reschool

Creation, growing and management of energy communities

Report on recommended collaborative game design process

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Executive Summary

This report provides an in-depth exploration of the process and outcomes of the co-creation and co-design activities pertaining to gamification in Energy Communities (ECs), particularly as implemented in the RESCHOOL project Task T2.3. This task focuses on inclusive serious game and gamification co-design methodologies and practices to enhance engagement within the RESCHOOL initiative, recognizing co-design and gamification as effective tools for ensuring sustained public engagement in the energy transition. Co-design, involving diverse stakeholders, ensures that final outcomes align with the varied needs of the target audience, fostering a sense of ownership. Simultaneously, serious games and gamification could introduce fun elements and simulate real-life experience into non-game contexts, addressing educational and behavioral goals.

D2.2 emphasizes outreach to the wider public, distinct from existing EC members, with community-specific aspects addressed in D2.3. The specific objectives of T2.3 are to identify the outreach needs of RESCHOOL's four pilots, understand the preferences of external stakeholders, develop a co-design & gamification framework for ECs and implement the framework to create a serious game. This strategic approach aims to increase individual awareness and responsiveness at household and community levels, ensuring the success of RESCHOOL's serious games and gamification approaches.

The report includes a co-design and gamification template for ECs that aim to integrate these tools and presents a serious game, the Energy Community Card Deck that introduces players (as young as 10 years old) to a series of ECs across Europe. Finally, applying the first part of the co-design process, different games or gamification approaches are presented for each RESCHOOL pilot.

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1. Introduction

1.1. Objectives

This report provides an in-depth exploration of the process and outcomes of the co-creation and co-design activities pertaining to gamification in ECs. It is an outcome of Task (T) 2.3 in Work Package (WP) 2, which focuses on implementing an inclusive game co-design process within the RESCHOOL project.

Co-design and gamification have been identified as effective strategies in increasing long-term engagement and interest in processes and initiatives that support sustainability (Guillen et al., 2021). Co-design involves the collaborative involvement of various stakeholders, including end users, in the design and development phases of projects. It promotes inclusion and uses collective creativity to ensure that the final outcomes resonate with the diverse needs and preferences of the target audience. By allowing participants to actively contribute to the shaping of initiatives, co-design establishes a sense of ownership and relevance that can significantly enhance sustained engagement.

Simultaneously, serious games and gamification infuse elements of play and interactive challenges into non-game contexts. Serious games are designed with explicit educational or behavioral goals, making them effective tools for conveying complex information and fostering understanding. Gamification, on the other hand, introduces game elements like competition, rewards, and achievement systems to make tasks more enjoyable and compelling. The inherent appeal of games and gamified experiences taps into human intrinsic motivation for play, transforming potentially mundane activities into dynamic and goal-oriented experiences.

RESCHOOL aims to increase the individual awareness and responsiveness of energy users at household and community level through serious games and gamification elements, hereafter referred to as Gamified Strategies (GS), that are co-designed by end-users and stakeholders from inside and outside the projects' consortium.

The Reschool project is a research consortium that brings together leading academic institutions and energy companies from Spain, Sweden, Germany, the Netherlands, Norway, Belgium, and Greece, along with energy communities and pilot parties. The project emphasizes data management, user engagement, and community building. With pilot city studies in Amsterdam, Stockholm, Athens, and Girona serving as the basis for implementation. Spanning a duration of four years, the initiative seeks to foster cross-collaboration and information sharing among its partners and stakeholders. A notable objective of Reschool is to effectively harness the power of gamification in the realm of energy saving and management.

D2.2 focuses on the development of strategies that aim at the **wider public**, as opposed to the existing EC members the specific emphasis on community members will be addressed in Deliverable D2.3.

The specific objectives of T2.3 have been to:

- Identify the needs and preferences of the 4 RESCHOOL pilots in terms of public outreach.
- Identify the needs and preferences of relevant stakeholders outside RESCHOOL's consortium.
- Develop a co-design & gamification framework for ECs.
- Implement the framework to develop a serious game and initiate tailored GS across the pilots.

The steps that we followed to meet these objectives, as shown in Figure 1, are:

- A literature review was conducted to identify GS aiming to support ECs in their public outreach activities and the mediums, types, objectives, and target groups of these GS.
- The initial literature review included the identification of co-design frameworks used to develop such GS.
- A focus group and an EU survey were conducted to identify the key priorities, intended learning outcomes and preferences of ECs regarding GS for public outreach.
- The above results led to the development of the RESCHOOL Co-Design and Gamification framework and a specialized template for the initiation step.
- The framework was applied to co-design an Energy Community Card Deck and the template to initiate two GS in RESCHOOL pilots.

