase PV project
- Install two EV charging posts
- Explore possibility for hydrogen pilot project

Goal 3: Reduction of individual energy demand of the cooperative members. Year of achievement: 2024. Votes of prioritisation: 9

Energy efficiency of individual households was recognised as a key goal of the cooperative. This would allow the cooperative to serve more members with the same level of energy generation. Also, the potential of leveraging the energy cooperative in centralised purchase of electricity or collective actions related to housing isolation were

seen as potential actions towards improved energy efficiency. The intermediate results of this goal are expected to be accomplished in two years by 2024.

Actions needed:

- Design a technical solution for energy efficiency for each type of housings
- Apply and obtain public subsidies for energy efficiency improvements
- Explore the option for centralised electricity purchase
- Facilitate collective purchase and management of improvements of housing isolation

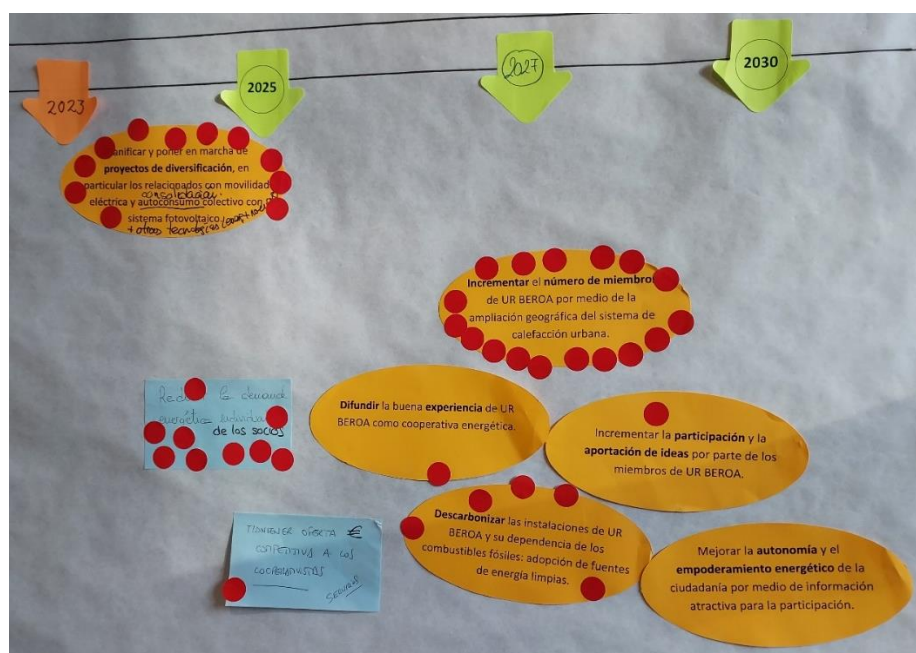


Figure 5: Voting results - prioritised goals

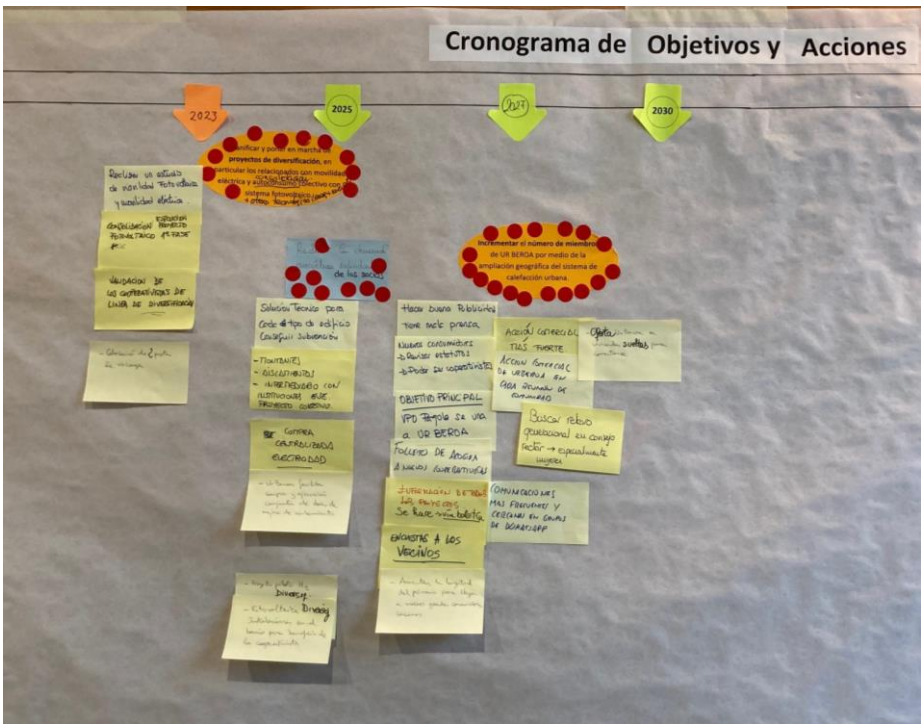


Figure 6: Prioritised goals and actions

4 Resources

This section considers the resources needed to transform the planned vision, goals, and actions in reality. The resources are looked broadly in terms of information, knowledge, and skills; economic/financial support; and support infrastructure including actors, institutions, and technology.

Information, knowledge, and skills:

The information, knowledge and skills needed to accomplish the goals of the pathway can be roughly divided into three distinct types, including:

- Energy technology related issues i.e., better understanding of development trajectories of different renewable energy technologies in respect to economic viability and environmental impacts, and their adaptation to the community scale.
- Policy framework including enhanced insights of legislation and regulation as well as opportunities to achieve public support in form of grants, subsidies, and guidance.
- Issues related to organisation and management of a cooperative. To accomplish the vision of UR BEROA, the management of the cooperative needs to have many different types of knowledge and skills either internally or acquired from external provides e.g., skills related to public relations, marketing, engineering, financial and legal aspects. In this respect, examples and experiences of how other energy communities are organised and managed was considered important. In addition, special information and skills will be needed to boost the active participation of UR BEROA members and, especially, the involvement of younger generations and women in the management of the cooperative to achieve the generational renewal in the decision-making bodies of the cooperative.

Economic and financial support:

Financial resources are pivotal for achieving any of the three goals set. The enlargement of the cooperative in terms of expanding the district heating system to surrounding neighbourhood or in terms of broadening the services offered to RES-based self-consumption and energy efficiency require significant financial resources including private investments and public funding. During the first phase, dedicated to viability studies of the RES projects, and planning of the potential extension of the district heating network, the financial resources needed are moderate compared to the actual implementation phase, in which the RES projects are rolled-out in large scale and the district heating network in enlarge to cover the neighbourhood close by. In the past, UR BEROA has benefitted from public support from the EU and regional funds. Looking to the future, public funds and support are important also for achieving the three prioritised goals.

Support infrastructure (actors, institutions, and technology)

The support infrastructure needed to accomplish the vision of UR BEROA involves a broad spectrum of actors including at least public administration, research and

technology organisations, legal and engineering companies, technology solution providers, residents of the Bera and surrounding neighbourhoods, etc.:

- Collaboration with public administration in different governance levels is of utmost importance in many ways: for granting permissions, providing public grants for the feasibility and piloting phase and investment subsidies for the implementation phase, as well as support and guidance e.g., in disseminating information and promoting energy communities in the surrounding neighbourhoods.
- Technology expertise forms an integral part of the support infrastructure. Research and technology organisations and engineering companies are needed to carry-out the viability studies and planning of the RES- and energy efficiency projects and the potential enlargement of the district heating system.
- Different technology solutions providers for implementing the chosen projects.
- Complementary support services may be needed in different forms, including e.g., legal, and administrative support, as well as support in public promotion etc. Juridical support may be needed when enlarging the energy cooperative or building an energy community for RES-based electricity self-consumption. Similarly, expert advice and support can be useful for participating in calls for proposals for public subsidies. The UR BEROA management office may also need external support for carrying-out publicity campaigns to inform the new potential members about benefits of energy cooperative.
- Enhanced communication and collaboration among the current members of the cooperative and between the management office and the current members.
- Outreach of the residents of the surrounding neighbourhoods.

In terms of technological infrastructure, the accomplishment of the vision includes enlargement of the current district heating system, and potential investments in photovoltaic system and electric vehicle charging stations. In longer-term, also the infrastructure changes related to transition to hydrogen is needed.

5 Final remarks

The process of drafting the Community Transition Pathway (CTP) for UR BEROA case allowed us to draw the following lessons.

The process encouraged and enhanced the participation of the members of the cooperative in its activities. The workshop provided a space for open and constructive discussion among the members on the direction setting of the energy cooperative. Furthermore, the participants considered that the workshop offered a forum for strategic discussion that is not taking place during the ordinary meetings of the cooperative and involved members of the cooperative that are typically less actively participating. It showed how a specific place, time and targeted guidance are key for encouraging more active participation.

It also allowed the members of the cooperative to start building a common and shared vision of the future of the cooperative. The CTP process revealed a broad spectrum of values and motivations for participating in the energy cooperative. These included purely economic incentives, concerns related to climate change and environment, willingness to build a community and social activities among the neighbours, personal convenience and comfort related to secure and safe heat and hot water supply, and different types of mixtures of the before mentioned. The differences in the intrinsic values and motivations translated to lively and occasionally very passionate discussions during the workshop but nevertheless allowed the participants to arrive to an agreement upon common vision and goals, and their prioritisation.

UR BEROA energy cooperative was established and has been driven by strong engagement of its members, and during the years the cooperative has made successful decisions and investments towards increased sustainability. The three goals prioritised together aim to make UR BEROA even more sustainable – in terms of more, and more actively participating members, and transition to cleaner energy sources and enhanced energy efficiency. For achieving these goals, collaboration also beyond the cooperative is crucially important: the local, regional, and national public administration in terms of permissions, subsidies, and support; residents of the surrounding neighbourhoods; technology expertise and technology solutions providers for planning and implementing the RES technologies.

Natural gas-free Neighbourhoods Community Transition Pathway

Writing done by: TNO

Short information on the case study:

Case study name	Natural gas-free neighbourhoods
Typology and geographical level of the case study	National (The Netherlands), we took the perspective of the municipalities who are responsible for this transition on a local level.
Main proximity domains for the case	<p>[for the entire overview, check D5.1 but in brief you should identify the main proximity domains of the energy citizenship in your case, e.g. availability of technologies (tech proximity), social value proximity, etc... Choose everything that apply]</p> <p><input checked="" type="checkbox"/> Spatial proximity (urban structure, climatic area, resource availability, energy infrastructure closeness, cluster and activities closeness)</p> <p><input checked="" type="checkbox"/> Policy proximity (political agendas, administrative structure, regulatory framework)</p> <p><input checked="" type="checkbox"/> Social proximity (community dimension, collaboration mechanisms, knowledge & learning, energy awareness)</p> <p><input checked="" type="checkbox"/> Technical proximity (energy system, technological readiness, technological appliances, enabling structures)</p> <p><input checked="" type="checkbox"/> Economic proximity (energy system economic structure, energy system enabling economics, value redistribution & inclusion mechanisms, cluster economy)</p>
Starting Engagement Level in the case	<p><input checked="" type="checkbox"/> Unaware</p> <p><input checked="" type="checkbox"/> Aware (<input type="checkbox"/> interested or <input type="checkbox"/> indifferent)</p> <p><input checked="" type="checkbox"/> Involved (<input type="checkbox"/> adopting, <input type="checkbox"/> unwilling, <input type="checkbox"/> member)</p> <p><input checked="" type="checkbox"/> Active (<input type="checkbox"/> sponsor, <input type="checkbox"/> frontrunner, <input type="checkbox"/> denial)</p> <p><input checked="" type="checkbox"/> Advocate (<input type="checkbox"/> championing, <input type="checkbox"/> leadership, <input type="checkbox"/> activism, <input type="checkbox"/> NIMBYism)</p>

	Since the natural gas-free neighbourhoods are all at different stages in the energy transition, energy citizens are sometimes unaware, aware, involved, active and even advocates sometimes (but rarely).
What is the targeted Engagement Level in the case?	Within the natural gas-free neighbourhoods, unaware energy citizens are aimed to become aware, involved and active. Advocates are of course nice to have.
By when?	By 2030 (so that they can help the rest of the Netherlands to be natural gas-free by 2050)
What is the targeted Engagement Level in the case for the end of GRETA project?	Aware/ involved / active / advocates

Community Transition Pathway summary

5.1 Brief background of the case study

In line with the Paris Agreement, the Dutch Climate Agreement stated that the Netherlands will be climate neutral by 2050 and by 2030 CO₂ emissions must be at least 49% less than the CO₂ emissions in 1990 (Rijksoverheid Nederland, 2019, p.4). In 2018, the inter-administrative Natural Gas Free Neighbourhoods program (PAW) was founded, which provided subsidies to 64 pilot neighbourhoods in three phases to become natural gas-free. PAW, Netherlands Enterprise Agency (RVO) and other sources provide an overview of policies and tools that support the energy transition towards becoming natural gas free. These are the existing policies and tools, which will be explained in more detail in chapter 2.3:

- Multiple subsidies for municipalities, citizens and businesses (e.g., a rental tax relief scheme for preservation, an incentive scheme for natural gas-free rental homes, and subsidies for energy-saving measures or energy advice for an association of owners, see [Kosten en financiering - Programma Aardgasvrije Wijken](#))
- Programs for developing and sharing knowledge for municipalities and regions (e.g., National Regional Energy Strategy Program, Expertise Centre Heat, Program of gas-free neighbourhoods, see [Aardgasvrij | RVO.nl](#))
- Instruments for municipalities to develop and implement the Transition Vision for Heat (see [Transitievisie warmte - Programma Aardgasvrije Wijken](#))
- Tools for citizens (e.g., Home Energy Savings Explorer (see [Hoe maak je je huis energiezuiniger en duurzamer | Verbeterjehuis](#)), guidelines and roadmaps towards a sustainable and energy-efficient home (see [Stappenplan aardgasvrij wonen | Milieu Centraal](#)))

The aim within natural gas-free neighbourhoods is to reach energy citizenship levels of awareness, involvement, activism and to stimulate energy citizens towards becoming advocates. Since the natural gas-free neighbourhoods are all at different stages in the energy transition, a generally applicable level of energy citizenship emergence cannot be defined. Some energy citizens are aware, some are involved, some are active and part of an energy community some may even be advocates or still unaware. Their level of energy citizenship could even differ within one natural gas-free neighbourhood.

5.2 Main vision and the main objectives of the natural gas-free neighbourhoods

There are eight milestones for a neighbourhood in the process of becoming natural gas-free by 2050 (PAW, 2022). Every municipality has its own timeline for these steps, whereas the first milestone had to be finished by 2021 and the second milestone has finished on march 10, 2022, when the last round of living labs for the Dutch national program on natural gas-free neighbourhoods was announced.

- Milestone 1: Finish Transition Vision for Heat [finished in 2021]
- Milestone 2: Apply for a neighbourhood to become a living lab for the Dutch national program on natural gas-free neighbourhoods [finished in 2022]
- Milestone 3: Develop a business case
- Milestone 4: Finalize the business case
- Milestone 5: Make residents an offer
- Milestone 6: Carry-out housing scans
- Milestone 7: Start the implementation phase
- Milestone 8: Finish the execution phase

5.3 Priorities and necessary resources to become natural gas-free by 2050

Ideally, municipalities perform the following four actions, including sub-actions, to become natural gas-free (see [Gemeentereis Aardgasvrij - Programma Aardgasvrije Wijken](#)):

1. **Explore** (resulting in Milestone 1 and 2)
 - Exploratory research
 - Plan of action
 - Analysis
 - Coordination & alignment
 - Consideration
 - Draft Transition Vision for Heat
 - Determination
2. **Prepare** (resulting in Milestone 3, 4, 5 and 6)
 - Draw-up an implementation plan
 - Establish the implementation plan
 - Draw-up an environmental plan
 - Establish the (amendment) environmental plan
3. **Implementation & Monitoring** (resulting in Milestone 7)
 - Monitor the impact of the implementation
 - Participation Roadmap
 - Last check-up
4. **Aftercare** (resulting in Milestone 8)

Out of these four action phases, the preparation and implementation & monitoring phases have the highest priority. This is due to the fact that most neighbourhoods are in these phases at the moment, and the focus on resident participation is central to them.

Research shows that the following resources are needed by the municipalities that lead the pilot neighbourhoods (de Koning, Kooger, Hermans, and Tigchelaar, 2020; Klösters, de Koning, Kort, and Kooger, 2020; Klösters, De Koning, Dreijerink, Tigchelaar, Bijvoet, and Kooger, 2020; PAW, 2022):

- Powers and preconditions, such as:
 - Municipal powers
 - National principles to facilitate the distribution of costs, benefits and risks
 - National agreements with the housing corporations
 - Additional financial resources for the unprofitable top and process costs
 - Appropriate financial arrangements and relief constructions
 - A supporting message from the national government
- Capacity and national and regional support
- Policy objectives and national direction, regarding:
 - The creation of regional connections between local heat networks
 - Making non-residential buildings more sustainable
 - Drilling and exploration licences for wells
- Action by the PAW
- Goals within the municipality for the participation process
- Time and capacity at the municipality
- A good team
- A good understanding of who residents are, their motivations and barriers
- Insights about what goes on in the neighbourhood(s)
- A resident participation method
- Involved residents
- Clear information on the heat transition and the usefulness and necessity of making homes more sustainable
- Strategies on how to deal with different opinions
- A neighbourhood implementation plan together with residents
- An offer that appeals to different groups of residents based on their housing
- Strategies to encourage and motivate residents who do not feel any urgency to take steps towards natural gas-free in the meantime
- Strategies to discuss the proposal with residents
- Strategies to respond to certain (groups of) residents who do not respond to the proposal by the municipality
- Strategies to determine who does what in the implementation plan
- An independent position as a municipality
- Strategies to determine what proposal will be made central and by whom
- Clear role of municipality in regulating the proposal

Abbreviations and acronyms

ECW = Expertise Centre for Heat

PAW = Natural Gas Free Neighbourhoods program

PBL = Netherlands Environmental Assessment Agency

RES = National Regional Energy Strategy

RVO = Netherlands Enterprise Agency

TVH = Transition Vision for Heat

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1 The brainstorming Canvas

To complete the Community Transition Pathway, we conducted desk research and consulted experts to complete the canvas. The desk research is mainly based on three sources:

1. Tools and information from the website of the Natural Gas Free Neighbourhoods program (PAW; see: [Nederland aardgasvrij - Programma Aardgasvrije Wijken](#)), which supports municipalities taking the proper steps to turn their neighbourhoods into gas-free neighbourhoods.
2. Results of the Monitor of 2021 (PAW, 2022), which PAW published in May 2022. This monitor provides insights into the state of affairs of the first and second round of natural gas-free neighbourhoods, which happened in 2018 and 2020 respectively. By that it identifies bottlenecks that can be taken into account by politicians and policymakers. The monitor is based on a survey, interviews and sessions with the project leaders and councillors of municipalities of the 1st and 2nd round of living labs.
3. Finding of studies conducted by TNO, Energy Transition Studies. A key part of those studies was developing a residents' customer journey and exploring the perceived drivers and barriers (resistance) that arise in the different steps of this customer journey (de Koning, Kooger, Hermans, Tigchelaar, 2020). Then, in line with that, a customer journey for collectives was developed, including the barriers and drivers that they perceive in the different steps of their journey (Klösters, de Koning, Kort, Kooger, 2020). After that, research was conducted among municipalities. They were asked how they deal with residents' perceived motives and barriers and what they encounter in solving them (Klösters, De Koning, Dreijerink, Tigchelaar, Bijvoet, & Kooger, 2020). Finally, all insights and knowledge was combined in shaping a practical site for municipalities (and other stakeholders) that are working with residents to realise the energy (specifically the heat) transition: [De energieke gemeente - Energy.nl](#)

Often, in the following report, we focused on taking the perspective of Dutch municipalities which are eventually responsible for the energy transition on a local level.

2 The starting point: acknowledging the current policies and the background of the case

2.1 Background information on the case

In the Netherlands, 64 neighbourhoods were selected to transition towards being natural gas-free. The Dutch national program on natural gas-free neighbourhood started in 2018 after the Dutch government has decided to gradually reduce the extraction of natural gas from the Groningen gas fields which repetitively has caused damages and injuries due to subsidence accompanied by earthquakes. Due to the energy crisis, including the gas inflation (incl. the war in Ukraine), the urgency to become less dependent on natural gas increased even more.