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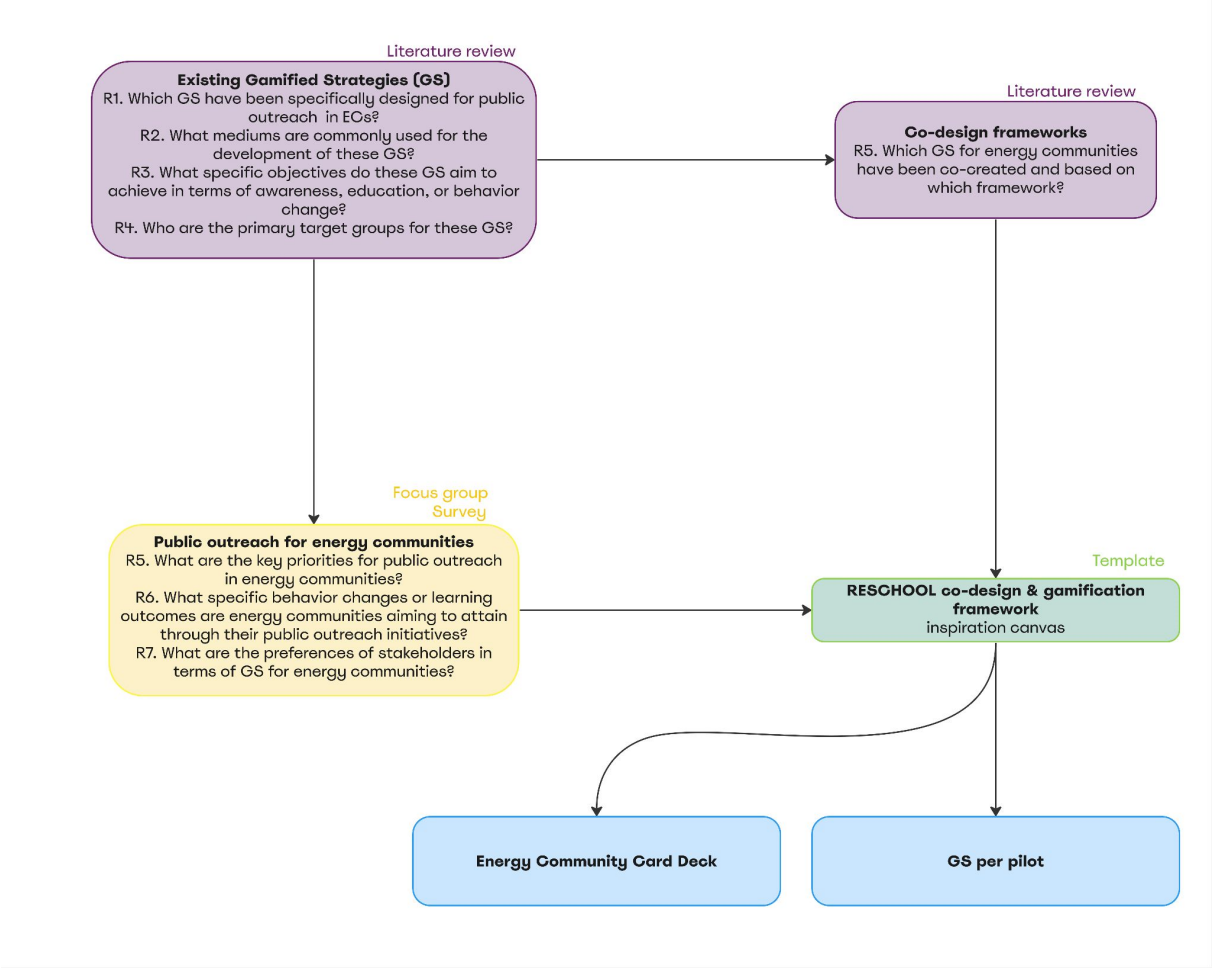

Figure 1: D2.2 workflow.

1.2. Contribution of partners

Table 1: Contribution of partners to this deliverable

Partner	Contribution
CERTH	Coordination, literature review, interviews, focus group and survey, design of framework, implementation of co-design activities, implementation of card deck (Ioanna-Mirto Chatzigeorgiou, Symeon Papadopoulos, Georgia Baltsou)
UU	Contribution in Links to other WPs and tasks and Review (Anton Belinskiy)
EREF	Contribution in 2.a (Johannes Vollmer)
RISE	Contribution in 2.b and Review (Martin Warneryd)
UiS	Review (Peter Mathias Lindkvist)
PILOTs	Interviews, participation in co-design sessions (Aleksandros Chronis, Maria Morgosi, Anna Camp)

1.3. Links to other WPs and Ts

This deliverable draws input and directions from D1.1- Energy management framework for communities in the EU, especially for the introduction of public engagement and the relevant barriers. Based on the classification

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of Use Cases (UCs) as defined and described in D1.2 - Requirements of technical development and shown in Figure 2, it is strongly connected to High-Level Use Case (HLUC 8) - Citizen engagement for community building at broad scale through gamification and rewarding. HLUC8 aims to increase awareness and motivation among citizens towards their participation in ECs through gamification, based on exemplars created by real data from running ECs.

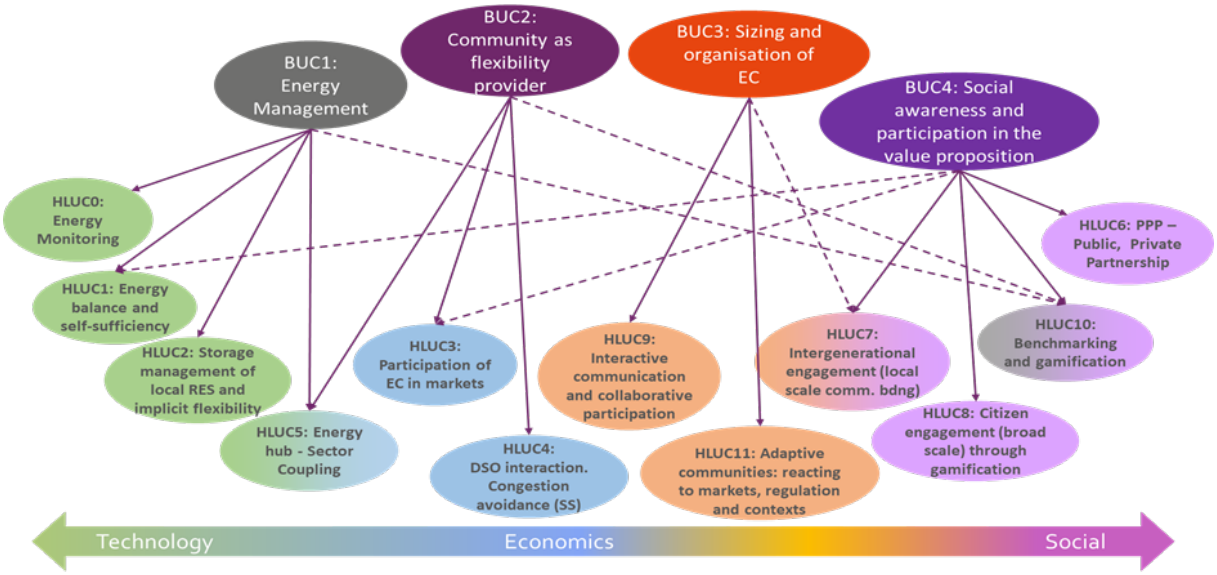

Figure 2: RESCHOOL use case structure: Dependencies among Business Use Cases (BUCs) and High-Level Use Cases (HLUCs)

It follows closely the outcomes of Deliverable (D) D2.1 - Report and training material for intergenerational schools and energy feedback. This report emphasizes the crucial role of schools in driving the energy transition and fostering ECs through intergenerational learning. It advocates for knowledge transfer from pupils to their parents and family circles, extending to the wider community. Drawing on insights from a literature review, the report proposes an innovative pedagogical intervention in schools, introducing "Creating Energy Communities", a theatrical process to develop key concepts and competencies. The practical application within the RESCHOOL project pilots, with a focus on the Girona pilot, is explored, along with challenges and strategies to overcome them. The overarching goal is to transform children from passive participants into proactive contributors within their communities, diffusing sustainable practices beyond the educational sphere.

It is also strongly linked to HLUC10 - Benchmarking and gamification with the inclusion of rewards and incentives, which will be further documented and addressed in D2.3 - Engagement strategies and implementation plans based on co-creation, which will be focusing on the engagement of the EC members. The subsequent deliverable D2.3 will delve deeper into engagement strategies and implementation plans with a focus on fostering both collaboration and competition among EC members.

1.4. Report Structure

The current section of this report highlighted the primary objectives, the report's focus on co-creation, co-design, and gamification activities for ECs, specifically within the framework of the RESCHOOL project. The introduction emphasized the role and significance of such processes in ensuring sustained engagement and interest in sustainability initiatives. Additionally, it provided a brief overview of the report's structure, offering readers a roadmap for the ensuing sections.