For more detailed information, please look at the [WP3 Background Research for natural gas-free neighbourhoods](#).

2.2 Energy citizenship engagement levels

Within the 64 pilot neighbourhoods, there can be different levels of Energy Citizenship found, depending on how far advanced they are within the transition towards being natural gas-free. Within GRETA, we propose that energy citizens can transition between engagement levels by means of changes of their condition and context (see Figure 7). An unaware energy citizen, for example, transits towards being aware of the energy transition by for example being interested. However, feeling indifferent or sceptical also has an impact on the level of energy citizenship as that energy citizen either stays unaware or has the urge to voice that indifference or scepticism and therefore becomes involved.

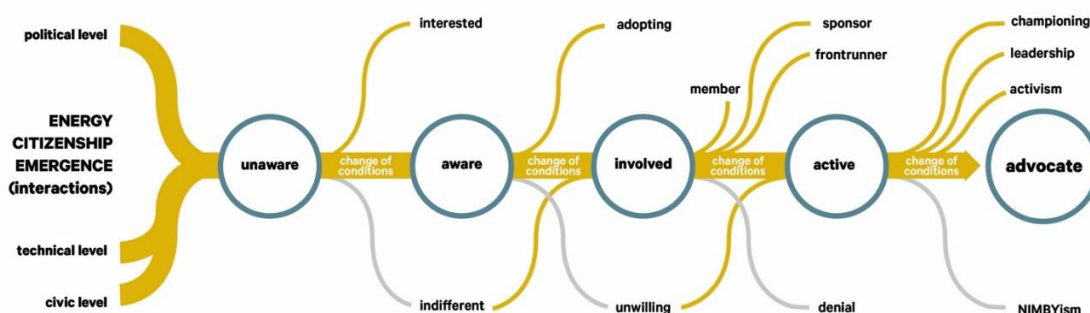


Figure 7. Concept of energy citizenship emergence in terms of engagement (source: Adapted from Massari, 2020).

Similar to GRETA's concept of energy citizenship emergence, TNO has developed a customer journey of residents of the natural gas-free neighbourhoods (see Figure 8).

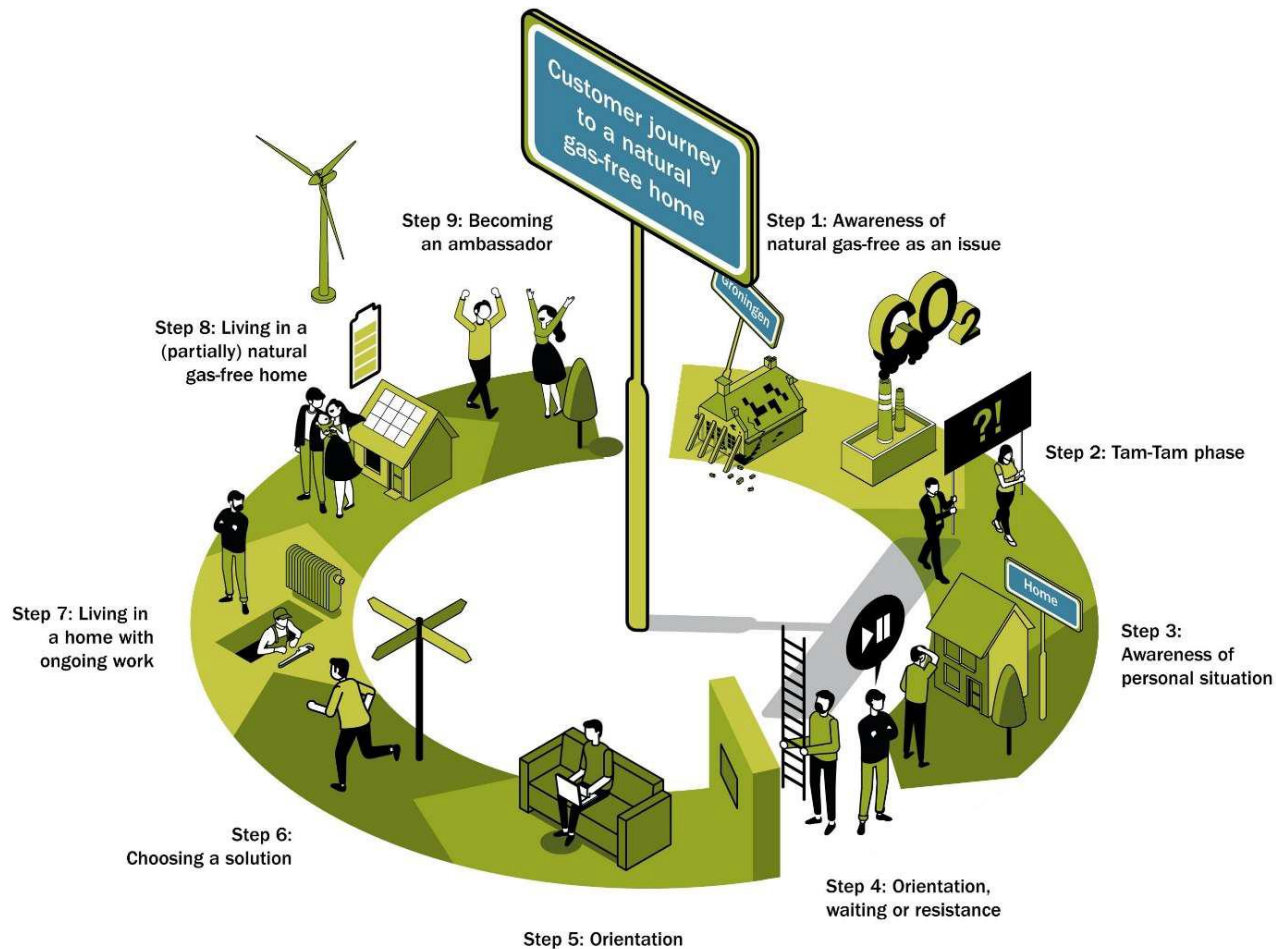


Figure 8. Customer journey to a natural gas-free home (source: de Koning, Kooger, Hermans, and Tigchelaar, 2020).

According to the study by de Koning, Kooger, Hermans, and Tigchelaar (2020), there are nine steps towards being natural gas-free:

1. Becoming aware of natural gas-free as an issue
2. Tam-tam phase (i.e., people form their opinions based on available information)
3. Awareness of personal situation
4. Choice of orientation, waiting or active resistance
5. Orientation
6. Choosing a solution
7. Living in a home with ongoing work
8. Living in a (partially) natural gas-free home
9. Becoming an ambassador

When comparing GRETA's concept of energy citizenship emergence and TNO's customer journey of natural-gas free neighbourhood residents, we see that for both becoming aware is the first step. From the research by de Koning, Kooger, Hermans, and Tigchelaar (2020), we know that as soon as a pilot neighbourhood is chosen by the PAW, municipalities try to make their residents aware of natural gas-free as an issue, by for example sending them information or organize residents meetings/ evenings. At a later stage, residents are also made aware of their personal issue, by for example visiting participants at home or giving insights into their energy costs. These are just examples of how energy citizens are involved by the municipality (see also chapter 4.3 for the participation roadmap for municipalities provided by PAW). As soon as a choice of orientation has been made, residents are involved and become active in the natural gas-free neighbourhood. Finally, the two concepts are also aligned in their last step: becoming an ambassador/ advocate.

Another study by TNO focuses on mostly active residents that are a member of an energy community (Klösters, de Koning, Kort, & Kooger, 2020). For them as well, a customer journey towards being natural gas-free has been developed (see Figure 9), including steps such as becoming aware, involved and even being an advocate that stimulates residents to take steps themselves.



Figure 9. Customer journey of collectives (source: Klösters, de Koning, Kort and Kooger, 2020).

Based on this earlier research, we can conclude that the aim within natural gas-free neighbourhoods is to reach levels of awareness, involvement, activism and to stimulate energy citizens towards becoming advocates. Since the natural gas-free neighbourhoods are all at different stages in the energy transition, a generally applicable level of energy citizenship emergence cannot be defined. Some energy citizens are aware, some are involved, some are active and part of an energy community some may even be advocates or still unaware. Their level of energy citizenship could even differ within one natural gas-free neighbourhood.

2.3 Case study-related goals and policies

2.3.1 Goals and policies on an international, European and national level

- After the *Paris Climate Convention* in 2015, 195 countries, including the Netherlands, agreed to limit the increase in the average global temperature to well below 2 degrees Celsius, and if possible 1.5 degrees Celsius, by 2050 (i.e., *Paris Agreement*).
- In 2017, the *Dutch Coalition Agreement* stated to make 200,000 homes natural gas-free each year starting in 2021 (VVD, CDA, D66 and ChristenUnie, 2017).
- After an especially heavy earthquake in January 2018, the Dutch government announced the *historic decision* to close the Groningen gas tap.
- In 2019, the *Dutch Climate Agreement* was approved by companies and (government) organisations with the aim to reduce carbon dioxide (CO₂) emissions and thus limit the Dutch contribution to global climate change. More specifically, the climate-related goals of the Netherlands are (Rijksoverheid Nederland, 2019, p.4):
 - By 2050 the Netherlands will be climate neutral
 - By 2030 CO₂ emissions must be at least 49% less than the CO₂ emissions in 1990.

The Dutch Climate Agreement is an important part of the Dutch implementation of the Paris Climate Convention.

- In 2020, the *European Green Deal* was approved, with the overarching aim of making the European Union climate neutral in 2050.

2.3.2 Goals and policies on a regional and local level

In order to reach the national goals on a regional and local level, the inter-administrative PAW was founded in 2018. In this program, the Ministry of the Interior and Kingdom Relations, the Ministry of Economic Affairs and Climate Change, the Interprovincial Consultative Council, the Association of Water Boards, and the Association of Netherlands Municipalities are working together to provide municipalities and stakeholders with the best possible support in the natural gas-free task.

Goals and milestones that have been decided upon within the PAW are described in more detail in chapter 4.

Subsidies for municipalities, citizens and businesses

For the PAW, the government made €435 million available between 2018 and 2030 in order to reach the goal of at least 49% less CO₂ emission than in 1990. In total, approximately €380 million is earmarked for pilot projects with natural gas-free neighbourhoods.

To be more specific, in 2018, the PAW provided subsidies to 27 pilot neighbourhoods to develop natural gas-free heat infrastructures (see Figure 10: dark yellow dots). In October 2020, 23 additional pilot neighbourhoods were subsidized (see Figure 10: white dots) and in 2022, 14 neighbourhoods are chosen (see Figure 10, light yellow dots).

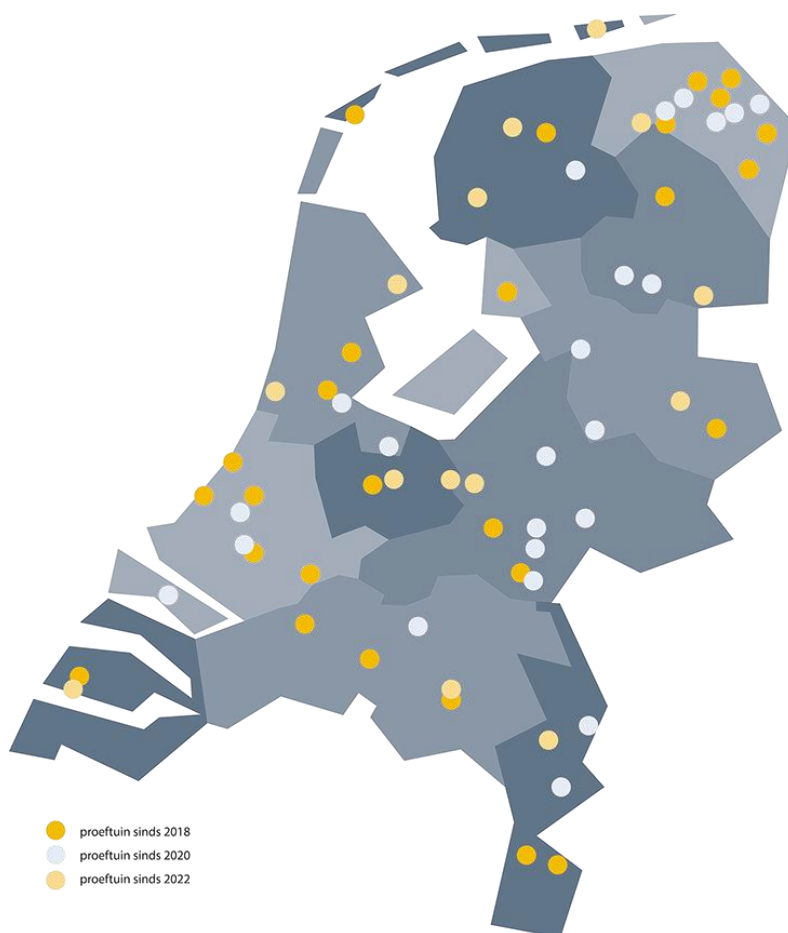


Figure 10. Overview of the 64 pilots of natural gas-free neighbourhoods in the Netherlands
(source: [Proeftuinen op de kaart - Programma Aardgasvrije Wijken](#))

Besides that, there are other financial support systems that can be applied for, such as:

- Tax relief for the preservation of rental housing throughout the Netherlands (see [RVV Verduurzaming | RVO.nl](#))
- Subsidy for the connection of rental houses to an external heat network (see [SAH voor verhuurders | RVO.nl](#))
- Subsidy for sustainable energy and energy saving, whereby homeowners and business users can apply for subsidies for the purchase of a solar boiler, a heat pump, connection to a heat network and insulation measures (see [ISDE voor homeowners and business users | RVO.nl](#))
- Subsidy for energy-saving measures or energy advice for an association of owners (Dutch: VVE), see [SEEH voor VvE | RVO.nl](#)
- For companies there are energy investment allowances (see [ELA voor ondernemers | RVO.nl](#)) and the renewable energy subsidy (see [HER+ voor innovatie | RVO.nl](#))

An overview of other subsidies concerning energy saving, alternative sustainable heat technologies or innovation can be found on the website of the Netherlands Enterprise Agency (RVO; see [Aardgasvrij | RVO.nl](#)) and in the following report: [PAW Financieringsinstrumenten | Programma Aardgasvrije Wijken](#).

Programs for developing and sharing knowledge for municipalities and regions

Next to subsidies by the government, there are several programs that help municipalities or regions to achieve the transition to natural gas-free (see [Aardgasvrij | RVO.nl](#)):

- **National Regional Energy Strategy (RES) Program** (see [Nationaal Programma Regionale Energiestrategie | Regionale Energiestrategie](#)): Within this program 30 energy regions are investigating together where and how sustainable electricity can best be generated on land (wind and sun), in order to generate 35TWh sustainable energy on land by 2030 (see [De energietransitie is een sociale transitie | Programma Aardgasvrije Wijken](#)). Specifically, the RES includes establishing how the sustainable generation of energy can be fitted into the spatial planning and how it fits into the electricity network, but also how support for the measures can be created in society. The RES Program, in turn, supports the regions in creating these RESs by developing and sharing knowledge, offering process support and facilitating a learning community. In addition, it connects parties, puts bottlenecks on the agenda and identifies linkage opportunities to achieve the ambitions.
- **Expertise Centre Heat (ECW)**; see [Expertise Centrum Warmte | Expertise Centrum Warmte](#): an expert knowledge centre that supports municipalities in the heat transition of homes and buildings in Dutch districts and neighbourhoods. It deals with issues in the fields of technology, finance, market organisation and sustainability.
- **Natural Gas Free Neighbourhoods program** (PAW, see [Programma Aardgasvrije Wijken](#)): an inter-governmental program, where solutions for bottlenecks in practice are being found. Various ministries and umbrella

organizations are working together in this program. Municipalities and parties involved are given the best possible assistance in their natural gas-free task. By learning from experience, the district-oriented approach can be better designed and scale up.

- **Newsletters:** In addition to these programs, municipalities and regions are also offered a newsletter in order to stay up to date with the latest developments (e.g., Natural Gas Free Neighbourhoods Program/ Expertise Centre for Heat Newsletter or National Program Regional Energy Strategy Newsletter).

Instruments for municipalities to develop and implement the Transition Vision for Heat (TVH)

Since, according to the Climate Agreement, municipalities must have had a TVH ready by the end of 2021, the PAW supported and still supports municipalities with various instruments:

- **Roadmap** (see [Stappenplan transitievisie warmte | Programma Aardgasvrije Wijken](#)): includes an assessment framework to help municipalities choose a strategic role and an elaboration of several directorial role variants. This assessment framework consists of seven steps:
 - (1) *Explore* what the TVH is, what it can achieve, what characteristics it has and how you as a municipality want to implement it.
 - (2) *Plan of action*, including ambitions, starting points and preconditions when drawing up the TVH.
 - (3) *Analysis* of reliable data. As a municipality, you are supported in this by the Guideline.
 - (4) *Align* with the relevant stakeholders and departments within the municipal organization about the preferred sequence of events: which neighborhood or district should be disconnected from natural gas at what time.
 - (5) *Weigh* the ambitions, preconditions and starting points established earlier, the results of the analyses and the discussions with the stakeholders involved.
 - (6) *Draft* the TVH.
 - (7) *Adopt* the TVH. The TVH must then be updated (at least) every five years.
- **The Guideline** (see [De Leidraad | Expertise Centrum Warmte](#)): helps municipalities in the assessment process. The tool consists of two parts:
 - (1) the preliminary analysis of Netherlands Environmental Assessment Agency (PBL), consisting of a technical-economic analysis based on the Vesta MAIS model of PBL (see [Vesta MAIS Model - Algemene beschrijving | PBL](#)), which provides the national costs of the various natural gas-free (heat) options at neighbourhood level for the whole of the Netherlands
 - (2) the Guide for Local Analysis of ECW, supporting municipalities in supplementing the analysis and the use of local data. In this way, they can make a careful and well-founded assessment.
- **Sustainable coalition of local stakeholders** (see [Wijkuitvoeringsplan | RVO.nl](#)): for the implementation of the TVH both within the region and within

the municipality. This coalition includes housing corporations, grid managers and (representatives of) companies and residents. Cooperation within this coalition is central to the entire process. This applies to both the Regional Energy Strategy (RES) and the TVH and the subsequent implementation plans. The coalition accompanies the transition until it is adopted by the municipal executive and council. An implementation strategy ensures that the choices made in the TVH are actually implemented.

- **Assessment framework for the choice of a governance role** (see [Afwegingskader voor de keuze van een regierol | Programma Aardgasvrije Wijken](#)): to help municipalities choose a strategic role. The choice depends on, among other things, substantive considerations, the way in which the municipality wants to deal with its environment and the available financial resources. The four roles defined in the assessment framework are:
 - (1) The waiting director
 - (2) The process director
 - (3) The managing director
 - (4) The integral director

The choice of how a municipality wants to fulfil its directorial role in drawing up the TVH has an influence on how the organisation is set up. Also for the set-up of the organisation, an inspirational document was developed (see [Organisatie inrichting | Programma Aardgasvrije Wijken](#)).
- **Tools for citizens:** Last but not least, there is much support offered to citizens to make their home natural gas-free step by step. A few examples are a webservice called the "Home Energy Savings Explorer" (see [Hoe maak je je huis energiezuiniger en duurzamer | Verbeterjehuis](#)) which has been developed to find opportunities to make homes more economical, more comfortable or even energy neutral. Besides that, there are guides and roadmaps developed by Milieu Centraal to a sustainable and energy-efficient home (see [Stappenplan aardgasvrij wonen | Milieu Centraal](#)).

3 Vision and Objectives in the short, medium and long term perspective

Since municipalities are given the main responsibility to realize the energy transition, the following visions and objectives focus on the overall pathway of a Dutch municipality being part of the PAW. Hence, we explain their process of turning a neighbourhood into a natural gas-free neighbourhood.

On the long-term (see chapter 2.3), the municipalities aim for all their neighbourhoods to become natural gas-free. Until then, however, municipalities start implementing changes only in one or a few neighbourhoods, that serve as a living lab. By doing that, municipalities learn about the process towards becoming natural gas-free and can upscale solutions to other neighbourhoods within their municipality more easily at a later stage. The timeline for this process differs per municipality. Figure 11 shows how many living labs are expected to be ready until 2030.