Following the introduction, the document explores the aspects of public engagement in ECs. This section introduces the definition of public engagement in this context and identifies various barriers, including legal, policy, technical, socio-economic, that impact the successful implementation of ECs initiatives.

Section 3 focuses on the RESCHOOL public outreach efforts. This is subdivided into segments discussing serious games and gamification, including a literature review, existing frameworks, and research gaps. It also presents

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the results of focus group interviews with ECs and surveys, outlining key findings related to target groups, stakeholders, learning outcomes, behavior change, entry procedures, and preferences for gamified strategies.

In Section 4, the report presents the RESCHOOL Co-design and Gamification framework, outlining steps, templates, and an inspiration canvas. The presented framework is designed to guide the co-creation process and ensure a systematic approach to incorporating gamification elements into ECs.

Section 5 introduces the Energy Community Card Deck as well as the implementation of the framework to co-design a gamified application per pilot. Finally, two more GS are initiated via the template and presented.

Concluding notes, an acronyms section and a comprehensive list of References is available at the end of the document.

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2. Public engagement in ECs

2.1. Background

The alarming impacts of climate change, deforestation, air and water pollution, land degradation, overfishing, plastic pollution, and ozone depletion, already evident in various locations worldwide, have prompted governments at both EU and global levels to adopt a series of policy, technical, and social measures. In the realm of energy systems, the critical need for sustainable solutions has driven the adoption of measures across production, supply, and demand-side (European Commission, 2011). The centralized energy system is intricately connected to, and has played a role in shaping, a societal understanding of the "energy public" primarily characterized by deficiencies in interest, knowledge, rationality, and environmental and social responsibility. In the past, people had limited awareness of the origins of electricity and the functioning of energy systems. They expressed concerns about health risks associated with pylons and wires, often displaying NIMBY (Not-In-My-BackYard) reactions to proposed new generation plants, especially onshore wind turbines (Devine-Wright, 2012). However, in recent years, there has been widespread discussion about the crucial importance of active public participation in the clean energy transition for policies to work and be accepted. It was in this context that the EU adopted the Clean Energy for All Europeans Package (CEP) (European Commission, 2019), which introduced a strong set of measures that was meant to empower and protect consumers, namely through:

- better information and access to energy consumption data and costs,
- a tighter safety net to address energy poverty and vulnerable consumers,
- increasing cost savings and energy-efficient behaviour through energy labels and eco-design measures,
- giving consumers more choice in their homes,
- and by facilitating consumers to play an active role and engage in individual and collective self-consumption, including in ECs.

Public participation, *public engagement*, *civic engagement*, *energy citizenship* are just a few of the concepts adopted to describe the more active involvement of people needed for the energy transition. The definitions include a spectrum of diverse activities, spanning from national to local levels and encompassing both bottom-up and top-down initiatives (Radtke et al., 2020). This wide range of actions and discourses that belong to the umbrella term of *public engagement* in the clean energy transition include for example public surveys, public dialogue processes, behavior change initiatives, community initiatives, protests, etc. (Chilvers et al., 2021). Public engagement has also been divided in three aspects: *public communication, consultation, and participation* (Rowe & Frewer, 2004). Public communication involves the transfer of information from an interested stakeholder to the public, while public consultation is the opposite. Public participation, on the other hand, entails a reciprocal exchange of information, a dialogue, and the transformation of opinions on both sides.

ECs have long been perceived as empowering structures for public participation in the energy transition. Literature attributes different meanings, objectives, and activities to ECs (Bauwens, 2022). Citizen ECs (CECs) and Renewable ECs (RECs), as defined by Directive (EU) 2019/944 and Directive 2018/2001/EU, are expected to prioritize environmental, economic, or social community benefits for their shareholders or members and the local areas in which they operate, rather than financial profits. Both definitions emphasise participation and effective control by citizens, local authorities, and smaller businesses, which, as suggested by studies, could make major contributions to the future decentralised energy system, estimating that by 2050, a total of 187 million, or 83% of all EU households[1], could be involved in renewable energy production, demand response, and/or energy storage. According to the above typology, ECs will guarantee public participation only if they function as a structure that facilitates an open dialogue between citizens, experts, policy makers, and governments—a structure where people both receive information and contribute to shaping the upcoming energy transition.

[1] RESCHOOL D1.1- Energy management framework for communities in the EU

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However, this is not always the case. The decision-making processes as well as the scope and objectives of the 9,000 EU ECs (European Commission, 2022), most of which are cooperatives (Koltunov et al.,2023), differ in terms of ownership, participation and empowerment. The research conducted by Dudka et al. (2023) classifies citizen involvement in these ECs through four distinct models: *full citizen ownership*, wherein citizens exert complete control and receive significant benefits; *shared citizen ownership*, marked by cooperative governance involving both commercial and public entities; *citizen crowdfunding*, where citizens possess equity primarily through online platforms; and *civic participation*, where citizen ownership is absent, and control predominantly rests with public authorities and commercial actors.

Furthermore, the motivation of individual members to shift towards more sustainable practices, change their consumption habits, and get involved in other initiatives, as a result of their participation in ECs, is also diverse, depending on income, willingness to see individual benefits or other socio-economic aspects, requiring consideration of case-specific features (Radtke et al., 2022).

Furthermore, public engagement in energy transition does not univocally equal nor lead to energy justice. In the case of ECs, important barriers in participation still exist, based on gender, race, economic situation, age, etc. (Suboticki et al., 2023) and need to be taken into consideration by the relevant stakeholders.

RESCHOOL aims to leverage ECs as a formal means of aggregating active consumers and prosumers, empowering them as significant stakeholders in the energy sector. The goal is to facilitate their involvement with the grid as providers of flexibility and their active participation in electricity markets. Achieving this objective necessitates the active engagement of a sufficient number of citizens in these communities and the aggregation of ample flexibility. This requires efforts in training and engagement campaigns, supported by effective results demonstrated in real life. RESCHOOL is committed to offering solutions that strengthen these engagement endeavors through co-creation and co-design participatory strategies, along with tools specifically designed to support energy and flexibility management. The interaction of both elements will be fostered through collaborative and gamification strategies. The effectiveness of these tools and methods will be validated through four distinct pilots conducted across the European Union, encompassing Spain, the Netherlands, Sweden, and Greece.

Summing up, public engagement in RESCHOOL includes the following:

1. Processes that promote engagement in decision-making within ECs.
2. Processes that encourage behavior change to support the goals of these communities.
3. Processes that facilitate collaboration between the communities and other stakeholders.
4. Initiatives aimed at expanding the size of ECs.
5. Initiatives designed to raise awareness and gain support from the broader public for these ECs.

In this report we will be focusing on the last two aspects, describing the public outreach of the communities.

2.2. Legal/Policy/Technical barriers

In the context of RESCHOOL, the CEP's main regulatory instruments and provisions for consumer activation, in individual and collective forms, are issued in the two Directives on the use of renewables (Renewable Energy Directive (RED) II)[2] and on common rules for an internal electricity market (Internal Energy Market Directive (IEMD))[3]. Both are designed to enable citizens to actively participate on a level playing field in relevant markets and engage as self-consumers (or "prosumers"), by investing in renewable technologies, and then consume, store or sell the electricity they produce and benefit from. Although self-consumption is not a new concept, the EU requires Member States to adopt enabling legislative frameworks, legally recognising self-consumers for the first time, as *renewable self-consumers* and *active customers*.

[2] Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources. Official Journal of the European Union L 328, 21.12.2018, p. 82–209.

[3] Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU

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2.2.1. Enabling Regulatory Frameworks for Consumer Activation in EU Legislation

Electricity, produced individually or collectively, can be fed into the grids and in return make self-consumers receive remuneration that reflects market value. Yet, this is not meant to represent anyone's primary commercial or professional activity. Electricity behind the meter is not being charged, although exemptions are foreseen for installation larger than 30 kW, such as for electricity that benefits from support schemes or if there's system risks resulting from increasing amounts of the electricity fed into the grid (from 2026 onwards). Active participation in energy markets is further enhanced through power-purchase agreements, peer-to-peer trading and demand response schemes.

With regards to energy community frameworks, the CEP sets out, for the first time in EU law, definitions and provisions on RECs and CECs, as mentioned before. RED II defines RECs as legal entities which, in accordance with national law, are based on open and voluntary participation, effectively controlled by shareholders or members that are located in the proximity of the renewable energy projects owned and developed by that community. Shareholders or members can be natural persons, Small and Medium Enterprises (SMEs) or local authorities, with the primary purpose to provide environmental, economic, or social community benefits for its members or the local areas where it operates, rather than financial profits. RED II further defines what RECs are to be entitled, i.e., the activities that can be carried out as well as the access to suitable energy markets. The enabling frameworks for RECs are meant to respect a number of minimum requirements, in terms of customer rights, administrative procedures, capacity-building and support schemes, and the cooperation with distribution system operators. While the IEMD definition and provisions for CECs overlap with RED II with regards to participation, control, purpose and its scope of activities, the main difference to RECs is that CECs are not geographically limited nor restricted to renewable sources, with the IEMD provisions referring to electricity only.