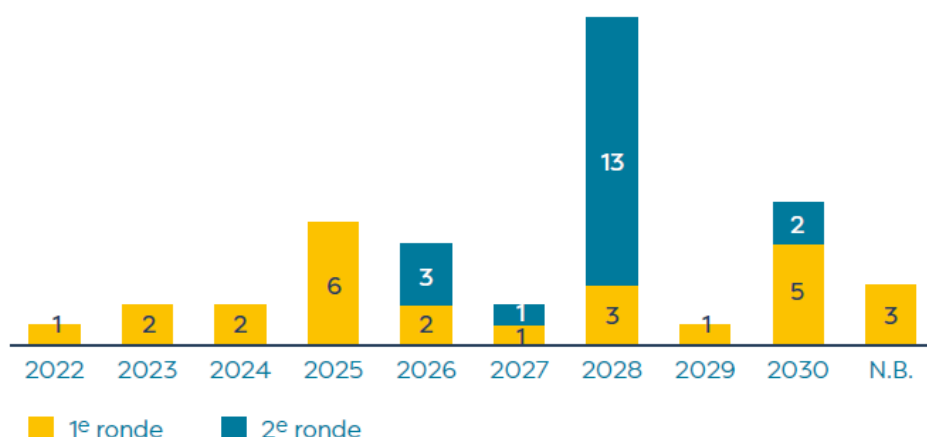


Figure 11. Expected year when living labs are natural gas-free, ‘N.B.’ means ‘unknown’ (source: PAW, 2020).

Below you will find the main milestones for a neighbourhood in the process of becoming natural gas-free.

Milestone 1: Finish TVH [finished in 2021]

Every municipality was obliged to establish a TVH before the end of 2021. The TVH provides the first direction for the approach to insulating and making buildings free of natural gas. The TVH focuses on the period from 2021 until 2030. Each municipality indicated how many homes and other buildings will be insulated and/or made natural gas-free during that period.

Milestone 2: Apply for a neighbourhood to become a living lab for the Dutch national program on natural gas-free neighbourhoods [finished in 2022]

Once an neighbourhood was selected for the program several steps need to be taken, which are provided below. This milestone has finished on march 10, 2022, when the last round of living labs for the Dutch national program on natural gas-free neighbourhoods was announced.

Milestone 3: Develop a business case

A business case is a plan that explains the costs and benefits of the approach chosen by a municipality to become natural gas-free. Once the business case is finalised, the costs and benefits of the approach are (contractually) agreed upon by all involved parties.

Milestone 4: Finalize the business case

Finalizing the business case means that the costs and benefits of the approach (contractually) have been agreed upon by the parties involved.

Milestone 5: Make residents an offer

An offer includes the selected technology(s) and measures, the adjustments to be made to the home, the costs for the resident/owner and the expected return on investments.

Milestone 6: Carry-out housing scans

Private home owners receive advice on which architectural and installation measures they can take to make their home more sustainable and to save energy.

Milestone 7: Start the implementation phase

Buildings/ homes become natural gas-free-ready:

- The installation of collective heat facilities, such as the construction/expansion of the heat network; and/ or
- Adaptations in the homes (i.e., provisions for electric cooking and/ or the heating system, insulation).

Milestone 8: Finish the execution phase

Buildings/ homes are natural gas-free.

Every municipality has its own timeline for these steps. In Figure 12, you can find the progress of the current living labs. The dark yellow bars show the increase of living labs that finished that particular phase last year.

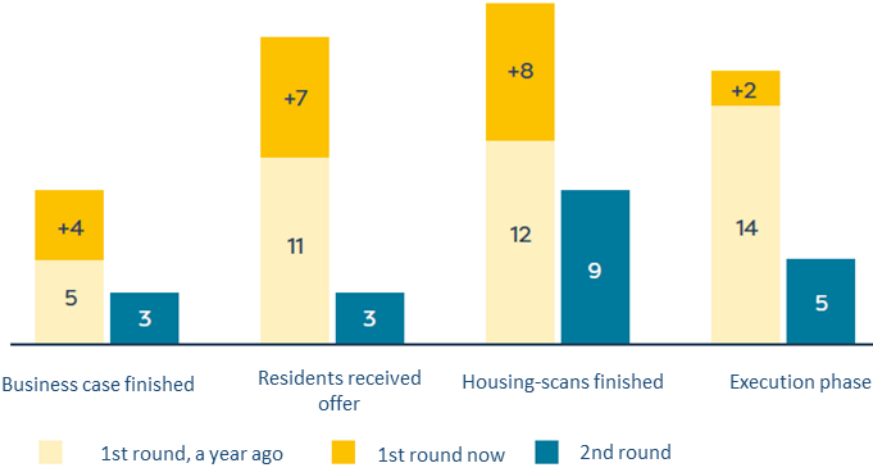


Figure 12. Progress of living labs by 2021 (source: PAW, 2020).

4 The Actions and the Priorities

Ideally, municipalities perform the following four actions, including sub-actions, to become natural gas-free, which result in the milestones described in chapter 4 and are displayed in Figure 13:

1. Explore (resulting in Milestone 1 and 2)
2. Prepare (resulting in Milestone 3, 4, 5 and 6)
3. Implementation & Monitoring (resulting in Milestone 7)
4. Aftercare (resulting in Milestone 8)

We elaborate on these four steps below.



Figure 13. The journey of municipalities: process-steps and actions (source: [Gemeentereis Aardgasvrij - Programma Aardgasvrije Wijken](#)).

4.1 Explore [This phase results in Milestone 1 and 2]

The exploration phase will be finalized in a TVH document. This document needs to be updated every five years. The exploration phase consists of seven steps, explained below.

Step 1: Exploratory research

This includes: 1) an examination of potential technical solutions, 2) the municipality decision on their own “directing” role in the process, 3) what that means for the organization and which stakeholders need to be involved (e.g., neighbourhood initiatives or energy cooperatives)

Step 2: Plan of action

This plan includes the municipality's ambitions, principles and preconditions for the TVH. It shows the criteria that determine which district or neighbourhood will switch off natural gas and when - and the chosen sustainable alternative. In addition, the municipality decides on the organizational structure, such as the (project) team, decision-making processes, a timeline, setting up advisory board and agreements about the collaboration with stakeholders. It also states how the municipality wants to involve residents and building owners in the TVH and the process to become natural gas-free. The action plan is often submitted to the Municipal Executive and the Municipal Council for approval.

Step 3: Analysis

The municipality gathers and analyses relevant and trustworthy data as the basis of their decision-making. In this phase, they collaborate with a number of (local) stakeholders to enrich the local data. For example, to gather data on multi-year (maintenance) schedules of the network operator, the housing corporation and the municipality's real estate. This analysis should result in an indication of the impact of different heat strategies at the neighbourhood level.

Step 4: Coordination & alignment

The results of the analysis are used to decide on which heat alternatives are most promising in which neighbourhood. Based on these results, the municipality starts conversations with different stakeholders on which neighbourhoods or districts can become natural gas-free at what time.

Step 5: Consideration

In this step the order of the plans (priorities) are set. Especially for the neighbourhoods that will be first in the period up to 2030. The prioritization of neighbourhoods determines which inhabitants will be the first to be confronted with the natural gas-free transition. Therefore, the municipalities are advised to ask for input from an advisory board or a residents' initiative.

Step 6: Draft

In this step, a draft of the TVH is written. For the districts or neighbourhoods that are already insulated and/ or will switched off natural gas before 2030, the municipality should indicate:

- how many homes and other buildings are involved;
- which alternative (affordable, reliable and sustainable) energy infrastructures are potentially available;
- which of those alternatives has the lowest national costs (including end-user costs).

Step 7: Determination

If the TVH is established as a program under the Environment Act, the Municipal Executive will adopt the TVH. This is regulated in the Environment and Planning Act

(implemented on 1 January 2023). In view of the impact of the natural gas-free specification, the Municipal Executive will closely involve the Municipal Council in this decision-making process – determining the TVH. The plan of approach should therefore be presented to the Municipal Council for decision-making.

Since this exploration phase results in the finalization of the TVH document which had to be ready by the end of 2021, this action is not a priority anymore.

4.2 Prepare [This phase results in Milestone 3, 4, 5, 6]

In the preparation phase the municipality develops an implementation plan. This entails the realization of the TVH. The municipality also makes a legal translation of the TVH and the implementation plan, which results in the environmental plan. The preparation phase consists of four steps, explained below.

Step 1: Draw-up an implementation plan

To develop an implementation plan, the municipality should follow these three steps:

1. Conduct a neighbourhood analysis

This includes an analysis of the physical and social characteristics of the neighbourhood, a stakeholder analysis and a financial-economic analysis of the chosen alternatives for natural gas. Also, information is gathered to develop a citizen participation process, such as data on who are living in the neighbourhood, and what needs, wishes and opportunities for participation are there among these people? Finally, the preconditions for participation are mapped-out: what are the technical, administrative and financial frameworks that are relevant for the participation.

2. Prepare a project plan

In the project plan the municipality describes the process on how they will develop the implementation plan. It includes ambitions, the demarcation, geographical boundaries, division of roles, risk analysis and project organization. An important part of this project plan is the development of a process on how residents will be involved in the decisions and agreements that are stated in the implementation plan. To determine the role of residents, the municipality designs a participation process during this phase. Administrative approval is needed for the project plan.

3. Draw up an implementation plan

Once the project plan has been approved, the municipality starts drawing up an implementation plan that must be approved by the board. Drawing up an implementation plan requires decisions on various aspects: administrative, legal, spatial, communicative, technical, financial. The municipality also starts to execute their citizens participation process, for example, by determining locations and discussion leaders, and by selecting and inviting residents (see: Step 2: Participation). The municipality then also needs to think about how the results will be incorporated in the implementation plan, and how participants,

the broader group of residents and other stakeholders will be informed about these changes and/ or implementations.

Step 2: Establish the implementation plan

The next step is the adoption of the implementation plan by the Municipal Executive and its embedding as a programme. From a legal point of view it makes sense to design the implementation plan as a 'program' under the Environment and Planning Act.

The program is a policy document. The legal translation of the implementation plan/programme into rules is done by the municipal council in the municipal environmental plan (this is regulated in the Environment Act). During this phase, residents have the opportunity to still influence decision-making via the legally regulated decision-making procedures, such as *zienswijze*. An appeal can also be lodged with the administrative court against the environmental plan or its amendment.

Step 3: Draw-up an environmental plan

The environmental plan is an important legal step: it can be appealed to the administrative courts of the Council of State. This is not the case for the environmental vision and the implementation plan/ program: these are binding for the municipality. To develop an environmental plan, the municipality should follow these three steps:

1. Start specification phase

This phase is the period in which the municipality plans the entire chain: from source to connection at street level. The municipality also defines the role of all the executors.

2. Determination: how does your municipality support the residents?

3. Working towards decision-making

4. Develop a monitoring plan

Effective monitoring starts with a good plan. First, the municipality has to determine what they want to do with the monitoring information: make adjustments, render account to the Council/ residents or do something else? That determines what information is needed and how it should be organised and analysed.

Step 4: Establish the (amendment) environmental plan

The last step in creating an environmental plan, which contains the rules necessary to implement the implementation plan/ programme, is its adoption by the Municipal Council. This is an amendment to the environment plan, i.e. rules are added and/ or rules are amended. In this phase, citizens, organisations, and other stakeholders can go to court to challenge the environmental plan, or the decision by which the environmental plan is amended to include new rules.

This preparation phase has high priority for a lot of natural gas-free neighbourhoods at the moment. In the study by Klösters, De Koning, Dreijerink, Tigchelaar, Bijvoet and Kooger (2020), they found that the realisation phase should be planned early on and

residents should be involved as soon as possible (also see chapter 4.3 for the participation roadmap).

4.3 Implementation & Monitoring [This phase results in Milestone 7]

In the implementation phase, the implementing parties will develop the connection to the alternative heat source. Building-/ home owners have to get started with preparations, such as (home) insulation and the installation of equipment. Monitoring is now essential. The implementation plan describes who has which role and responsibilities. The implementation and monitoring phase consists of three steps, explained below.

Step 1: Monitor the impact of the implementation

The municipality needs to continuously monitor both the technical and social consequences of the activities in the neighbourhood. The municipality also answers questions from residents and stakeholders.

Step 2: Participation Roadmap

During the implementation it remains crucial for the municipality to communicate well with residents in order to ensure smooth implementation in consultation. It is precisely in this implementation phase that residents have to deal with the heat transition on a daily basis. The measures have a direct impact on the households. Therefore, municipalities are not only advised to organize good communication, but also remain open to citizens' stories and experiences, and adjust their plans accordingly.

That is why a participation roadmap has been developed, which helps municipalities to gain insight into what is needed to allow residents to participate constructively in the decision-making and implementation of the heat transition in their neighbourhood. This roadmap consists of five steps that go parallel to the development of the implementation plan (see Figure 14) and are explained below.

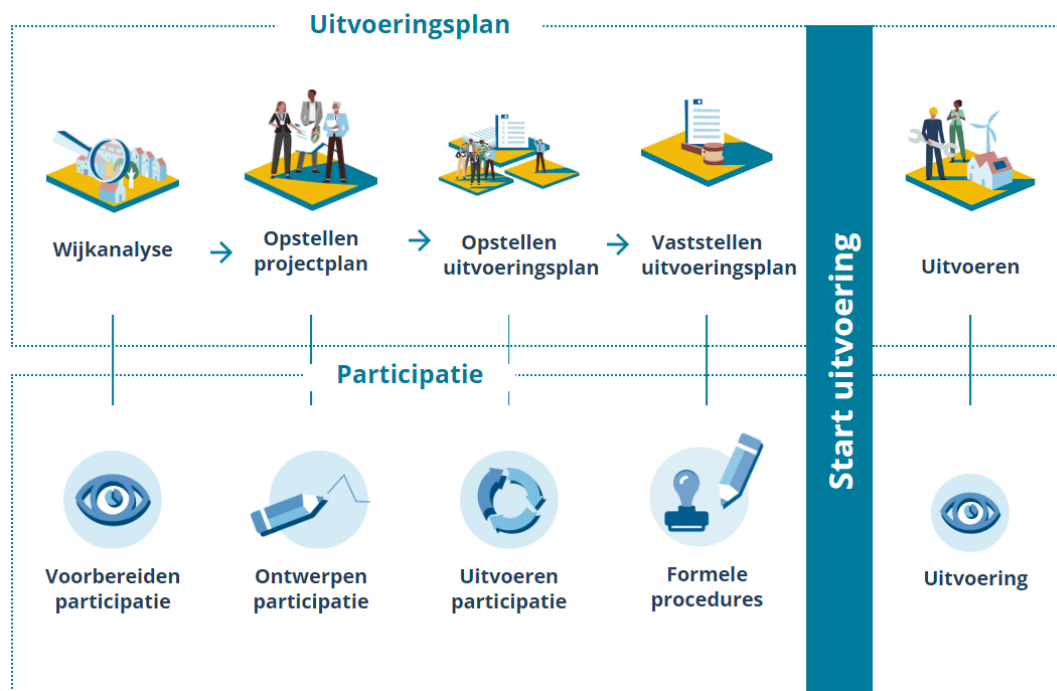


Figure 14. Participation Roadmap, consisting of a preparation, drafting, implementation, formal procedures and execution phase (source: [Participatieroute stappenplan - Programma Aardgasvrije Wijken](#)).

1. Preparation participation

In this phase, the municipality gathers knowledge about the neighbourhood: who lives there, and what needs, wishes and possibilities for participation exist among these people? Besides that, the preconditions for participation are mapped out: what are the technical, administrative and financial frameworks within which you will be organising participation? At the end of this phase, the following information should be gathered:

- Information about residents and building owners and their preferences for the participation process.
- Information about the scope of influence of participants
- Information about the possibilities within your own organisation

2. Drafting participation

Residents can be involved in the choices and agreements that are laid down in the implementation plan. In order to define the role of the residents in this process, the municipality makes a design for a participation process. Based on the information collected in preparation phase, the municipality can take the lead in this and make a design based on the information collected, or let (organised) residents do this (partly) themselves. At the end of this phase, the municipality will have a design for a participation process.

3. Implementation participation

Based on the design, the municipality starts organising and implementing the participation process. They make choices about locations and discussion leaders, and start selecting and inviting residents. At the end of this phase, the

municipality will have completed the participation process and used the results to draw up an implementation plan.

4. Formal procedures

Once a draft implementation plan has been drawn up, the ball is in the political arena. During this phase of adopting the implementation plan (a programme as referred to in the Environmental Act) and the environmental plan, residents will still have the opportunity to influence the decision-making process through the legally regulated decision-making procedures, such as participation and expressing their views. It is also possible to appeal against the environmental plan or its amendment in an administrative court.

5. Execution

Once the implementation plan has been adopted, the heat transition can begin. For the municipality, it remains crucial to communicate well in order to ensure smooth implementation in consultation with residents. It is precisely during this implementation phase that residents will be confronted with the heat transition on a daily basis. The measures have a direct impact behind households' front doors. Therefore, municipalities must not only organise good communication, but also remain open to their stories and experiences, and adjust their plan accordingly where necessary.

Step 3: Last check-up

The municipality checks whether the alternative heat source is connected. Only after confirmation, the municipality can proceed to the next step.

Similar to the preparation phase, the implementation and monitoring phase has high priority for a lot of natural gas-free neighbourhoods at the moment. In this phase it is very important to include residents, to earn their trust, to put them at the centre of the neighbourhood approach, to clarify the costs and benefits of natural gas-free and to use positive experiences of residents of other natural gas-free neighbourhoods (de Koning, Kooger, Hermans and Tigchelaar, 2020; Klösters, De Koning, Dreijerink, Tigchelaar, Bijvoet, and Kooger, 2020).

4.4 Aftercare [This phase results in Milestone 8]

The alternative heat sources are connected and working. Then the aftercare phase starts. The gas can be disconnected. Communication to residents is now essential. After the disconnection, the municipality evaluates and ensures that residents with questions or problems are properly helped.

Since this phase has not been reached by most natural gas-free neighbourhoods, it is not a priority at the moment. It will become a priority after most of the implementation and monitoring has been finalized.

5 Resources

5.1 Resources needed based on Monitor 2021

Results from the Monitor of 2021 (PAW, 2022) show that *learning by doing* in a neighbourhood is necessary to arrive at successful approaches. The municipalities of the first and second round of living labs experience what works, what doesn't, and which preconditions are necessary to achieve a successful approach and further upscaling. Based on these experiences, the following bottlenecks and resources that are needed are summarized below.

Time: Organising the approach and choosing a position takes a lot of time

Mostly, because a tailored approach is necessary for each local situation and municipalities have to find an optimal balance between keeping the control, acceptable financial risks for all parties involved and affordability for residents. Therefore, municipalities invest a lot of time in thoroughly exploring the advantages and disadvantages of the various governance models and in shaping cooperation with partners and residents.

Powers and preconditions: The process is fragile under current conditions

Municipalities are dependent in their choices and progress on the willingness of partners and residents, since at the moment participation is entirely voluntary. There is a need for more steering possibilities and handles from the national government, specifically:

- a. Municipal powers, including the power to designate to avoid high social costs of maintaining the gas grid for some households, instruments for controlling investments by network operators and powers to manage the safeguarding of the public interest in the case of heat networks.
- b. National principles to facilitate the distribution of costs, benefits and risks.
- c. National agreements with the housing corporations (more sustainable in relation to the district-oriented approach).

There is also a need for:

- d. Additional financial resources for the unprofitable top and process costs (incl. staff capacity).
- e. Appropriate financial arrangements and relief constructions for owner occupants with guarantees and (building-related) financing.
- f. A supporting message from the national government (i.e., in order to gain local support, it is necessary that the national government makes a clear statement about the usefulness and necessity of gas-free neighbourhoods and the neighbourhood-oriented approach; the government is also asked to communicate more pro-actively and directly to residents about the applicability

and availability of sources such as hydrogen and green gas, for example through a public campaign).

Capacity and national and regional support

There are capacity constraints both in municipalities and in the market. Small and medium-sized municipalities in particular have difficulty in building up knowledge and skills and attracting and retaining qualified staff. In the market, there is a lack of sufficient technical staff and capacity of heat companies.

Policy objectives and national direction

More direction is needed at the national level with regard to the following issues:

- a. The creation of regional connections between local heat networks.
- b. Making non-residential buildings more sustainable (e.g., by investing in the necessary infrastructure to make it easier to connect companies with residual heat to nearby offices or a neighbourhood in need of heat).
- c. Drilling and exploration licences for wells.