Further EU decision-making that is expected to foster consumer activation and the uptake of ECs comes in form of the recently agreed energy market design reform[4], which was launched as part of EU's policy response to Russia's invasion of Ukraine and its subsequent energy and cost-of-living crisis (European Commission, 2022). Although the reform does not introduce changes to the previously adopted CEP rulebooks (on self-consumption, ECs), new provisions that could facilitate the growth of existing community energy initiatives include rights to share energy among households, public authorities, and SMEs, including between members of ECs. Also, smaller actors will be enabled to access renewable energy through power purchase agreements (PPAs), and benefit from solutions that involve storage, demand response and aggregation.

2.2.2. Key to removal of legal and policy barriers: the effective transposition of EU legislation

Yet in practice, key to the effective growth of ECs – in numbers and size – is the consequent transposition of EU provisions into national laws. While the deadline for transposing the relevant CEP rules (described here above) into national law passed in June 2021, legal experts agree that most Member States have not sufficiently – neither in completeness nor conformity – done so yet, with regards the provisions related to renewable and citizen ECs. While there is progress made in countries such as Greece, Spain, and the Netherlands, where national lawmakers are adopting legislation to enhance collective energy initiatives, countries like Sweden[5] are lagging behind, not having introduced favourable regulatory environments in this respect. Transposition ranges from copy-pasting definitions into national laws and the lack of essential elements that would establish enabling frameworks, to full compliance with EU rules and the provision of effective incentives that are expected to trigger substantial community energy development. In this context it is important to bear in mind that in many EU countries, energy cooperatives have been operated for decades, mostly spread across the North-West of the continent. Today, the estimated 3500 cooperatives represent the major form of community-led initiatives in energy[6], which makes stakeholders and in particular national regulatory authorities facing the question if and

[4] While a political agreement among EU institutions was reached in December 2023, the formal adoption process is expected to terminate in April 2024, with the reform measures entering into force thereafter.
[5] RESCoop's transposition tracker for more information: www.rescoop.eu/transposition-tracker
[6] COMPILE. (2021).D4.1 – COOLKIT – Best Practice Guide. https://www.rescoop.eu/uploads/rescoop/downloads/D4.1.1_Best_Practice_Guide.pdf

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to what extent the many existing cooperatives can be treated as RECs or CECs from a regulatory perspective, when transposing the corresponding RED II and IEMD provisions.

Transposition challenges – and the resulting persistence of legal and policy barriers across EU Member States - stem from several factors: the diverse reality and tradition of energy cooperatives in Europe, as well as the fact that energy community frameworks also impact consumer protection and infrastructure rules, including supplier and network charging arrangements. Certain aspects of ECs, such as ownership of simple generation assets or direct services to the local community (e.g., advice on energy efficiency or initiatives to help reduce energy poverty) are largely unproblematic, from a regulatory perspective. Others however, such as energy sharing within ECs, defy the classical supplier-customer relationship. Depending on which EU and national regulation applies, ECs may act as supplier or service provider (e.g., of aggregation and balancing services) or, if allowed by the relevant Member States, as grid operator. These activities fall under the competence of electricity market regulation and go beyond energy community frameworks (for instance, RECs operating distribution networks would have to comply with regulatory requirements that apply to Distribution System Operators (DSOs)). Consequently, national regulatory authorities pay particular attention when introducing new business and organisational models and service provisions that imply increasing complexity for the consumer. Also, transposition of EU law is mostly oriented towards subsidiary structures and influenced by national specificities and political preferences, resulting in widely diverging national provisions.

As a result, regulatory frameworks in many Member States are not accommodating the active participation of consumers and ECs in energy markets, cementing the status quo of passive and inflexible consumption behavior, and disallowing to benefit – mostly economically - from effective demand-side management that is done through aggregation and the provision of flexibility products and services to functioning markets, creating financial incentives for participating consumers and ECs. Other barriers include the lack of interoperability and data sharing, (the lack of) local flexibility markets, (the lack) of clear rules on new market entrants such as aggregators, as well as regimes that reflect the changing roles and obligations for Transmission System Operators (TSOs) and DSOs, and incentivising network tariff designs.

2.2.3. Digitalisation of the energy sector and the key technical barriers

The accelerated roll-out of renewable energies require advanced smart and flexible systems and infrastructures that are fit for net-zero, allowing for interoperability and the exchange of data and energy flows among consumers, producers, network operators and actors such as energy system managers, IT solutions providers and aggregators. This will be key for unlocking benefits for consumers (and ECs), through efficient and optimised management of consumption and production, the sharing of energy, and the trading of flexibility.