Action by the PAW

The role of the PAW is appreciated, but there is doubt in the extent to which policy-related bottlenecks are actually being resolved.

5.2 Resources needed based on TNO research

Additional bottlenecks and resources that are needed, can be retrieved from the practical website for municipalities (and other stakeholders) that are working with residents to realise the energy (specifically the heat) transition: [De energieke gemeente - Energy.nl](https://de-energieke-gemeente.nl). On this website all insights and knowledge that was gathered through TNO research is combined (de Koning, Kooger, Hermans, and Tigchelaar, 2020; Klösters, de Koning, Kort, and Kooger, 2020; Klösters, De Koning, Dreijerink, Tigchelaar, Bijvoet, and Kooger, 2020).

In the following all resources needed are summarized.

Goals within the municipality for the participation process

Resident participation is a core component in making neighbourhoods sustainable and natural gas-free. Municipalities should therefore actively involve residents early on. This will give them time to form an opinion and possibly become active themselves.

Time and capacity at the municipality

Smaller municipalities in particular have limited time, capacity and resources to manage participation within the heat transition (entirely) themselves. Municipalities should therefore involve other parties that can support them in the participation process: for instance, housing corporations, but also residents themselves and resident initiatives.

A good team

A good and strong team consists of members with expertise and the qualities of the members should be aligned. There is also a demand of (technical) knowledge and expertise that municipalities do not always have in-house.

A good understanding of who residents are, their motivations and barriers

Residents are very diverse and for good cooperation, municipalities need to know well who they are and what they find important. What are their motivations and what barriers need to be removed? This is the only way to achieve a successful approach to sustainable or natural gas-free living.

Insights about what goes on in the neighbourhood(s)

In line with understanding the residents, it is important for municipalities to gain knowledge about what goes on in the neighbourhood(s). By linking residents' objectives with those of the municipality creates a common goal and makes it interesting for residents to think along, develop plans and participate.

A resident participation method

There are many different participation methods. Often municipalities use a mix of participation methods. Which mix of methods is appropriate depends on the situation.

A participation plan

It is important to draw up a participation plan for the neighbourhood approach. This plan describes, among other things, who should decide about what, when and why. By clearly articulating the objective, it is easier for municipalities to choose the desired level of participation and subsequent resident participation methodology.

Involved residents

For municipalities, it is important to mobilise and involve residents at an early stage. Residents' initiatives or residents' cooperatives can be very helpful with that, since active residents are often already enthusiastic and usually eager to help. A residents' cooperative is also sometimes more trusted by residents than a municipality.

Clear information on the heat transition and the usefulness and necessity of making homes more sustainable

In raising residents' awareness, providing reliable information is important to answer residents' questions about the usefulness and necessity of making homes more sustainable. In particular, the central government, as creator of the national targets, is an important sender, but the municipality also has a role in this. After all, municipalities have local control.

Strategies on how to deal with different opinions

People simply do not like being told what to do. This can lead to residents being against the natural gas-free plans and not wanting to cooperate or even protesting, for example.

A neighbourhood implementation plan together with residents

Depending on how far plans have already progressed at neighbourhood level, it is important to start concretising these ideas in (different) neighbourhood implementation plans. The Heat Transition Vision defines which districts will be made sustainable how and when. The implementation plan describes the concrete elaboration and approach for each neighbourhood. The opinions, wishes and concerns of residents are important in the development of these plans.

An offer that appeals to different groups of residents based on their housing

Ultimately, owners/residents decide on their own homes. There is no legal mandate (yet) on the basis of which the municipality can decide to make homes natural gas-free. For municipalities, it is therefore important to develop a proposal that individual homeowners are positive about.

Strategies to encourage and motivate residents who do not feel any urgency to take steps towards natural gas-free in the meantime

For some residents, it will take several years before their neighbourhood will switch to a natural gas-free alternative. In general, people prioritise the short-term and have difficulty thinking about a future more than 10 to 20 years ahead. This causes people to find it difficult, for example, to see the consequences of climate change and it is difficult to see the long-term benefits. As a result, not everyone is convinced of the urgency to take action now. Nevertheless, it pays to take steps towards natural gas-free living now, for instance by insulating the home. In that way, more and more residents are so-called 'natural gas-free-ready'.

Strategies to discuss the proposal with residents

The way the proposal is discussed with residents can have a lot of impact on residents' final opinion and decision on the proposal. It can be difficult for residents to imagine what the proposal will mean to them practically, meaning that municipalities need strategies to do so.

Strategies to respond to certain (groups of) residents who do not respond to the proposal by the municipality

Thinking about natural gas-free, or more sustainable homes in a general sense is easier than when it comes to your own home. It may be that residents are in favour of making homes in the neighbourhood more sustainable, but end up not getting excited about the proposal for their own homes. For residents, it now becomes 'real' and they may (only then) start thinking much more seriously about whether they actually want a more sustainable home and under what conditions.

Strategies to determine who does what in the implementation plan

There is a difference between who is responsible for something and who actually does the implementation of a neighbourhood approach. For instance, a municipality is responsible for the creation of a neighbourhood implementation plan, but it may well be that a consultancy firm does most of the implementation work or a heating company or a grid operator that helps to develop an offer for residents.

An independent position as a municipality

As a municipality, cooperation with contractors is possible, but it must be avoided that residents have no freedom of choice. The municipality should never promote or appear to promote one offer from one party, or create a situation where a resident no longer has a choice.

Strategies to determine what proposal will be made central and by whom

There are several ways to take a neighbourhood off natural gas. This can be done by connecting it to a heat network, by all-electric options or by offering renewable (green) gas. One option focuses mainly on neighbourhood infrastructure, while the other requires a lot to be done in the home. It seems to be a jumble of options where it is often unclear what the proposal is for residents and what role the municipality should have in this offer.

Clear role of municipality in regulating the proposal

The municipality is not a contractor or installer. There are various roles that the municipality can assume when offering a renovation concept (e.g., facilitator for market parties to make contact with home owners, vice versa facilitator for residents to get in touch with market parties, or intermediary in which the municipality actively offers concepts to clients).

On the website, [De energieke gemeente - Energy.nl](https://www.energiekegemeente.nl), tips, tools and hands-on experiences are listed to help municipalities overcoming bottlenecks and gaining the above listed resources.

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Connected and cooperative automated mobility (CCAM) Community Transition Pathway

Writing done by: TNO

Contributions from: Carlos Montalvo and Sven Jansen

Short information on the case study:

Case study name	Connected and cooperative automated mobility
Typology and geographical level of the case study	European
Main proximity domains for the case	<input checked="" type="checkbox"/> Spatial proximity (urban structure, climatic area, resource availability, energy infrastructure closeness, cluster and activities closeness) <input checked="" type="checkbox"/> Policy proximity (political agendas, administrative structure, regulatory framework) <input type="checkbox"/> Social proximity (community dimension, collaboration mechanisms, knowledge & learning, energy awareness) <input checked="" type="checkbox"/> Technical proximity (energy system, technological readiness, technological appliances, enabling structures) <input checked="" type="checkbox"/> Economic proximity (energy system economic structure, energy system enabling economics, value redistribution & inclusion mechanisms, cluster economy)
Starting Engagement Level in the case	<input checked="" type="checkbox"/> Unaware <input checked="" type="checkbox"/> Aware (<input type="checkbox"/> interested or <input type="checkbox"/> indifferent) <input checked="" type="checkbox"/> Involved (<input type="checkbox"/> adopting, <input type="checkbox"/> unwilling, <input type="checkbox"/> member) <input type="checkbox"/> Active (<input type="checkbox"/> sponsor, <input type="checkbox"/> frontrunner, <input type="checkbox"/> denial) <input type="checkbox"/> Advocate (<input type="checkbox"/> championing, <input type="checkbox"/> leadership, <input type="checkbox"/> activism, <input type="checkbox"/> NIMBYism)
What is the targeted Engagement Level in the case?	CCAM is an initiative driven primarily by industry and supported by policymakers at the national level. This implies that Industry is advocating the development and deployment of CCAM in Europe. The inclusion of citizens has been extremely limited if

	not at all absent in the process of developing the roadmap for CCAM in Europe. Thus, it can be considered that citizen remain limited to the unaware, aware and involved.
By when?	By 2030-2030
What is the targeted Engagement Level in the case for the end of GRETA project?	For citizens: Aware

Community Transition Pathway summary

Connected and cooperative automated mobility (CCAM) refers to an infrastructure of transport whose individual vehicles or platooning vehicle units perform an autonomous “self-driving” without human intervention. The human driver becomes a passenger being driven by the vehicle in urban, rural and highways contexts. In addition, the autonomous vehicle is capable of communicating and coordinating its dynamic and static behaviour with other vehicles, with road infrastructures and with service providers via internet connectivity (to perform speed control, stops, avoid collisions, change lines, take directions, exchange data for mobile services, etc.). This transition is at the dawn of its development and deployment. There is a massive regulatory report of the road transport system demanded by CCAM and the digitalization of road and transport service enabled by new technologies embedded in the vehicle and in new road infrastructures. Currently there is a deluge of new regulatory proposals that require broad consultation, consolidation and adoption by EU parliament and member states. The large number of new proposals provides an image of the dimension and radicalness of the transition to CCAM.

Key objectives of the CCAM transition include: 1) Increasing safety in road transport; 2) Reducing negative impacts from road transport on environment; 3) Ensuring inclusive mobility and goods access for all; 4) Strengthening competitiveness of European industries and 5) Capitalising knowledge to accelerate development and deployment of CCAM solutions. This transition goes hand-and-hand with the electrification of the vehicle park as CCAM is to be operating in an electric vehicle platform. This creates challenges of transforming the vehicle in the “new smart phone” where software apparently rules the character of business models and the main motive of use.

The transition early stage is envisioned to be deployed in three phases:

- Phase 1 (2021- 2024) aiming to develop the building blocks of the transition. This includes vehicle and infrastructure technologies, key enablers, validation methods the safety of functioning systems and methods to engage users and citizens.
- Phase 2 (2025 – 2027) is dedicated to advance the operational environments and when possible implement large scale demonstration projects, and advance the technology (TRL) for implementation in the final phase of the partnership.
- Phase 3 (2028 - 2030) will be oriented to promote and support the large upscaling of demonstration across Europe via trials in Living laboratories including users of vehicles in different contexts.

Key actions that are necessary to include and engage citizens in the transition fall into two large line of actions:

- The provision of information about the benefits of the new mobility concept (CCAM) will bring to individuals, society and the environment. Demonstration of the maturity and operational safety of the new technology is key.
- Education on new skills requirements and on the new regulatory system that protects citizens and ensures a level playfield for business is required.
- The support of new business models that question individual ownership and favour collective use of new vehicle technologies is crucial for the successful transition to CCAM.

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1 The brainstorming Canvas

The elaboration of the Community Transition Pathway benefited by the TNO participation in two key projects supporting the transition to Smart and Autonomous Mobility.

- Behaviour and Performance
- CCAM Partnership Scientific Support

These two projects that were part of the European Commission consultation activities related to strategy and policy development aiming to support the development and deployment of Connected and Cooperative Automated Mobility in Europe. The TNO coordination activities in these two projects gave access to key sources of information but also to many stakeholders in policy and business circles.

TNO personnel that work in the GRETA project where key researches in the two projects mentioned. This allowed the participation in four rounds of stakeholders workshops with more than 150 participants each round. In addition, TNO is part of the experts group participating in the dialogue and implementation of the CCAM Partnership but also in the implementation of the resulting Strategic Research Agenda in Horizon Europe. This has facilitated the identification of key issues in the CCAM deployment but also access to key stakeholders in the transition to Smart, Autonomous and Sustainable Mobility.

The participation in the discussions that lead to the CCAM strategic research agenda and program in Horizon Europe made clear that the technology is its early stages of development and deployment and that the participation of European citizenry despite its key role for the smooth transition to CCAM has been limited so far. Studies and consultations available on the role of citizens have focused primarily to be conceptualised as users and consumers. Only recently the attention has been shifted to the conceptualization of an active citizen and engagement in the use and deployment of new behavioural roles and patterns of use of new infrastructures and mobility technologies that give support to the energy transition.

The elaboration of the Community Transition Pathway required desk research to update information on policy initiatives related to the digital transition and consider a twin transition between energy and mobility.

2 The starting point: acknowledging the current policies and the background of the case

2.1 What is connected and cooperative automated mobility?

In a nutshell, connected and cooperative automated mobility (CCAM) refers to an infrastructure of transport whose individual vehicles or platooning vehicle units perform an autonomous “self-driving” without human intervention. The human driver becomes a passenger being driven by the vehicle in urban, rural and highways contexts. In addition, the autonomous vehicle is capable of communicating and coordinating its dynamic and static behaviour with other vehicles, with road infrastructures and with service providers via internet connectivity (to perform speed control, stops, avoid collisions, change lines, take directions, exchange data for mobile services, etc.).

The CCAM technology that is attributed to the vehicle is actually a technological system that requires a dynamic interaction with its surroundings. The vehicle autonomous features are enabled primarily by the vehicle onboard system complemented with access to telecommunication infrastructures. Such infrastructures include primarily internet, satellite geolocation and data servers and corresponding data analytics (often with artificial intelligence). Such technologies are intrinsically linked to the advance of electrification of the vehicle park and its recharging infrastructure. All these technologies are evolving fast but the CCAM concept is still in the early stages of what we could call autonomy. Autonomous driving is still in the early stages of development. The level of autonomy has been defined in five levels of driving automation by the SAE Organisation, this is displayed in the Table 1 below.

Table 3. Vehicles automation levels

L1	L2	L3	L4	L5
Feet off	Hands off	Eyes off	Minds off	Driver less
2000s	2010s	Year 2020s	2030s	2040s

Source: based on SAE International (SAE, 2016)⁷

⁷ Levels of automated driving according to SAE J3016. www.SAE.org, Society of Automotive Engineers levels see: <http://articles.sae.org/13573/>

In Table 1 the levels 1 and 2 are colored in blue, indicating that the human is the main actor in the driving task, even if feet are off the pedals and hands are off the steering wheel and many automated features can support the driver the ultimate responsible of the performance and behaviour of the vehicle is the human driver. Level 3 is an intermediate level where the vehicle is capable of automated driving but not in all circumstances. The driver is requested to take control when the vehicle indicates that is needed. In level 3 automated driving is dependent on the circumstances of the road and the surroundings, probably also on the risk factors measured by the automated system. Current issues subject to subject of debate and further development on automated driving concerns this level, where the safety of the transition of control (ToC) between a human and the automated system is questioned. Who is liable in case of accidents, damages and death? ToC is a major theme in studies of the human factor in driving and a difficult technical issues to overcome (See Montalvo et al, 2020).

As mentioned above CCAM is still at its early stages. Its development, deployment and the long-term impacts are uncertain. The social, environmental and economic impacts will depend on how far and speedy the technology develops and the markets and regulatory frameworks responds. In particular it will depend on how policy and regulation support and steer this development to ensure benefits for all societal segments. There have been an number of initiatives and efforts to provide a policy and regulatory framework that supports both the linkage between the energy transition and the mobility transition. Key objectives seek to realise several long term visions of Zero CO₂ and Zero Deaths in road transport. Concerning the contribution of transport to Zero CO₂ emissions the long term the aim is to achieve the electrification of the vehicle park. In this regards most of the initiatives are oriented to support the transition from internal combustion engines (ICEs) to electric vehicles (EVs). Building and creating synergies with EVs deployment, the next step is the sophistication of the EVs to include features of automated, connected and cooperative vehicles to support the achievement of Zero Deaths in road transport. In the following we outline the key initiatives and policy directives supporting both transitions. The following intends to show that CCAM deployment has four major challenges: (1) understanding user and societal needs, (2) advancing technologies, (3) enactment of a regulatory framework that ensures a level playfield and secures social and environmental benefits, and (4) demonstrating the maturity of CCAM at a large scale.

2.2 Engagement levels of different stakeholders

CCAM is an initiative for technological advances in vehicles, data connectivity and associated services that encapsulates a new form of mobility and is a radical shift in the way a vehicle is conceptualized. This new development is expected to have a strong impact in sustainability. This is driven initially and primarily by business, vehicles manufacturers and digital industries. As this new development promises major source of industry renewal and enabler of new business models based on service rather than

ownership. Policymakers and the European and national member state levels have so far being supportive of such initiative. The European Commission have helped to organise the activities and regulatory framework that will give support to the full deployment of CCAM in the EU. Given the level of CCAM development, level 3, the participation of citizens CCAM has been absent. This is due to the early stage of development. CCAM stage level three is expected to enter in the 2020's wide deployment of testing on the roads. As it stands now, for this decade, this does not include massive sales to consumers.

The participation of citizens is currently in the pre-deployment stages CCAM featured by the diffusion of EVs that serves as platform for CCAM. Such participation has been primarily engaged citizens of high income levels due to the high cost of electric vehicles. The participation and engagement of middle and low income citizens in the wide diffusion of EVs remain in the future. This is expected to increase during the 2020's decade and take off after 2035 due to the banning of internal combustion engines sales in Europe.

The absence of citizens in the development strategy of CCAM is primarily due to requirements of the knowledge intensive discussions on different aspects of the technology, standards and regulatory framework required to enable CCAM.⁸ In a nutshell citizens don't have the time, information or resources necessary to participate in the CCAM pre-deployment stage (for levels L3, L4 and L5 of automation). Given the above context it is expected that during the lifetime of GRETA and perhaps five years beyond many citizens will remain unaware while some be aware of the existence and details of CCAM and few will be engaged in the use of autonomous vehicles. In this sense there is not a "community of citizens engaged in the CCAM transition" as yet, like in other topics addressed in the GRETA project.

2.3 Policy and Regulatory framework supporting CCAM

The development and deployment of CCAM requires a well defined regulatory framework that must cover very diverse aspects of a technological system that encompasses, the safety of the passenger, the reliability of the vehicle concerning performance and safety, the road infrastructures, the infrastructure and data flows that enable connectivity between vehicles and the context and the environmental performance of such system. The overall regulatory framework is guided by two major European strategic policy documents:

⁸ Other factors like lack of time, resources and interest might play a role as well.

- On the road to automated mobility: An EU strategy for mobility of the future, COM (2016) 766.⁹
- A European strategy on Cooperative Intelligent Transport Systems, a milestone towards cooperative, connected and automated mobility, COM(2018) 283.¹⁰

These orientation documents are supported by a complex set of regulations across different domains. Such regulatory framework is briefly sketched below.

2.3.1 Climate change adaptation, energy autonomy and support to the European energy transition.

Running in parallel and sometimes preceding the CCAM initiatives related to safe and intelligent mobility in Europe, there are five large policy initiatives that are pillars supporting climate change resilience and adaptation. These are: 1) The CO₂ emission performance standards for cars and vans; 2) The European emissions trading system; 3) The social climate fund; 4) The effort sharing regulation and 5) The regulation of land use land-use change and forestry. These pillars supporting the energy transition are briefly outlined below.

CO₂ emission performance standards for cars and vans: The Council agreed to raise the targets for reducing CO₂ emissions for new cars and new vans by 2030 to 55% instead for cars and to 50% for vans.¹¹ The Council also agreed to introduce a 100% CO₂ emissions reduction target by 2035 for new cars and vans. Enabling drivers to recharge their vehicles across the member states will be ensured by the related revision of the deployment of an alternative fuels infrastructure (AFIR). In 2026, the Commission will assess the progress made towards achieving the 100% mission reduction targets and the need to review these targets taking into account technological developments, including with regard to plug-in hybrid technologies and the importance of a viable and socially equitable transition towards zero emissions.

The Council agreed to put an end to the regulatory incentive mechanism for zero- and low-emission vehicles (ZLEV) as of 2030. The proposal of the reduction of CO₂ emissions in transport vehicles (in this case cars) is part of a broader number of policy initiatives aiming to reduce emissions and their societal impacts. Amongst other measures that accompany the phasing out of ICE car include the following:

⁹ [EUR-Lex - 52018DC0283 - EN - EUR-Lex \(europa.eu\)](#)

¹⁰ [EUR-Lex - 52016DC0766 - EN - EUR-Lex \(europa.eu\)](#)

¹¹ EU Council (2022) REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Regulation (EU) 2019/631 as regards strengthening the CO₂ emission performance standards for new passenger cars and new light commercial vehicles in line with the Union's increased climate ambition. Dossier interinstitutional: 2021/0197 (COD), Council of the European Union, 30 June 2022.