Removing the technical barriers that prevent the effective implementation of flexibility solutions includes the deployment of interoperable, resilient, and reliable grid-based energy management systems, increase the cooperation between TSOs and DSOs, connect and integrate assets at any layer of the power system, guarantee the aggregation of decentralised resources, and provide a customer-centric approach including standardised access to data and data-driven services. Among the major challenges to overcome is the sharing of data among all actors involved, with a lack of interoperability that prevents aggregators from developing solutions for the demand-side management of consumers. Currently, aggregators develop customised end-to-end solutions, leading to fragmented energy management setups and data platforms. This approach prevents efficient integration and scalability, making it challenging for aggregators to meet the demand criteria set by EU wholesale flexibility markets, typically requiring capacities up to 1MW[7]. Therefore, interoperability is a crucial requisite for the future net-zero electricity system, where various actors can manage, exchange and aggregate large volumes of energy-related data from different sources and different formats.

Also, the complexity and heterogeneity of technical systems to implement ECs requires technical expertise, i.e. in the field of energy (e.g. from production to markets, from EV to batteries), in ICT including communications, computer science, data analytics, distributed systems and cybersecurity – which in return puts limits to the

[7] SmartEN. (2020). The implementation of the electricity market design to drive demand-side flexibility. https://smarten.eu/wp-content/uploads/2020/11/FINAL_smartEn-EMD-implementation-monitoring-report.pdf

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involvement of laypersons, incl. regarding democratic decision-making process and the governance of energy community projects.

2.3. Socio-economic barriers

In general, socio-economic factors determine a person or group's status in the social hierarchy and often include occupation, education, wealth, income level, and family relationships including security. In a community energy context previous literature provides a wider understanding of these factors. Karytsas and Theodoropoulou (2022), review 60 articles, books, and reports, and find that socioeconomic characteristics such as age, gender, marital status, education, occupation, income, home ownership, energy bills, ownership of a RES-based microgeneration system, and area of residence can affect the willingness to participate and invest in ECs. Koirola et al (2016) describe the following socioeconomic issues related to integrated community energy systems: Paradigm shift through community engagement, Economic incentives, Willingness to pay, Split-incentives problem, Energy poverty, Energy autonomy and security of supply, initial cost, and financing. Some are clearly challenges, such as up-front costs and financing, while others are incentivizing shared energy investments such as energy poverty. Additional literature such as Hanke et al (2021), are focused on vulnerable groups and relate socioeconomic factors to energy justice issues. Examples of such issues that can arise in the context of ECs are:

- available investment capital or possibility to get loans with decent conditions,
- priority of actions (i.e. time and possibility to give concern to energy related topics),
- biases from homogenous groups,
- knowledge and understanding.

Fundamentally, ECs offer a greater potential to include citizens from widespread socioeconomic groups, at least compared with individual households (O'Shaughnessy, Barbose et al. 2021). By including the whole community, it is possible to bring the policy incentives for stimulating the uptake of renewable energy into vulnerable socioeconomic groups, although the most deprived areas are seldom included (Stewart 2021). Given the issues described, participation and engagement in ECs from socioeconomic vulnerable groups depend on stimulating legislation and the ability of the EC organisation to recognize and actively find solutions to overcome these (Hanke, Guyet et al. 2021).

A study from US cities (Bayulgen 2020) concluded that higher wealth and education levels gave higher support for local clean energy projects. There was also slight proof that homogeneity levels were higher in supporting cities compared with less supportive cities that were more heterogeneous. Turning to Europe, a rather comprehensive study was undertaken by Radtke and Bohn (2023)[8] showing that age was the most crucial factor influencing 85 Community Energy projects in Germany. Younger ages were more pragmatic in their view toward CE projects whereas the older ages gave larger meaning to the community part of the system. Also, education levels had influence. Interestingly both academics and non-academics approved of EC projects, but not for the same reasons. For academics it was most important to get a return on investment, while the non-academics granted the sense of belonging to the community as most important. Income levels did matter but were not decisive. In general, members with higher incomes were more interested in returns, while those members with lower incomes had more idealistic preferences. Looking at gender issues, there are results that clearly indicate that men are usually more commonly associated with the governance of ECs than women (Hanke, Guyet et al. 2021), but regarding willingness to participate, there are no big differences between genders (Jansma, Long et al. 2023). The conclusion is that in order to engage members to an energy community, different goals and drivers in different socioeconomic groups should be accounted for. Given the issues raised in the previous paragraph, differentiated measures for inclusion of vulnerable groups need to be taken.