EU emissions trading system: The EU Emissions Trading System (ETS) is a carbon market based on a system of cap-and-trade of emission allowances for energy-intensive industries and the power generation sector.¹² The Council agreed to keep the overall ambition of 61% of emissions reductions by 2030 in the sectors covered by the EU ETS, proposed the Commission.

Social climate fund (SCF): The Council agreed to establish a SCF to support vulnerable households, micro-enterprises and transport users to support the creation of an emissions trading system for the buildings and road transport sectors.¹³ The SCF would be established over the period 2027-2032, to coincide with the entry into force of the ETS for the buildings and road transport sectors. Each member state would submit to the Commission a CSF containing a set of measures and investments to address the impact of carbon pricing on vulnerable citizens. The fund will provide financial support to member states to finance the measures and investments identified in their plans, to increase the energy efficiency of buildings, the renovation of buildings, the decarbonisation of heating and air-conditioning in buildings and the uptake of zero-emission and low-emission mobility and transport, including measures providing direct income support in a temporary and limited manner.

Effort sharing regulation: The Council agreed to an EU-level greenhouse gas emissions reduction target of 40% compared to 2005, for the sectors not covered by the ETS, namely domestic maritime transport, agriculture, waste and small industries.¹⁴

Land use land-use change and forestry (LULUCF): The LULUCF sector covers the use of soils, trees, plants, biomass and timber. Emissions and absorptions generated by the LULUCF sector are taken into account in the EU's overall 2030 target.¹⁵

The measures above (general approaches) outlined above are key legislative proposals that are pillars of the 'Fit for 55' package proposed by the European Commission on the summer of 2021 as part of the European Green Deal. The Fit for '55' package

¹² EU Council (2021) Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union, Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading scheme and Regulation (EU) 2015/757. interinstitutional File: 2021/0211(COD)

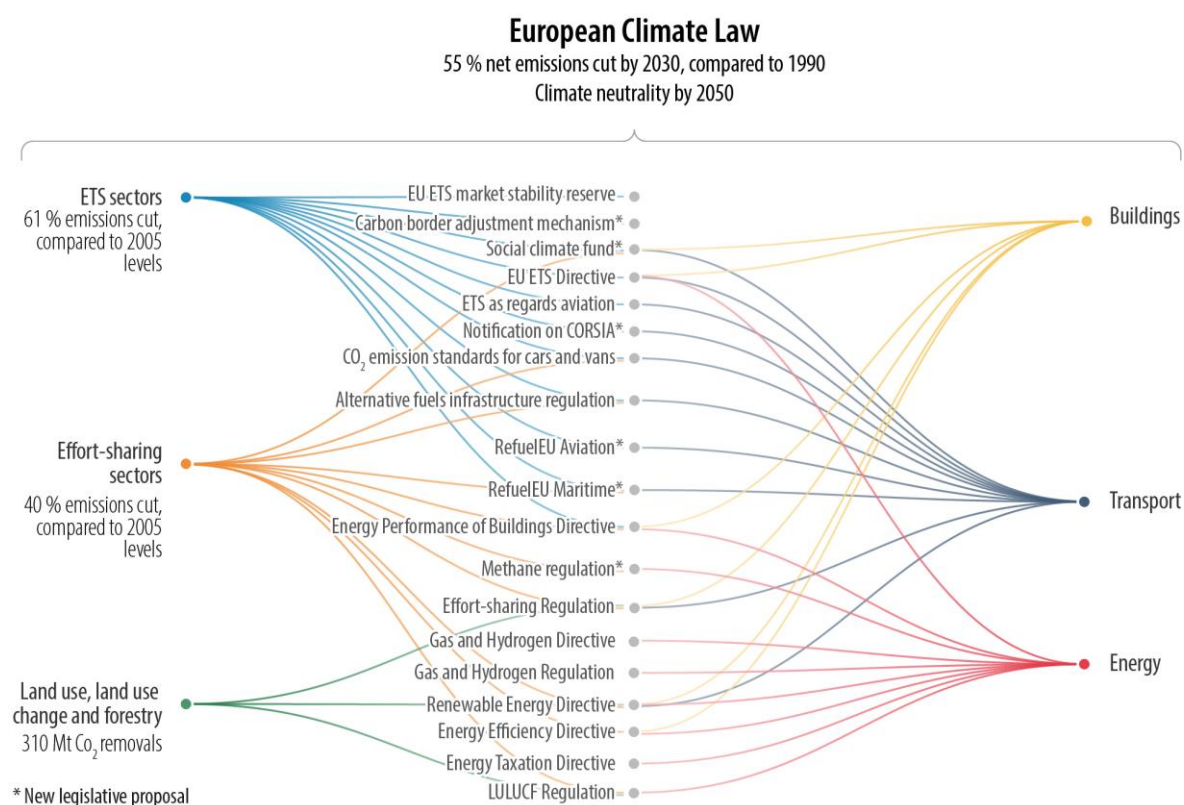
¹³ EU Council (2022) [Proposal for a Regulation of the European Parliament and of the Council establishing a Social Climate Fund](#). Dossier interinstitutional: 2021/0206(COD). Council of the European Union, Brussels, 20 June 2022

¹⁴ [European Council proposition of Shared efforts on reduction of CO2 emissions](#). Dossier interinstitutional: 2021/0200(COD) Brussel 29 June 2022.

¹⁵ [European Council proposition of a regulation on the land use land-use change and forestry](#). Dossier interinstitutional: 2021/0201(COD). Brussels, 29 June 2022

includes 13 specific measures aiming to support the European Union to tackle greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels and to achieve climate neutrality in 2050. The full package of measures is outlined in figure xx below. General policy initiatives are composed by a number of specific measures.

Figure 15. Climate resilience and adaptation regulation framework



EPRS | European Parliamentary Research Service

Source: [EPRS](#)

2.3.2 Ensuring infrastructure for connectivity

The Commission has set in motion a number of actions to support and promote the deployment of connectivity infrastructure and services in the support of automated vehicles with the adoption of strategies for the pillars supporting the deployment of CCAM across Europe for the connectivity aspects. These initiatives include:

- Standardisation Strategy¹⁶

¹⁶ <https://ec.europa.eu/docsroom/documents/48598>

- The 5th generation of communication networks ("5G")¹⁷;
- Cooperative Intelligent Transport Systems¹⁸;
- The Space Strategy¹⁹;
- Artificial intelligence²⁰

2.3.3 Data and cybersecurity

Digital technologies are transforming many areas of economic activity in different sectors. The generation, storage, transmission, trading and analytics of data have generated a number of new regulations in recent years. The full effect on privacy, cybersecurity, new services and business models remains to be seen in the medium and long term. In general, the advent of new directives has to be adopted and implemented at the European Member States. The most well known regulation on data flows is the General Data Protection Regulation (GDPR) that was approved by the European Parliament in 2016.²¹ Despite that it was published in 2016 little is known of it from the common European citizen and its implications for privacy and data protections. In addition to the GDPR, there are a number of proposals to regulate data flows, data analytics and the services associated to these across different domains. These new initiatives that hold relation with and will be affecting the deployment of CCAM over the next decade are listed below.

- Proposed Digital Markets Act (DMA)²²
- Proposed Digital Services Act (DSA)²³
- Proposal for a Regulation on harmonised rules on fair access to and use of data (Data Act)²⁴
- Proposal for a Data Governance Act²⁵
- Proposal for a European Digital Identity (eIDAS 2)²⁶
- Proposal for a Regulation laying down harmonised rules on artificial intelligence²⁷

¹⁷ Communication from the European Commission "5G for Europe: An Action Plan", COM(2016) 588.

¹⁸ Communication from the European Commission on Cooperative Intelligent Transport Systems, COM(2016) 766.

¹⁹ Communication from the European Commission "Space Strategy for Europe", COM(2016) 705.

²⁰ COM(2018) 237.

²¹ [General Data Protection Regulation \(GDPR\) – Official Legal Text \(gdpr-info.eu\)](https://eur-lex.europa.eu/legal-content/en/TXT/?qid=1608116887159&uri=COM%3A2020%3A842%3AFIN)

²² <https://eur-lex.europa.eu/legal-content/en/TXT/?qid=1608116887159&uri=COM%3A2020%3A842%3AFIN>

²³ <https://eur-lex.europa.eu/legal-content/en/TXT/?qid=1608117147218&uri=COM%3A2020%3A825%3AFIN>

²⁴ <https://digital-strategy.ec.europa.eu/news-redirect/736379>

²⁵ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020PC0767>

²⁶ <https://digital-strategy.ec.europa.eu/news-redirect/712464>

²⁷ <https://digital-strategy.ec.europa.eu/news-redirect/709090>

- Proposal for a Regulation establishing the Union Secure Connectivity Programme for the period 2023-2027²⁸
- Proposal for a Geo-Blocking Regulations²⁹
- The EU's [Regulation](#) on Promoting Fairness and Transparency for Business Users of Online Intermediation Services (the Platform to Business Regulation or P2BR) including [Guidelines](#) on the “ranking transparency” under the P2BR.
- Proposed e-Privacy regulation³⁰
- Cybersecurity Act³¹
- the “European Electronic Communications Code” (the “EECC”)

2.3.4 Testing the operational safety of autonomous vehicles.

Key to ensure safety and reliability of CCAM are the protocols to measure and assess the performance of new vehicle systems. These are protocols that have been developed with the multilateral cooperation of automotive, road and transport authorities. Key to the operational safety of new vehicles is the Directive 2010/40/EU on the Framework for the Deployment of Intelligent Transport Systems in the Field of Road Transport and for Interfaces with Other Modes of Transport (ITS Directive). This directive is complemented by three other that ensure the standardisation of testing protocols, driver licences and product liabilities.

- Regulation (EU) 2018/858 on the Approval of Motor Vehicles
- Directive 2006/126/EC on Driving Licences
- Directive 85/374/EEC on Product Liability

At a National level, vehicle requirements, vehicle identification and registration, exemption legislation and procedures, road safety, traffic rules or driving licenses are regulated both by EU and/ or national standards. In this context, each country has its own specific regulatory framework for automated driving purposes.

Given that the level of automation is generally level three for most advanced systems, vehicles manufacturing companies and research organisations developing these technologies are further developing subsystems required in the vehicles. Autonomous vehicle require extensive testing before being allowed to be manufactured and upscaling sales for road use.

²⁸ https://ec.europa.eu/info/sites/default/files/proposal_regulation_union_secure_connectivity_programme.pdf

²⁹ https://ec.europa.eu/commission/presscorner/api/files/document/print/en/ip_15_5704/IP_15_5704_EN.pdf

³⁰ <https://digital-strategy.ec.europa.eu/en/library/proposal-regulation-privacy-and-electronic-communications>

³¹ <https://eur-lex.europa.eu/eli/reg/2019/881/oj>

Manufacturers and brands are required to comply with European automotive and road safety regulations. In addition, they are required to consider national regulations of several European countries in order to run tests involving connected and automated vehicles. Regarding open road driving activities for testing automated driving functions, it is general practice in several European countries to require additional information, in order to allow the deployment of Field Operational Tests nationally. The following information is requested to the company or research organisation that would like to conduct testing of a car on the national roads:

- The applicant (e.g. contacts responsible of the testing operation, insurance).
- The driver / steward (e.g. understanding of the system).
- The vehicle (e.g. description, meeting applicable standards).
- The infrastructure / Operational Domain (e.g. needed for the test).
- Behaviour (e.g. what driving tasks are automated and need to be tested).
- Documentation (e.g. Hazard analysis & Risk assessment, Electro-Magnetic Compatibility, etc.).
- Results of admittance testing (e.g. safe operation, including stress testing, etc.).
- Results of the field operational tests (e.g. logbooks, evaluation, etc.).

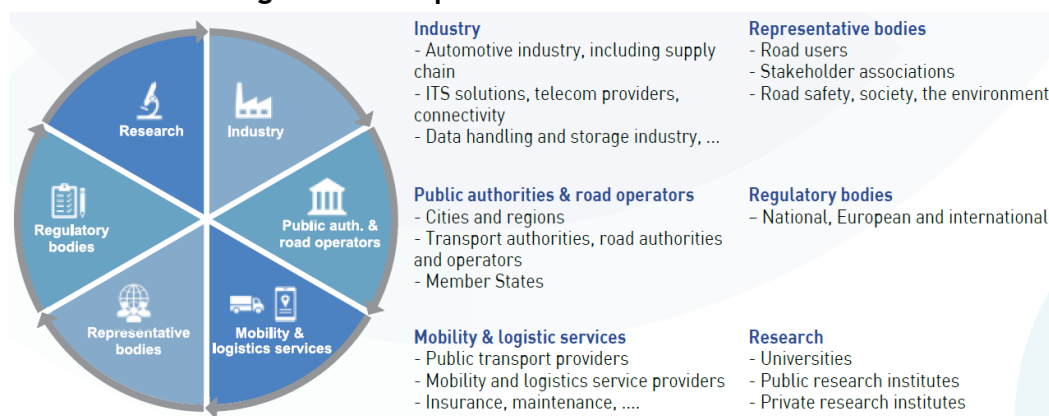
2.3.5 Conclusion

The energy transition and climate resilience and the transition to autonomous mobility are two trends that will influence each other in the long run. The mutual influence creates positive synergies. Saying this, the regulatory framework for the development and deployment of the most advanced levels of automation is extensive and complex. The advent of this relatively new regulatory framework will take time to be implemented across member states. It will require an effort not only of national authorities but also business to adapt and operate in this new regulatory framework. Business and national authorities are still at the early dawn of awareness of the implications of the advent of the digital mobility and its regulatory system. At the side of the end user of these technologies many of these regulations are not visible as they are embedded in the systems that provide the service of mobility, that is the vehicle and the enabling infrastructure. Most citizens operate their vehicles not being aware of the regulatory system supporting the operation of the vehicle park beyond aspects and issues related to private insurance, road rules and licencing. The advent of new vehicles with CCAM capabilities might require more awareness of such regulatory matters in order to better adopt and use these new systems.

3 Vision and Objectives in the short, medium and long term perspective

As mentioned above the development and deployment of CCAM is an initiative that started within the automotive industry supported by policymakers. Citizen communities as conceptualized in the Community Transition Pathways approach do not exist yet. The technology as well as its regulatory framework are the early stages of development. This will become more clear when outlining the vision and objectives of the CCAM partnership. This partnership was formally established in 2021 as an international not-for-profit organisation. Currently the CCAM Association represents the private side of the CCAM Partnership, including more than 180 business entities and innovation stakeholders involved in the connected, cooperative and automated mobility field.³²

Figure 16 European CCAM stakeholders



Source: [CCAM partnership](#)

3.1 CCAM partnership vision

“The ambition is to make Europe a world leader in the deployment of connected and automated mobility, making a step-change in Europe in bringing down the number of road fatalities, reducing harmful emissions from transport and reducing congestion. The deployment of driverless mobility – when fully integrated in the whole transport system and accompanied by the right support measures and synergies between driverless mobility and decarbonisation measures – is expected to contribute significantly to

³² [CCAM - Members](#)

achieving these key societal objectives. Ultimately this is expected to lead to achieving the so-called Vision Zero, i.e. no road fatalities on European roads by 2050.”³³

Many new vehicles are already connected with cellular technologies and all new cars (EVs and internal combustion) are expected to have integrated the capability for internet connection by 2022³⁴. Such connectivity will enable fast access to information on traffic conditions ahead (e.g. accidents, roadworks, environmental conditions), it also will allow for large scale fleet data to be gathered by public authorities, such as anonymised real-life average fuel/energy consumption for the whole vehicle park in a given region or real-time traffic conditions.

As mentioned above there is a strong reinforcing synergy between EVs and CCAM concept but in terms of human behaviour CCAM promises to have a major effect in human behavioural preferences regarding mobility and vehicle ownership. CCAM is intended to be an extension of the office, home living room and bedroom, where work and entertainment practices and individual and collective preferences are to play a major role.

3.2 Major objectives of CCAM and phases 2021-2030

The CCAM partnership has a number of objectives strongly related to sustainability. These objectives are:

- Increasing safety in road transport.
- Reducing negative impacts from road transport on environment.
- Ensuring inclusive mobility and goods access for all.
- Strengthening competitiveness of European industries.
- Capitalising knowledge to accelerate development and deployment of CCAM solutions.

The internal combustion engine (ICE) is set to be phased out in the European Union from 2036 onwards.³⁵ This means that ICEs will not be sold in Europe. The existing stock of vehicles with ICEs will still be allowed to drive in European roads. There is no defined date for a ban of ICEs in European roads. Manufacturers are questioning the viability of an actual stop of ICE sales by 2035.

³³ White Paper: Roadmap to a Single European Transport Area, COM(2011) 144. This vision from 2011 remains in the new European Commission communication “on the road to automated mobility: an EU strategy for mobility of the future”, COM (2018) 283 final, Brussels 15.05.2018.

³⁴ PwC, The 2017 Strategy & Digital report.

³⁵ [News \(ecee.org\)](https://www.eceee.org/);

As mentioned above the measures supporting the reduction and eventually elimination of emissions in vehicles are targeting the replacement of ICEs by EVs. The next step in the transition to an electrified vehicle park in Europe is the parallel transition to a zero accidents and more efficient vehicle park enabled by CCAM. The new paradigm is primarily pursued and promoted by industry with the support of policymakers.

The proposed time frame for the initial stages of the transition to CCAM are:

- **Phase 1 (2021- 2024)** aiming to develop the building blocks of the transition. This includes vehicle and infrastructure technologies, key enables, validation methods the safety of functioning systems and methods to engage users and citizens.
- **Phase 2 (2025 – 2027)** is dedicated to advance the operational environments and when possible implement large scale demonstration projects, and advance the technology (TRL) for implementation in the final phase of the partnership.
- **Phase 3 (2028 - 2030)** will be oriented to promote and support the large upscaling of demonstration across Europe via trials in Living laboratories.

4 The Actions and the Priorities

4.1 Enabling the initial stages of the CCAM transition

4.1.1 CCAM three phases roadmap

The three phases outlined above to roll out the CCAM transition are to be fulfilled conducting activities around seven cluster topics as outlined below:

Large scale demonstration: aims to continuously implement results of all other Clusters into Large -scale Demonstrations in Pilots, FOTs and Living Labs supporting deployment readiness and a final impact assessment.

Vehicle technologies: aims to deliver the most efficient and effective future solutions which have been proven to be safe and reliable. For Europe's future mobility and transport system, significant technical research and innovation challenges must be overcome since tomorrow's highly automated vehicles will rely on advanced solutions to 'sense-think-act', enabling safe interaction with other road users and providing protection in the case of emergency, while also ensuring the well-being of the vehicle occupants.

Systems validation: will provide the procedures, methodologies and tools which are needed for validating, verifying and rating CCAM systems, in terms of both technology itself and human factors handling the technology. This will include suitable metrics and references for system behaviour and performance.

Integration of autonomous vehicles in the transport system: the aim here is that research and innovation projects will advance the physical and digital infrastructure support for CCAM vehicles and improve connectivity and cooperation between actors, which will support the integration of CCAM vehicles in the overall transport system so that fleet and traffic management systems can be enhanced.

Key enabling technologies: aims to implement key general purpose technologies like Artificial Intelligence, Big Data and cybersecurity will support the whole mobility system consisting of vehicle technologies, integrating the vehicles in the transport system, as well as the validation of all aspects of the entire system. Cluster 5 is embedding the "Key enabling technologies" with technical details, contributions, requirements and risks for Cluster 2, 3 and 4.

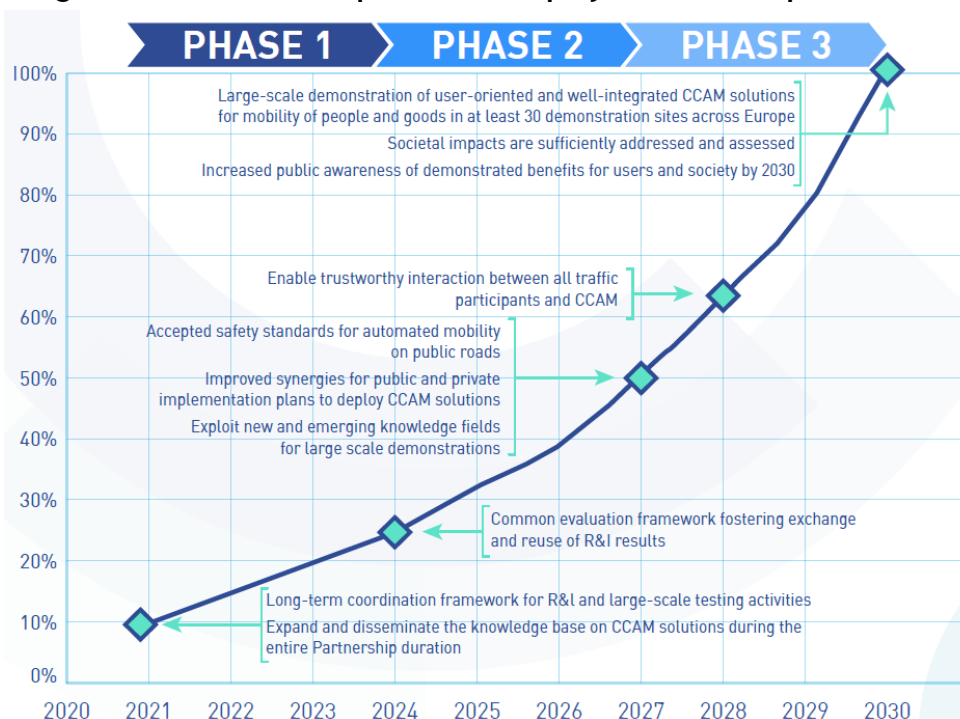
Societal aspects and user needs: activities aim to deliver a framework for understanding and taking into account user and citizen needs, and societal aspects of mobility to all other Clusters. Methods and measures for societal impact assessment will be developed and applied when executing the final societal impact assessment from Cluster 1 results.

CCAM coordination: this set of activities coordinates all CCAM stakeholders and deployment activities, facilitates knowledge exchange und enables lessons learned.

The activities listed above should be considered as running in parallel and interdependent. The notion of priorities is perhaps applied to the basic technology development that gets feedback from the other activities and retrofitting knowledge to each of the listed activities. The system of activities must be fulfilled in tandem for the CCAM transition to fully succeed and achieve the strategic objectives listed in section 3.2 above.

Some of these activities are scheduled and staged in a road map that outlines actions across time from 2021 to 2030. This is displayed in Figure 3 below with five major milestones that are planned to be accomplished over the next eight years up to 2030.

Figure 17. CCAM development and deployment roadmap



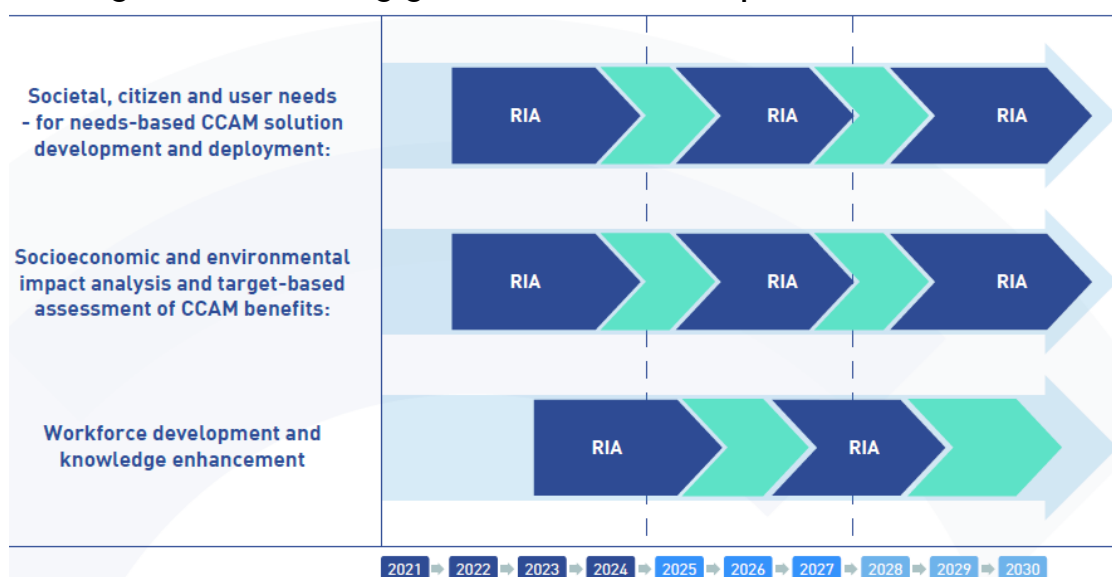
Source: CCAM SRIA 2022³⁶

³⁶ CCAM (2022) CCAM Strategic Research and Innovation Agenda, Brussels, CCAM.EU, Version 1.4, 17/03/2022

4.1.2 First steps to for citizen engagement in CCAM

Given the character and interest of this report we place attention to the CCAM cluster of activities related to the engagement of citizens in the planned deployment of CCAM. As mentioned earlier so far the broad inclusion of citizens the CCAM transition has been absent. Key reasons are the level of technical and regulatory specialization not in reach of the common citizenry. All current stakeholders engaged are knowledge intensive organisations. Engagement in the CCAM SRIA as outlined above requires time, resources and knowledge not in reach of citizens. The cluster activities of the CCAM considers that is critical to include citizens as soon as possible to enable a smooth transition to CCAM. The main traits of the citizens inclusion roadmap is outlined in the CCAM SRIA and displayed in figure 4 below.

Figure 18. Citizen engagement in CCAM roadmap 2021-2030



Source: CCAM SRIA 2022³⁷

It is widely accepted that the successful deployment of CCAM is contingent on the societal benefits it can generate and on the broad adoption and use by individual users. This implies that the CCAM development, deployment and regulation should be based on a deep understanding of the needs, impacts, benefits and costs across a diversity of stakeholders, including citizens. In particular the activities in this CCAM cluster aims to deliver the following:

- Provide input on user needs for the right setup of large-scale demonstrations, requirements on studies; what needs to be tested in FOTs to confirm user acceptance; and, in Living Labs to confirm societal expectations (to Cluster 1).

³⁷ CCAM (2022) CCAM Strategic Research and Innovation Agenda, Brussels, CCAM.EU, Version 1.4, 17/03/2022

- Deliver user needs with a focus on HMI and user-centric technologies (to Cluster 2).
- Provide the user perspective and societal needs to develop and guide overall transport system integration (to Cluster 4).
- Provides user needs and concerns to be addressed while developing and adapting key enabling technologies for CCAM (Cluster 5).
- Give feedback on societal/citizens aspects in co-creating Living Labs for evaluation methodologies (to Cluster 7).

As it can be inferred from the aims of the human dimension of the CCAM the inclusion of the citizen in the roadmap is in its early stages. The knowledge generated in the research activities of CCAM are oriented to generate a knowledge framework for the smooth inclusion of citizens in the roadmap. Actions in this cluster are oriented to the following:³⁸

- Investigate, the needs of future users, citizens, and society at large.
- Develop methods and measures to capture these demands as well as the expectations, desires and concerns towards CCAM.
- Assess the socio-economic and environmental impacts in order to understand how CCAM and associated services can be a positive contributor to societal targets in terms of safety, accessibility, equity, and environmental issues.
- Develop methods to assess socio-economic impacts and address interdependencies of effects in different time frames.
- Provide CCAM developers, deployers and public authorities with tools to implement user-centred solutions that contribute to the societal targets and the uptake of CCAM systems at regional level.
- Identify needs for renewal of labour skills regarding transport management, planning and policy making to ensure up to date knowledge for dialogue with CCAM.

The actions above are expected in the CCAM community to give foot and enable a program on citizen engagement base primarily on creating awareness and trust in the new technological system.

The base line and target goal for 2030 concerning citizen engagement relate to: 1) increased public awareness of demonstrated benefits for users and society by 2030; 2) Evolvement of public awareness and perceived benefits with the help of assessment reports of large-scale demos.

³⁸ CCAM (2022) CCAM Strategic Research and Innovation Agenda, Brussels, CCAM.EU, Version 1.4, 17/03/2022

The baseline of citizens engagement as reported by surrogate measures from Eurobarometer 496 2019 on “fully automated and connected vehicles”³⁹, and the L3 Pilot survey 2021.⁴⁰

- Eurobarometer:
 - Awareness = has seen, heard, read something about AV last year: 60%
 - Willingness to use “fully automated and connected vehicles”: 47%
- L3Pilot questionnaire results for level 3 automation:
 - Willingness to use automated vehicle: 60%
 - Willingness to buy: 28%
- Target by 2030:
 - Public awareness: 100%;
 - Willingness to use: 75%;
 - Willingness to buy: 56%.

³⁹ Special Eurobarometer 495. Mobility and Transport. Conducted by Kantar Public at the request of eDirectorate-General for Mobility and Transport. Survey co-ordinated by the Directorate-General for Communication (DG COMM ‘Media monitoring and Eurobarometer’ Unit). Brussels, July 2020. [dx.doi.org/10.2832/348298](https://doi.org/10.2832/348298)

⁴⁰ [L3 Pilot survey essentials](#)

5 Resources

The early stages of development and deployment of CCAM limits to some extent the full understanding of the type of resources needed to support the full inclusion of citizens in the early deployment and uptake of CCAM. The following suggestions are based on the acknowledgement by the CCAM community as reported in their work program whose traits were here outlined above. One of the major activities that the program undertakes is to understand the citizens needs and drivers of acceptance of the new technology. From the qualitative stage and interviews conducted with citizens, policymakers and business some insights can be put forward to support and motivate the urge to participate. These insights follows closely the behavioural model used to guide the enquire, identify and structure the drivers and enables of citizens engagement in CCAM.

5.1 Provision of information

First question is why is CCAM desirable for citizens to uptake it? This has to do with the potential benefits and costs that that automated vehicles might bring as well as the support that the regulatory framework provides for such uptake. It will necessary to provide information on the maturity of the technology to create thrust (based on dissemination of Demonstration Projects results). Thrust that citizens data gathered is used to a good end. Real time driving behaviour and performance monitoring and rule enforcement (i.e., instant fines) might create resistance for uptake.

The question, of “Who and how is using my data” must be balanced with clear increases in safety and services that support change to CCAM. Safety and security concerns in citizens must be balanced with the potential of enjoying new services while riding. The new character of the technology changes cars from a paradigm of mechanical performance to a data driven device whose possibilities are imagined paralleling the smart phone. This might transform the vehicle into a digital and mobile office and living room. This perspective of home and office services could be a major driver of adoption by citizenry. The provision of information on new regulation and new forms of vehicle operation are key for acceptance and uptake of CCAM.

5.2 Provision of enablers

Education and information on the existing and upcoming regulatory framework. Basic knowledge on the implications of new data flows for privacy but also instant liabilities that could be impinged on individuals by the implementation of

infrastructures steered by artificial intelligence applications. This include a clear demarcation of responsibilities and liabilities in case of accidents. Who's is liable the driver when requested to take control in unexpected situations or the vehicle supplier?

For citizens that are professional drivers this new technology might bring a new set of knowledge requirements that mimic those of plane pilots that work with complex cyber-physical systems. This is likely to create requirements of a re-licensing where the tests might include not only new traffic rules in roads but also notions of control, automation and maintenance on the road. Key is to answer "how my truck or taxi works?".

Concerning the enablers, knowledge might be key, but also the cost of new vehicles might be prohibitive for most citizens as it is now with average cost of ownership for new EVs. Facilitation of the adoption and use of new vehicles. This is likely to change due to the upcoming of new business models based on services. The cost of full ownership is likely to be high but this can be ameliorated with new business models that consider car-sharing, pay-by-ride, collective leasing, etc. What is clear is that CCAM will demand a higher level of digital literacy in citizens and business alike. This will require an active partnership between business, government, and universities and education instances to educate the common citizenry on the basic features of CCAM operation and use, as well as the new regulatory framework.

6 Final remarks

Currently we are facing the emergence of a new paradigm shift in mobility. This is indicated not only by the complexity of technologies involved in making an automated vehicle possible. This concerns also an ample reform of the transport sector regulatory system that affects not only the manufacturing of vehicles but also all infrastructures, physical and digital. This is indicated by the significant number of new regulations spanning from consumer and product protection to basic standards of interoperation of telecommunications and algorithmic rule enforcement. These challenges require to tackle four major challenges: (1) understanding user and societal needs, (2) advancing technologies, (3) demonstrating the maturity at a large scale and the enactment and consolidation of an appropriate regulatory system to be adopted by European member states. Given the knowledge available is difficult to indicate what are the net priorities when many of the activities listed above. Similarly it is difficult to propose or identify what are the citizens need as much of the potential, beyond the overall objectives of the CCAM, are still to be discovered.

Bologna Pilastro-Roveri district

Community Transition Pathway

Writing done by: UNIBO

Contributions from: workshops and interviews with the local community and institutions

Short information on the case study:

Case study name	Bologna Pilastro-Roveri district
Typology and geographical level of the case study	Local
Main proximity domains for the case	<p> <input checked="" type="checkbox"/> Spatial proximity (urban structure, climatic area, resource availability, energy infrastructure closeness, cluster and activities closeness) <input checked="" type="checkbox"/> Policy proximity (political agendas, administrative structure, regulatory framework) <input checked="" type="checkbox"/> Social proximity (community dimension, collaboration mechanisms, knowledge & learning, energy awareness) <input type="checkbox"/> Technical proximity (energy system, technological readiness, technological appliances, enabling structures) <input type="checkbox"/> Economic proximity (energy system economic structure, energy system enabling economics, value redistribution & inclusion mechanisms, cluster economy) </p> <p>The area of Pilastro-Roveri (400ha) is a mixed-use district, located in the north-east part of Bologna Municipality. The district is composed by two neighborhoods: Pilastro (residential) and Roveri (industrial). Pilastro was originally conceived as an autonomous 'village' with proximity services and crafts activities. Unfortunately, these have not been built creating a mono-functional residential neighbourhood, which became a source for stigmatisation due to social and economic issues. Indeed, despite</p>

	<p>the neighbourhood has been deeply changing, there are low-socioeconomic status households. The Roveri area, adjacent to Pilastro, hosts a variety of industrial companies in multiple sectors (e.g. packaging, mechanics and electric vehicles). The Pilastro Roveri district has been selected as a pilot project to investigate the feasibility of a REC for some core reasons:</p> <ul style="list-style-type: none"> • Geographical features: it is a large but physically well-defined area • Variety of functions: residential, service, and productive use • Infrastructural facilities: it hosts the largest roof-mounted solar photovoltaic plant in the EU and has a district heating plant (waste-to-energy plant). • Social configuration: presence of associations, active citizens, organisations and civic committees.
Starting Engagement Level in the case	<input checked="" type="checkbox"/> Unaware <input type="checkbox"/> Aware (<input type="checkbox"/> interested or <input type="checkbox"/> indifferent) <input type="checkbox"/> Involved (<input type="checkbox"/> adopting, <input type="checkbox"/> unwilling, <input type="checkbox"/> member) <input type="checkbox"/> Active (<input type="checkbox"/> sponsor, <input type="checkbox"/> frontrunner, <input type="checkbox"/> denial) <input type="checkbox"/> Advocate (<input type="checkbox"/> championing, <input type="checkbox"/> leadership, <input type="checkbox"/> activism, <input type="checkbox"/> NIMBYism)
What is the targeted Engagement Level in the case?	Aware
By when?	2030
What is the targeted Engagement Level in the case for the end of GRETA project?	Active

Community Transition Pathway summary

The Executive Summary

In conformity with the directive RED II, the Italian Government has introduced the possibility to establish Renewable Energy Community (REC) to accelerate the decarbonisation of society and economy. The Pilastro Roveri district, located in the north-eastern part of Bologna, has been selected by the GECCO, a climate kic funded initiative, as a pilot project to investigate the feasibility of a REC. The area has been chosen for some core reasons:

- Geographical features: it is a large but physically well-defined area;
- Variety of functions: residential, service, and productive use;
- Infrastructural facilities: it hosts the largest roof-mounted solar photovoltaic plant in the EU and has a district heating plant (waste-to-energy plant);
- Social configuration: presence of associations, active citizens, organisations and civic committees.
-

It is an area that has several potentialities that should be taken into account:

- a pilot area to see some of the resilience strategies envisaged by the PUG (General Urban Plan), the PUMS (Sustainable Urban Mobility Plan) and the SECAP (Sustainable Energy and Climate Action Plan) concretised and adapted to local specificities;
- a workshop to access the conditions that will also be generated by the new Regional Energy Plan, consistent with the Green Deal and national targets;
- a place of learning to lay the foundations for achieving the objectives described in the Pact for Jobs and the Climate. In particular, the axis on ecological transition, which sets the goal of achieving carbon neutrality before 2050, in line with the European strategy, and the transition to 100% renewable energy by 2035, and which the Region intends to pursue also by formalising the role of energy communities;
- in the long term, it is also a key experiment for the PNRR, which speaks extensively of ecological transition and energy communities;
- it is also a strategic area for the 100 Climate Neutral cities Mission in which Bologna has recently been included, which envisage the goal of climate neutrality by 2030.

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1 The brainstorming Canvas/ Workshop process

The area has been involved in a series of participatory activities aimed at defining the Community Transition Pathways, collaborative pathways to understand how communities can transition from different states of initial engagement to more active levels towards energy issues.

In the case study, GRETA set out to identify and describe community attitudes towards energy issues through a series of incremental activities, such as neighbourhood treks, participation in monthly roundtables with local associations, participation in neighbourhood events, mini-interviews with local community members, semi-structured interviews with representatives of local institutions and co-design workshops dedicated to energy issues and the co-design of Energy Citizenship Contracts.

One of the first dissemination activities used to start engaging the community of the Roveri-Pilastro district was the “Energy days” event organized on the 10th and 11th of December 2021, focusing on two levels of engagement:

9. The first day was organized in Roveri area, inviting technicians and experts as well as industries interested in developing energy community;
10. The second day, organized in Pilastro area, was mainly addressed to citizens organizing laboratories and activities, in order to explain in a friendly way the energy transition process starting from the energy bills reading and understanding and sharing ways to make everyday life habits more sustainable and efficient.

During this two-days event, a very first draft of pathway was developed with citizens, technicians, associations and industries, cooperating in tables of discussion. The synthesis of the activities was graphically reported in a path towards the climate neutrality of the case study by 2050, as you can see in the picture below.



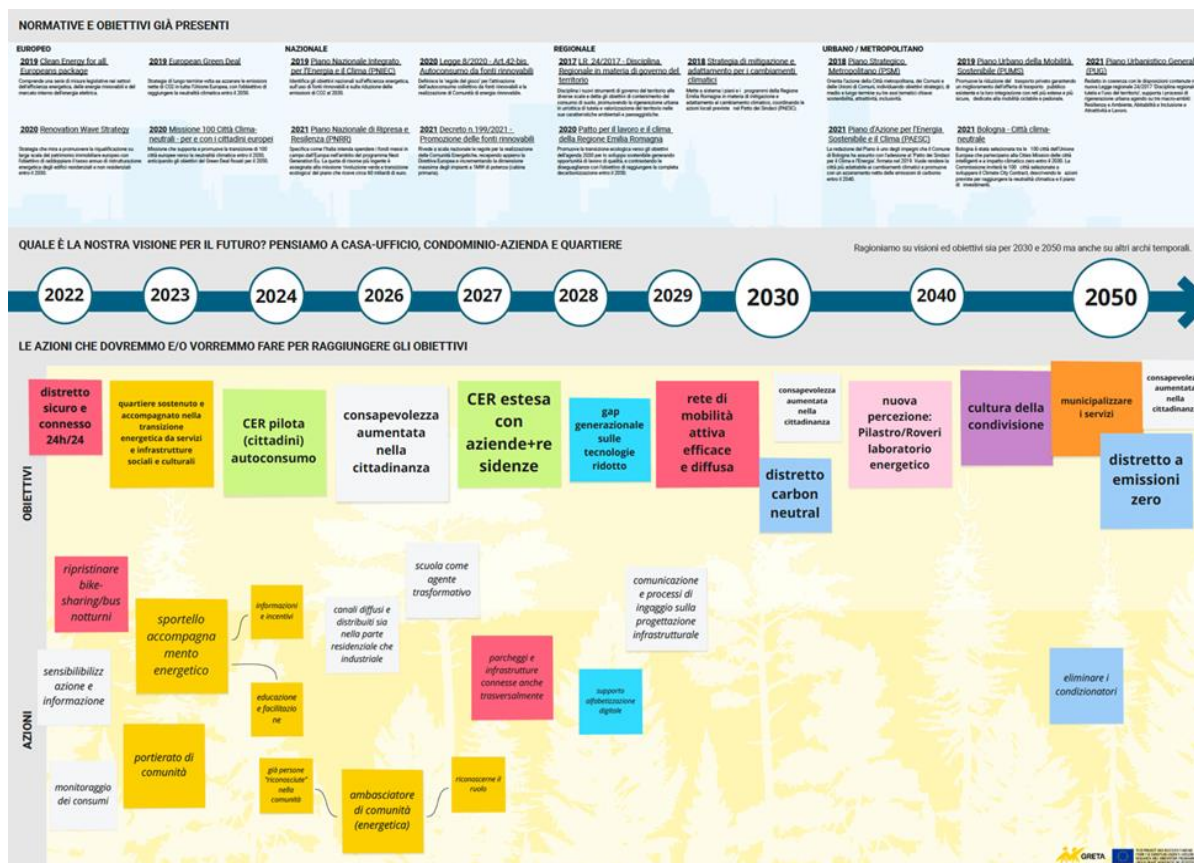
In order to develop the Community Transition Pathways (CTPs) for and with the Roveri-Pilastro district community, we integrated the development of the pathways into the Community Level Indicator (CLI) workshops that were also conducted within the GRETA project. This allowed us to develop (1) community visions and objectives (2) steps to reach these goals, and (3) a timeframe during which to reach these objectives with participants of our community, (4) indicators to verify the progress of the community.

The workshops “Our energy actions for the climate” took place in May 2022 within the organization of “GRETA lab workshop. Let’s talk about energy”. This event represented a path to approach and collaborate on the topic of energy citizenship with the case study community that was divided into five appointments.

The first day was held in the Roveri area with an introduction to the GRETA project, followed by the presentation of the methodology for the development of the Energy Citizenship Manifesto: a tool that will facilitate and accompany the exercise of energy citizenship and that GRETA will build together with the Pilastro and the Roveri district.

Afterwards, the first collaborative workshop on **needs assessment** took place, a co-creation activity between the participants divided into 3 tables: 1) Home/office; 2) Building/company; 3) Region/district.

As support of the discussions, the following scheme was used, where the main normative was reported associated to the questions: “which is our vision for future at levels of home/office, building/company, region/district?”, and then “in a timeline from 2022 to 2050, which are the main actions to realize in order to reach the energy targets?”. The results were collected in the scheme reported as sample below and summarized as following.



- **Home/office:** The table was attended by a resident, students, two researchers and a legal consultant. The table dealt with some of the most relevant issues in relation to home/office management in order to identify what were some of the needs most felt by the participants in relation to living in their own homes or going to work. Although the scale was that of home/office, the discussions often tended to address the various issues from a broader condominium/neighbourhood/city of Bologna perspective. In mapping the needs, we proceeded along thematic lines: energy (energy efficiency: consumption for heating/cooling and lighting), waste, water. In general, opinions on the centrality of individual actions in favouring the energy transition emphasised the importance of coordinating the activities of individual citizens with policies that facilitate such activities and create a sense of community. Both 'concrete' and practical needs emerged, as well as socio-cultural needs to be reached also through better political choices/decisions and a more inclusive type of communication that reaches different targets in terms of language, age, gender, as well as through an economic system that pays attention to the community and to the most economically and socially vulnerable segments of the population. The need to reduce the intergenerational gap on energy and environmental culture also emerges, emphasising the need for greater collaboration and cooperation between different ages and skills.

- **Building/company:** The table was attended by a resident, students from the Advanced Design course, researchers and university professors. The apartment building represents an intermediate scale between the house and the neighbourhood, and the issues and needs that emerged from the discussion often overlapped with other levels, especially that of the neighbourhood or neighbourhood unit. The discussion focused on various topics of the climate transition: from more strictly energy issues to those of the circular economy to possible new services and/or support tools for the ward. Given the participation of a citizen from the Pilastro district, the discussion mainly focused on that area, while the Roveri district was not investigated.
- **Region/district:** The table was attended by a resident of the Pilastro district, students from the Advanced Design course, workers from the San Donato and San Vitale districts, university researchers and professors, and legal consultants. The discussion at the table tackled several issues, starting with the economic one, which appears to be the most urgent and most related to the problem of energy poverty. In practice, in fact, citizens (lower/middle stratum of the population) and small businesses consider the payment of bills to be a maximum urgency for family/business organisation, which can sometimes become a difficulty. Therefore, a reduction in expenses is a solution to the problem of energy poverty. Also discussed was the issue of diversity, thought of not as a difficulty, but understood as a resource: differentiation and compensation are useful to have different profiles. The need to clarify what the direct and indirect benefits of energy investments and sustainable choices are, highlighting externalities and possibly quantifying them, including from the point of view of economic return, in order to be able to think of an energy transition in all respects, was emphasised. Afterwards, the table focused on the issue of the community. On this point, the difficulty of involving local residents emerged, especially due to the strong socio-economic emergency, as those in poverty or social fragility do not consider the energy issue a priority. With respect to the community issue, one wonders who the spokesperson for the needs of residents to the institutions should be that deals with energy needs. Often the spokesperson is the condominium administrator, who is involved and reports the determined needs of the condominium residents. Almost the entire population of the district lives in macro-condominiums and condominium administrators are important interlocutors: they do not have absolute power, but a lot of influence. The table agrees on the need to have more variety in the representation of needs. In line with that, the participants underlined that a broader discussion on active citizens should take place to reflect on their role. Another need that emerged from the discussion is the possibility of adapting the actions envisaged by the city's spatial planning (in particular PUMS) to the district level so that they can respond to the actual needs of the district's users and are therefore more effective and impactful.

Social innovation Lab (Engagement with policy makers)

Social Innovation Lab is an international event organized by Eurocities that took place in Bologna from on 19-21 October 2022 to engage city representatives in sharing, learning and co-creating innovative solutions to support an inclusive and just energy transition, using new opportunities for energy efficiency measures targeting the most vulnerable, developing renewable energy communities and retraining workers. We aim to build the capacity of cities to develop and apply

social innovations to mitigate the social impacts of energy crisis and support a just transition. During the event city representatives went for a site-visit to the Pilastro Roveri district to get to know GECCO and GRETA projects. They discovered that the area is rich in bottom-up stances and local cultural initiatives. Moreover, they had the opportunity to learn about the role of specific spaces that elicit participation and sociability within the green transition framework, the interconnectedness of local practices, communities, institutions and places in supporting the transition as well as the role of the GRETA project within it). City representative also attended a workshop on the role of Energy communities to reduce energy poverty. With the support of Unibo team they identified four main issues: **Success Factors, Obstacles, Key Learnings and Transferability** of the Bologna experience with energy transition and energy citizenship.

2 The starting point: acknowledging the current policies and the background of the case

The starting point of Roveri-Pilastro case study is characterized by an energy citizenship engagement process that starts from an almost **unaware level**. The GRETA initiatives organized during the previous months have contributed to increase the level of knowledge about energy topic, working also in collaboration of the Green Energy Community project (GECO) running since 2019 to support communities in the process of designing and creating a renewable energy community. Indeed, it has been very important to follow the evolution of the European and national policies concerning the energy community development, that are particularly influencing the energy system of the case study.

The main European normative is the Renewable Energy Directive (2018/2001/EU) entered into force in December 2018 that establishes a new binding **renewable energy target for the EU for 2030** of at least 32%. The ambitions of this directive have been reviewed over time in order to deliver the urgent emission cuts of at least 55% by 2030 required by the “Fit for 55” package, published in July 2021. In that directive, the Commission proposed a revision of the normative (COM/2021/557 final) with an increased 40% renewable energy target as part of the package to deliver on the European Green Deal. In May 2022, the Commission proposed in its Communication on the REPowerEU plan (COM/2022/230 final) to further increase this target to 45% by 2030.

The Bologna Municipality joined the “100 Climate Neutral Cities Mission by 2030” and in April 2022 it has been selected to become a climate neutral city within 2030. This new target has a strong impact on the energy transition pathway of the city’s district and the process to engage citizens. The main projects that Bologna has the aims to realize are the following:

- Mobility and transport: decarbonisation of Local Public Transport (tram network, trolleybuses, SFM), completion of Biciplan and incentives for active mobility, creation of the Green Area;
- Energy efficiency: energy redevelopment of public residential buildings, development of positive energy districts, energy redevelopment of university buildings and positive energy districts;
- Public lighting: completion of the transformation of LED lighting, supply of zero-emission energy for public lighting, smart city - adaptive lighting;
- Waste: construction of the Power to Gas plant at the Hera treatment plant in Bologna, interconnection of two energy systems that will power the Fair and the University, installation of an electrolyser for the production of green hydrogen;
- Production of renewable energy: replacement of supplies of fossil origin with supplies from renewable sources, promotion of energy communities, energy communities in public housing (ERP);
- Cross-cutting “flag” projects: Green footprint, Digital twin, City of knowledge.

This ambition is in line with the intention to bring to "active" the Engagement Level of citizens at the end of GRETA project.

2.1 Background information on the case

The area of Pilastro-Roveri (400ha) is a mixed-use district, located in the north-east part of Bologna Municipality. It was built from the '60s as a response to the growing need of social housing, for locating immigrants. The district is composed by two neighborhoods: Pilastro (residential) and Roveri (industrial). Pilastro was originally conceived as an autonomous 'village' with proximity services and crafts activities. Unfortunately, these have not been built creating a mono-functional residential neighbourhood, which became a source for stigmatisation due to social and economic issues. Indeed despite the neighbourhood has been deeply changing, there are low-socioeconomic status households. The Roveri area, adjacent to Pilastro, hosts a variety of industrial companies in multiple sectors (e.g. packaging, mechanics and electric vehicles).

The case study Pilastro-Roveri is relevant for GRETA because due to its socio-economically features, the case will provide grounds for testing strategies for combating injustice and exclusion, e.g. by means of better understanding, utilizing and sharing of energy data. In addition, through establishment of engagement mechanisms via GECO community, collaboration/cooperation mechanisms among companies, partnerships and agreements among owners and tenants, and further governance mechanism.

The Green Energy Community project (GECO) started some engagement activities and meetings, but the participation has not been extensive. Due to high presence of elderly and foreign population (Pilastro), there is difficult interaction concerning technical topics, reduced access to social media and digitization. In addition, competitiveness and privatism tendencies prevent the participation of specific categories (e.g. entrepreneurs, companies' staff), and lack institutional trust (due to feeling of being left out from welfare and care policies) and in property owners generates conflicts in the management of buildings and their maintenance, due to diversified properties (Public owned, cooperatives, PPP). Due to its socio-economic nature.

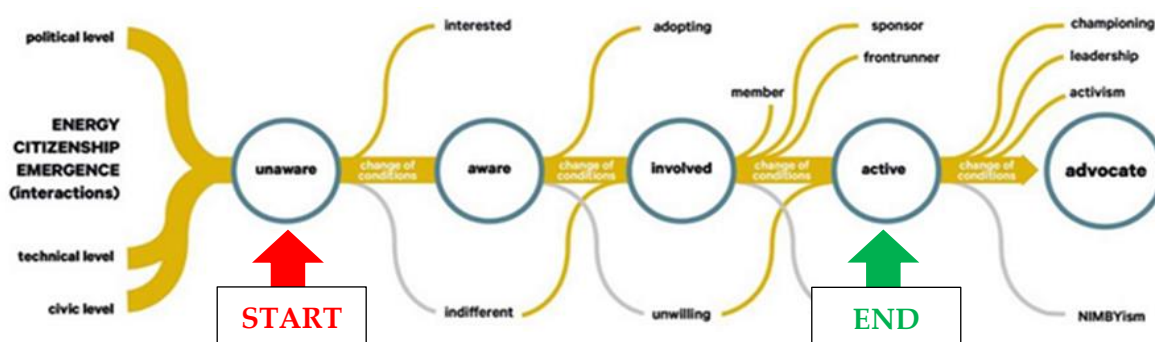
Pilastro community is experiencing a certain fatigue since its spaces of living are often subject to large top-down project that, when they terminate, leave the area with no benefits or added value; the community is very aware both of their stigmatisation and of their potentiality, but they fear to be exploited only for external purposes; on a positive note, the population is interested in the energy topic and in some case expresses the will to learn more, to share their knowledge and to get more attention from institutions such as the University, requiring a more stable presence in the area.

Roveri community is composed by transient inhabitants, city users who live in the area only for a limited hours per day. They tend to not recognise themselves as belonging to a

community, but are very much engaged in energy topics and committed to improve their behaviours.

2.2 Energy citizenship engagement levels

Energy citizenship engagement levels: **UNIBO expects to elevate the community from an unaware to an active engagement level, where aware, involved citizens take decisive action towards energy.**



The area of Pilastro-Roveri is envisioned to become a paradigmatic experience of sustainable society, with zero-net emissions and climate resilience. The goal is to reach a Collaborative Energy Community, where emissions come from renewable resources, waste is nearly zero and recycled, suppliers meet sustainability criteria in production and people are trained to fight climate risks.

In order to reach this long-term vision, GRETA considers the transition of Pilastro-Roveri towards this goal, by nudging the local community to transit from unaware to active positions. For this purpose, the following part explains how the future of this area could be.

Pilastro residents are aware of the amount and quality of energy they use. Roveri staff workers are informed about the possible incentives for the renewal of their energy consumption systems.

The communication networking between the inhabitants of Pilastro and the productive and commercial activities of both Pilastro and Roveri is improved and made a stable monthly appointment.

The most suitable communication channel for the inhabitants of the neighborhood considering their age and ability to use technology is found and they can share their legacy and experience through leading by example. The sharing is facilitated by the enhancement of the architectonic features as points of interest through a method of permanent involvement to strengthen credibility and extend the valorisation of the area towards other city locations.

The area is a laboratory and a virtuous point of reference of example of best practices on energy efficiency citizenship for the metropolitan city of Bologna.

2.3 Case study-related policies and goals

In this paragraph, the main policies and directives that can influence the energy transition and citizens' engagement process in the case study of Bologna are reported. The policies are divided into the main levels of influences: European and national and Regional and local.

European and national level policies

- REDII - Renewable Energy Directive (2018/2001/EU) entered into force in December 2018 that establishes a new binding renewable energy target for the EU for 2030 of at least 32%. The ambitions of this directive have been reviewed over time in order to deliver the urgent emission cuts of at least 55% by 2030 required by the "Fit for 55" package, published in July 2021.
- "Fit for 55" package, published in July 2021: the EU has set itself a binding target of achieving climate neutrality by 2050. This requires current greenhouse gas emission levels to drop substantially in the next decades. As an intermediate step towards climate neutrality, the EU has raised its 2030 climate ambition, committing to cutting emissions by at least 55% by 2030.
- In May 2022, the Commission proposed in its Communication on the REPowerEU plan (COM/2022/230 final) to further increase the renewable energy target for the EU to 45% by 2030.
- Legislative decree n.8/2020 - Art. 42-bis Autoconsumo da fonti rinnovabili (update of "Decreto Milleproroghe"), which defines the conditions for the activation of collective self-consumption from renewable sources and the creation of a renewable energy community, starting the experimentation of a framework of rules aimed at allowing final consumers and / or energy producers to join for "Sharing" the electricity produced locally by new plants powered by small-sized renewable sources.
- Regulatory Authority for Energy, Networks and Environment (ARERA) Resolution n.318/2020 defined that the participants in the Collective Self-consumption schemes and the CERs will be granted the return of some components relating to network charges and network losses avoided in a cost reflective logic of network use.
- Legislative decree n.199/2021 implementing the RED II Directive.
- The Ministerial Decree MISE of 16 September 2020 established the value of the incentive on shared energy for Renewable Energy Communities.
- The GSE, on 22 December 2020, published the Technical Rules and the portal for requests for access to incentives.

Regional and local level policies, directives and plans

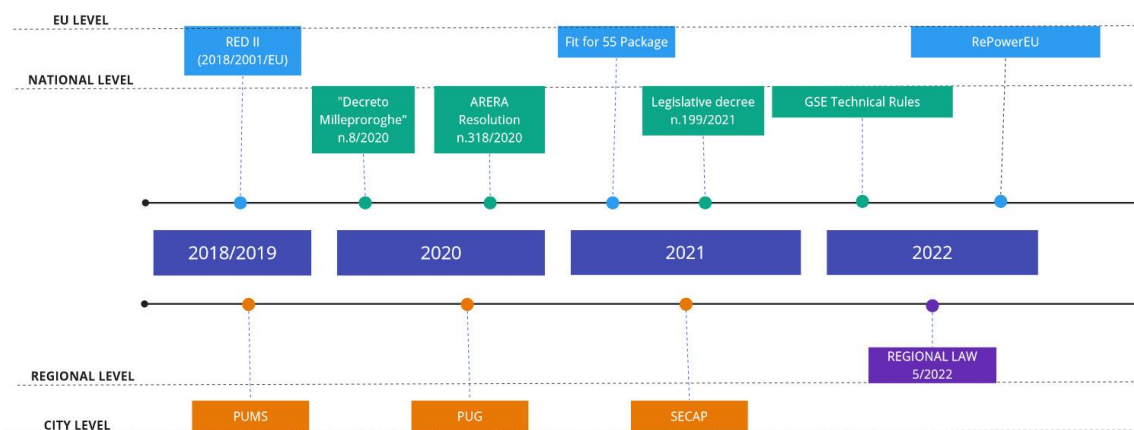
- Regional Energetic Plan (2017): The plan adopts the European objectives for 2020, 2030 and 2050 on climate and energy as a driver for the development of the regional

economy, and in particular: the reduction of climate-changing emissions; the increase in the share of consumption coverage through the use of renewable sources; the increase in energy efficiency in buildings, public buildings, transport and production activities. In particular, it incentivises: Reducing climate-altering emissions by 20% in 2020 and 40% in 2030 compared to 1990 levels; Increasing the share of consumption coverage through the use of renewable sources to 20% in 2020 and 27% in 2030; Increasing energy efficiency to 20% in 2020 and 27% in 2030.

- Patto per il lavoro e il clima della Regione Emilia Romagna (2020): The Pact for Work and Climate is part of an Italian and European Union strategy whose objective is to achieve climate neutrality by 2050 and transition towards a new, more environmentally and socially sustainable economy. The pact identifies strategic objectives: to generate quality jobs, to fight inequalities, to promote the ecological transition towards the goals of the 2030 agenda for sustainable development. The pact includes main targets: to achieve decarbonisation by 2050; to move to 100 per cent renewable energy by 2035; to devote 3 per cent of regional GDP to research; to decrease the number of Neet (young people not studying and working) below 10 per cent.
- PUMS (2019) of Bologna Metropolitan scale: first Italian experience of Urban Mobility Plan drawn up on a metropolitan scale. The objective of the plan is to achieve an important reduction in private transport in favor of non-polluting modes (bike or foot) ensuring an improvement in the existing public transport offer and their integration with more extensive and safer networks, dedicated to cycling and pedestrian mobility
- PUG (2021) of Bologna Municipality: It identifies three macro-areas on which to act: Resilience and Environment; Habitability and Inclusion; Attractiveness and Work. These three macro-strategies highlight how environmental aspects are confirmed as a strategic priority on which to work with commitment and constancy in the coming years.
- SECAP (2021) of Bologna Municipality: It is part of the city's commitments on climate change and energy efficiency issues. It brings with it the participatory process undertaken starting from 2012 as part of the Life+ project 'BLUE AP - Bologna Local Urban Environment Adaptation Plan for a resilient city. The process aimed at the construction of an innovative climate policy increasing citizens' awareness on the risks associated to climate change and gas emissions and it was based on a participatory path in which the involved subjects were also the implementers of the actions proposed in the Adaptation Plan.
- REGIONAL LAW 27 May 2022, No. 5: Promotion and Support of Renewable Energy Communities and Self-consumption acting collectively. The law identifies system actions and measures to support and promote collective self-consumption and energy communities, providing for the provision of contributions and financial instruments to accompany communities from the establishment and design to the purchase and installation of production and storage facilities. The law also finances: communication, information and citizen participation initiatives on the themes of renewable energy, self-consumption and energy sharing, also in collaboration with energy agencies; training for the professionals involved; support for the creation of information desks and the strengthening of territorial energy desks. With this law, the Region intends to support all types of energy communities consistent with the standard but, in order to

combat energy poverty and foster social inclusion, it plans to grant higher contributions for the establishment of renewable energy communities composed of persons with economic fragility, or third sector entities, entities owning public or social housing management, or located in mountain and inland areas of the region or, alternatively, that implement inclusion and solidarity projects in cooperation with third sector entities or local authorities.

The following scheme synthetizes the main policies and directives that can be related to the case study.



Within the "100 Climate and neutral cities by 2030" EU mission, Bologna Municipality has been selected among the 100 European cities with the target to reach the climate neutrality by 2030. Bologna has to develop its Climate City Contract, describing the planned actions to achieve climate neutrality and the investment plan. This process also influences the participation of citizens, businesses and the world of research. The European Commission describes the Climate City Contract as a process and document with three components: strategic commitments, actions, and investments; to accompany and guide the 100 selected cities toward climate neutrality. Once the Climate City Contract is signed, the city of Bologna will receive a Mission Label from the European Commission that aims to:

- Give recognition to the quality and feasibility of the city's commitments by facilitating the creation of targeted funding opportunities in the various EU funding programs (including structural funds).
- Participate in EU funding where explicit reference will be made to the label in the allocation procedures to enable dedicated access.
- Facilitate the process of accessing support from different funding sources, including private investors.
- Provide an opportunity for regions and member states (and other public actors) to support "labeled" cities without further quality assessment, thus reducing administrative burdens.

The Municipality is currently working on the pathway towards its own Climate City Contract. The Bologna Climate City Contract therefore has four major goals:

- Federate key players and define the commitments, functions and investments they can bring.
- Co-design the actions to be implemented to achieve the goal.
- Co-implement the co-designed actions.
- Measure outcomes with shared metrics.

To achieve climate neutrality goals Bologna will progressively activate within the Climate City Contract framework several tools:

- Citizen Assembly: formed by randomly drawn citizens, the Assembly will help define how to overcome some of the barriers Bologna faces on the path to climate neutrality.
- Open platform for listening to and collaborating with citizens, including within existing participatory pathways.
- Investment Plan, intended as a real business plan to achieve neutrality.
- Impact Report: a tool for monitoring emissions and other social and economic impacts generated.

3 Vision and Objectives in the short-, medium- and long-term perspective

The future vision of the district is strongly influenced by the commitment of the Bologna Municipality to become a climate neutral city by 2030. So, the identified objectives mostly have a short/medium term timeline by 2025 and 2030.

During the workshops “Our energy actions for the climate” took place in May 2022, the construction of short-, medium- and long-term objectives for energy citizenship were defined, starting with the analysis of citizens’ needs and the identification of objectives to be achieved. It was a co-creation activity between the participants, focusing on different proximity scales of engagement: home/office, building/firm/, neighbourhood/district. The objectives that emerged from this discussion is summarized below in each of the working tables in a common timeline.

PROXIMITY SCALES	OBJECTIVES’ TIMELINE		
	Short term By 2025	Medium term By 2030	Long-term By 2050
Home/Office	<ul style="list-style-type: none"> • Involvement of school teachers; • Awareness-raising among condominium administrators and improved communication; • Monitoring consumption; • Use of sports centres and schools as key places to initiate outreach, to communicate messages in relation to the target audience, and to control language and speech; • Energy efficiency of buildings (in relation to incentives). 	<ul style="list-style-type: none"> • Construction of a tram line connecting the outer parts of the city; • Possible investment by UNIBO in student halls of residence; • Leverage on economic aspect to hire people. 	<ul style="list-style-type: none"> • Creation of a culture of sharing; • Municipalisation of water services; • Elimination of gas as an energy source; • Reduction and reuse of plastic; • Creation of different ways of living (e.g. Co-housing); • Equalisation of social and environmental aspects; • Elimination of air conditioners since the building are good insulated and self-efficient.
Building/company	<ul style="list-style-type: none"> • Activation of citizen support services (community concierge, energy help desk). 	<ul style="list-style-type: none"> • Creation of a pilot citizens-only energy community (self-consumption group); 	-

		<ul style="list-style-type: none"> • Presence of a connected and efficient soft mobility network. • Creation of a real energy community including companies; • Drastic CO2 reduction with investments on the ground. 	
District/community	<ul style="list-style-type: none"> • Reactivation of the 20N night line • Reactivation of the Movi (formerly mobike) hubs; • Reaching out to more people in the short term, both in terms of involvement and contextualisation of area plans; • Outfitting areas (gymnasium type, etc.) with equipment; • Promotion of dedicated events and initiatives; • Enhancement of what is already there, communicating it better and making it better known, especially internally, creating a sense of affection for one's neighbourhood; • Raising the population's awareness and understanding of how this area can be enhanced; • Greater support for the elderly; 	<ul style="list-style-type: none"> • Reducing parking and increasing cycling infrastructure; • Better integration between means: intermodality; • Interchange car park; • More infrastructure and investment; • Change in Acer housing policies; • Better integration between the population; • Reducing the concentration of Acer houses at Pilastro (or Barca). 	<ul style="list-style-type: none"> • Activation of a shuttle bus connecting Roveri and Pilastro to the centre; • Reducing the need for travel (more services within the area), not the possibility of it (more internal and external links); • Transformation of the district into a laboratory for logistics; • Reduction of the gap between Roveri and Pilastro due to the stopover (physical caesura); • Improvement of the population's economic and cultural level.

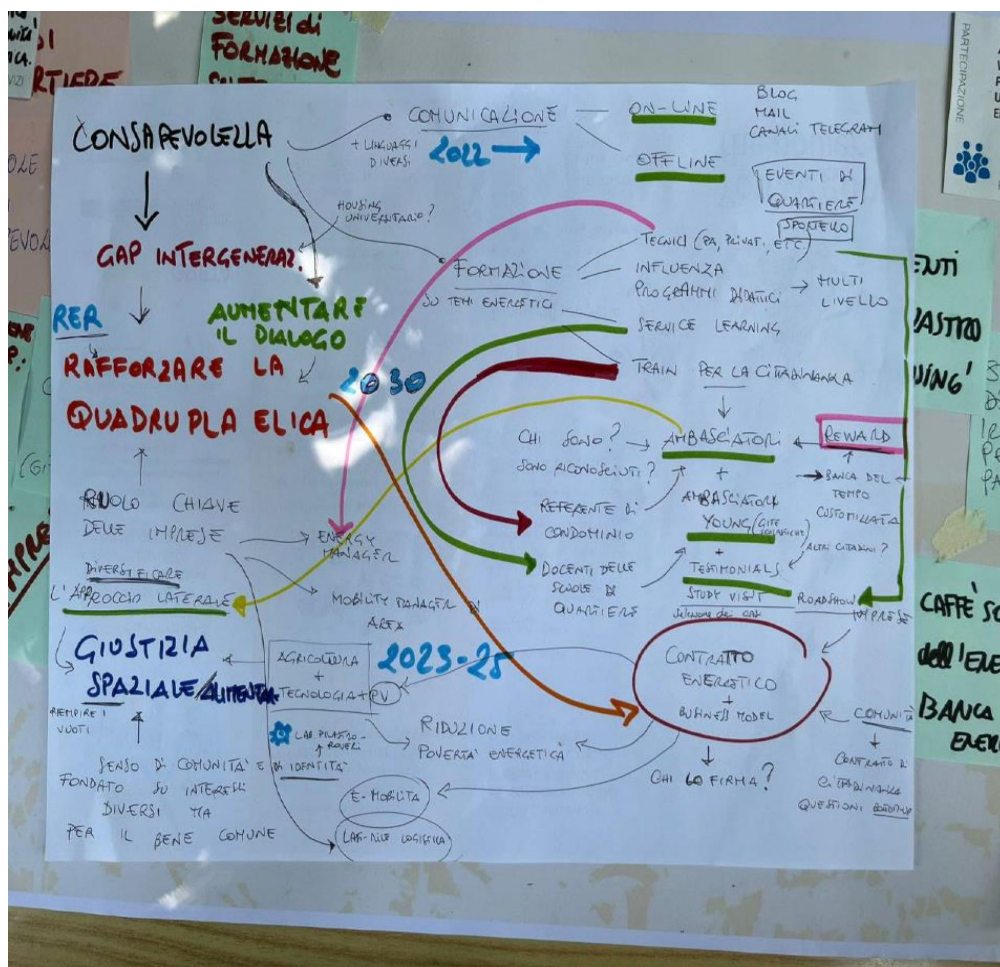
	<ul style="list-style-type: none"> • Greater resources to reduce digital illiteracy • Accessibility of the Internet to everyone in more common spaces; • Increased information for more people living in the Pilastro, with posters and information boards. 		
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Basing on the identified objectives, the participants underlined that the vision of the analysed area on future energy systems and scenario cannot be separated from a broader consideration of what it means to live well and in a more sustainable way in a suburban neighbourhood. The main keywords that characterized the future vision can be reassumed as:

- Strong community commitment in the energy transition process;
- Climate neutral city by 2030;
- Towards a less consumerist life-style.

4 The Actions and the Priorities

The workshop then continued with a division into working tables in which we worked first on the inspirations for possible innovative actions to respond to the highlighted needs and objectives, and then on the measurement of these actions with community indicators.



The results of actions that emerged are outlined below structured into seven themes: 1) awareness rising, 2) intergenerational gap overcome, 3) quadruple helix strengthening, 4) reducing energy poverty, 5) energy community/social community creation, 6) politicising individual actions, 7) active mobility improvement.

1-Awareness rising:

- Energy coaching desk. Involve teachers from the Pilastro schools who can be informed about energy issues and who can work in close cooperation. Create an itinerant point of reference in the neighbourhood, so that it can reach even those people who are not able to use digital means (with, for example, an automatic chat always active for questions, and a physical presence with set times). Informal information, as if it were a chat at the bar, so

that the communication is flexible to the citizen. Some places in which to experiment with the energy desk could be, for example, neighbourhood houses or the vacant spaces of Acer buildings. This information point could be itinerant, not fixed in one place in the neighbourhood, and can become something public, financed by private individuals interested in energy communities.

- Communication path, starting in 2022 until widespread awareness is reached, addressing environmental issues through several languages. Communication can make use of two main channels: the On-line channel (Blog, Mail and social channels such as Telegram) and the Off-line channel (Neighbourhood Events, Counter, Physical landmarks such as: Yellow House, Red House and Neighbourhood House). This would respond to the need to create information meetings in areas close to residents (e.g. condominium areas) so as not to ask citizens to go to a dedicated place, but to go to citizens. Mini tutorials could be proposed as part of the course, explaining with videos how to waste less energy, tips, etc.
- Training of Energy Ambassadors, figures capable of bridging the trust "gap" by giving clear and complete information but also bringing testimonies of other experiences. Use multi-level educational programmes (starting from school age, to create aware future citizens who can in turn raise awareness in their families, up to university to create the competent figures who can activate the counters). Training and identifying 'ambassadors', facilitators who act as spokespersons for each micro-community, so that people feel represented (as happens in city assemblies). Provide people who are like cultural mediators for the language issue (in this case it would be work, paid). Inform the elderly by going door to door and emphasise the economic benefit. An inhabitant of a block of flats can be trained and can become a contact person for the block of flats. An expert figure of the energy community would be created who would dialogue with and in the energy desk. The idea is to have several types: 'Young Ambassadors' (the Citizens of the Future, sensitised by teachers and targeted school trips); 'Teachers' (figures who live in the neighbourhood and are already active in sensitisation); 'Testimonials' (the 'Most Active Citizens' or 'Most Virtuous Citizens', recognised within the context and by the community).
- Energy Time Bank, offering services in exchange for services.
- Training for citizenship, To Receive (Carrying out trips to related virtuous contexts to "touch with one's own hands", but at the same time not submitting examples that are too distant to prevent a sense of mistrust and frustration from setting in) and to carry out in person (bringing Pilastro's example of a virtuous and change-conscious neighbourhood to other contexts that are not yet active).
- Rewards for virtuous neighbourhoods.

2-Intergenerational gap overcome:

- Set up physical and digital places for digital literacy, so that everyone, even those who are not digitally literate, can access essential e-services (e.g. SPID).
- Shared workshops to unite parents and children.

3-Quadruple helix strengthening:

- Energy Manager and Mobility Manager as 'bridge' between community and employees.
- Energy Contract and Business Model for companies.
- Citizenship Contract for residents.
- Awareness-raising course for companies on Last-Mile transport and logistics of their goods.
- Involve businesses through trade associations.
- Communicate the mapping of spaces available for photovoltaic installations (previously done by GECCO).
- Creation of a spin-off of the University of Bologna at the Pilastro: a coworking, with offices, spaces in which to work, study, etc. (at the end of the GRETA project). A possible location could be one of Acer's empty spaces.

4-Reducing energy poverty:

- Exchange of services with other services (e.g. Time Bank).
- Energy exchange in the community, create a sharing of energy pooled (Energy Bank open to all) such as Energy "sendable" such as quick transactions from Condominium to Condominium or from Family to Family (idea: a sort of Paypal/Satispay of energy).
- Actions to promote energy sobriety.

5-Energy community/social community creation:

- Promoting urban agriculture as a tool for social cohesion must be combined with the implementation of new technologies. A kind of ToGoodToGo of vegetable gardens: inform gardeners (700 gardens) to create awareness; weekly market with stalls of urban gardens that have abundance. Introduce training on circular cooking to reduce or avoid waste. Bring citizens, market gardeners and restaurants together to share recipes. Share recipes and food between apartment blocks. Multi-ethnic condominium dinner.
- Biannual meeting between GRETA representatives and condominium managers.
- Building a community of people also through the establishment of transversal social spaces where meetings and exchanges can take place.

6-Politicising individual actions:

- Politicising individual actions with a broader political planning both to amplify the impact of the actions themselves and to build a collective and shared vision. E.g.: Institutional recognition of a self-organised group of citizens for cleaning the Pilastro parks as a practice for realising the vision of the district as a common good.

7-Active mobility improvement:

- Temporary pop-up actions for Pilastro-Roveri to become an energy laboratory. Reactivate the 20N night line and measure how useful it is to the neighbourhood in terms of numbers, how much it is used and how much it would facilitate night-time transport. Use low-consumption LED lights to illuminate public spaces: a low-cost, pop-up solution. Try to expand carsharing and understand through monitoring whether it can have a future.

Reintroduce Mobike hubs and understand through monitoring whether it can be successful to maintain them in the future. Provide citizens with a kit (Pin Bike) to make their bikes smart, which also benefits administrations through flow and traffic monitoring.

5 Resources

The following is a brief exploration of the main resources needed to achieve the visions and goals identified above. The section is divided into five subsections: (a) knowledge; (b) human resources, (c) financial resources, (d) infrastructure/material resources, (e) relational/network resources.

a. Knowledge: scientific and lay expertise

It is important to acknowledge that this includes expert or **scientific knowledge** but also so called **local or community knowledge** about practices and themes. The division between these two types of knowledges is fluid.

It is essential to find a more effective and inclusive way of communicating both the terms of the problems and the possible solutions that citizens can adopt. For this, in addition to scientific knowledge, another type of knowledge is needed to facilitate these processes.

Regarding lay expertise: Recover the 'ancient' knowledge of sobriety in consumption and the restoration and repair of objects.

It is also important to spread education of environmental issues and information about mapped data on areas available for the installation of photovoltaic or thermal panels.

b. Human Resources

It emerges that these aspects must be supported by real activities of constant accompaniment of the community in the actions, not only at the start of the initiatives but over time. As has already been mentioned, the problem of the absence of a point of reference for citizens in relation to environmental and energy measures to be taken for the energy transition is quite pressing. Consequently, it will be necessary to identify and set up as soon as possible an **energy desk** in which figures with different but complementary professional profiles can help citizens and support building managers. At the same time, the university should also play an active role in the decarbonisation process, not only as a producer of knowledge but also as a spokesperson for demands.

An action that has been discussed is the training of Energy Ambassadors, meant as local actors capable of bridging the trust "gap" by providing clear and comprehensive information but also bringing testimonies of other experiences.

c. Financial resources

With respect to the topic of enabling modes and how to support an increase in awareness and energy-efficient actions, it was reflected on how much knowledge and information contribute. These appear crucial but prove more effective when combined with an actual economic return and benefit. Incentives, especially economic ones, in fact, are seen as a key tool that can support actions by parts of the population that would otherwise struggle to access them. From the workshop discussion it emerged that financial support is indeed a primary need, as several groups of citizens would be ready to take energy-efficient actions, but need financial assistance especially regarding more expensive interventions such as the installation and/or purchase of tools and materials.

d. Infrastructural and material resources

Support infrastructure such as **One-stop-shop to provide technical assistance.**

Technologies that can support the creation of energy community can be smart meter and other devices to monitor energy consumption and make people aware of their energy behaviour.

Moreover, another aspect discussed regards proximity services and social spaces to create and solidify the culture of participation.

e. Relational and networking resources

It is fundamental to create alliances with some stakeholders, collaboration with industries, local and regional institutions; active collaboration with schools of all levels and the University.

6 Final remarks

The pathway towards a just energy transition is a clear priority for everyone in the European Union. However, how to do it is still uncertain and it will depend of course on the specific features of Member States. This implies taking into account how they are implementing effective policies, their socio-economic conditions as well as their cultural and territorial features. The Pilastro-Roveri case study shows the importance of an integrated regulatory framework on different levels, (local, regional, national and European) but at the same time it emphasizes that this cannot be enough if citizens, stakeholders, industries, policy makers and firms do not actively work together to implement those policies with coordinated actions. In this regard, the identification of each one's responsibilities and priorities is crucial to achieve the decarbonization goals. The community transition pathway clearly provides some important elements to be taken into account for the draft of the Energy Citizenship Contracts especially regarding issues such as social and energy justice.



Annex B. CTPs Canvas

1 **ALREADY EXISTING POLICIES**

This section should contain the major policies and set goals at the local, regional, national, European level. This is a framework to start from, it will bring all people at the same knowledge on energy policies. You can either prepare this before brainstorming with the community or set an activity of "knowledge sharing" among people.

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2 **A - SETTING THE BOUNDARIES**

YOUR **STARTING** COMMUNITY ENERGY CITIZENSHIP ENGAGEMENT LEVEL:

WHICH LEVEL DO YOU WANT **TO ACHIEVE** AT THE COMMUNITY LEVEL?

to be achieved by the

3 **B - DEFINING THE VISION AND/OR THE OBJECTIVES**

WHAT IS THE VISION FOR THE FUTURE? WHEN THE CHANGE STARTED IN YOUR CONTEXT? You can refer to different proximity levels, such as home/office, district, region, etc.

2030 2050

Which are those actions needed to reach the set goal? You can reflect both on "easy to reach" actions, actions that you think are feasible in a selected timeframe. But you can also try to figure out what happens if we anticipate some actions, what are the resources needed?

4 **C - ENVISIONING THE NEEDED ACTIONS**

5

Actions

Resources needed

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GRETA

THE ENERGY AND CLIMATE TRENDS
FOR THE CENTRAL AND EASTERN EUROPE
REGIONAL ENERGY AND CLIMATE
ACTION PLANS

These are the suggested steps:

- activities already implemented in the past
- policies and goals already set by institutions relevant to your community level

- First identify your current energy citizenship engagement level, next
- Brainstorm / Define which level of engagement do you want to target in the future
- Set also when do you want to reach this engagement target

- what is the vision for your community for 2030 (i.e. set an energy community, expand the energy community, create a cooperative, become carbon neutral at district/city/region level, etc)?
- what is the vision for your community for 2050?
- which are potential intermediate milestones?

- What are the steps to set an energy community by 2030?
- What are the steps to reduce your energy consumption?
- What are the main actions/steps that can support the inclusive participation of citizens?

- Which kind of informations do you need?
- Which kind of knowledge and skills do you need?
- Which kind of economic/financial support do you need?
- Which kind of support infrastructure do you need? (actors, institutions, technology...)

- Go back in the action and resources section to adjust, add or modify actions in order to ensure that also the engagement level can be achieved

(7) Now you have a roadmap to start implementing. GRETA will help you in defining how operatively act, through another tools, the Energy Citizenship Contract. This tool will support you in identifying which instrument (e.g. contract, mission statement, etc) you should implement in your context to make those change effective.