When reviewing cultural factors, there are some differences between the PILOTs' countries in the RESCHOOL project. Both the Netherlands and Spain have a long history of energy cooperatives, where the early Dutch energy cooperative goes back to the start of the 20th century. In Spain cooperative tradition is strong in several sectors including electricity and were in the late 19th and early 20th century a way to electrify the countryside

[8] [1] Based on survey data from 2011/12

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when the state was uninterested in connecting some rural locations to the grid. After 2010 a boom in modern energy cooperatives is spread in the countries Spain and the Netherlands (Sciullo, Gilcrease et al. 2022). Greece is slightly different. The country was the first EU member to introduce the concept of ECs into national legislation in 2018 (Biresselioglu, Limoncuoglu et al. 2021). Before this law was passed, a general liberalisation of the Greek electricity market was established over the past two decades, however not resulting in the specific growth of ECs. Since the law was passed in 2018, several ECs have been established (Vasilakis, Vrettos et al. 2020). In Sweden, historically, ECs were not a common model, although some wind and solar cooperatives have existed (Kooij, Oteman et al. 2018). In recent development an interest has grown quite rapidly, not the least by the number of critiques toward what is seen as insufficient regulations from different actors in the Swedish market (Envall and Rohracher 2023). This leads to the conclusion that although the cooperative model was not prominent in the past, citizens in general could adapt it quite readily.

What's apparent in the different countries is the fact that the EU initiated REDII and EMD legislations has spurred an interest in ECs in all countries, regardless of their previous history and experience with communities. In order to create inclusive conditions for members with socioeconomic differences, there are some efforts that can be taken. For lower income households, member fees and share prices can be lowered, but also raise awareness among all community members that differences exist and thereby try to avoid the risk of bias driving members away from the community (Hanke, Guyet et al. 2021). What and how to share information is another issue that needs to be considered in order to increase the access to relevant information, membership and decision making in the community. Targeted information for different groups is important here. An emphasis is the importance of education and specifically energy-targeted education, which have been shown to have a positive impact on citizen participation, regardless of socioeconomic status (Koirala, Koliou et al. 2016, Karytsas and Theodoropoulou 2022). Also, attaching further social benefits to the membership and receiving support in e.g. energy efficient behaviour to lower bills is a possible way to create interest in participating in the community (Hanke, Guyet et al. 2021).

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3. RESCHOOL public outreach

Throughout RESCHOOL different engagement strategies will be developed to support ECs to ensure active engagement internally as well as externally. This report aims to shed light on the public outreach of the ECs, and more specifically initiatives aimed at:

- expanding the size of ECs
- raise awareness and gain wider public support for these ECs.

3.1. Serious games and gamification

Serious games are defined as "games or game-like interactive systems designed with the primary purpose of providing an engaging, enjoyable context in which users can learn, practice, and master educational, professional, or problem-solving content" (Michael & Chen, 2006).

Gamification is defined as "the use of game design elements in non-game contexts to engage and motivate individuals, solve problems, improve user experiences, and drive desired behaviors" (Lee & Hammer, 2011).

Gamification has been recognized as a potential driver of motivation and increased interaction among end users in a variety of contexts e.g. education, health/exercise, intra-organizational systems, sharing systems, sustainable consumption, work, innovation/ideation, data gathering (Hamari et al., 2014). It involves, for example, the integration of game elements, such as points, rewards, challenges, and competition, to make non-game activities more interactive, enjoyable, and conducive to achieving desired outcomes.

Gamification has been widely applied as a tool to encourage sustainable practices, including sustainable consumption behaviors (Guillen et al., 2021), responsible resource use, energy efficiency, recycling and waste management, sustainable product design and production, conscious agriculture and land management, sustainable forest practices, eco-friendly transportation, green construction, and sustainable urban planning (Hallinger et al., 2020).

It has been, also, widely employed to encourage long-term engagement in sustainable energy consumption through apps, websites and stand-alone interfaces at homes and public spaces integrating several game elements such as feedback, levels, social sharing, rewards, tips, challenges, rankings, avatars, leaderboards, points, user-generated content, and badges (Johnson et al., 2017). There are promising findings that gamification could lead to behavior change although more quantitative empirical studies are recommended towards understanding the potential of the approach (Mulcahy et al., 2020). For example, the study by Beck et al. (2019) suggests that typical energy-related apps heavily underutilize search engine optimization, gamification components, and game design elements, which can improve user experience and encourage behavior change.

A detailed taxonomy of gamification elements, including element dimensions and characteristics, was presented in a study by Schöbel et al. (2020). The elements included in the taxonomy were badges, collection systems, points, badges, virtual goods, leaderboard, user level, progress bar, feedback, user avatar, mediating avatar, missions, one-time narratives, processing narratives, reminders, and time manipulation. They were analysed based on the underlying game logic (independent/dependent, developing/static, partial involvement/prescribed by developer, intrinsic/extrinsic) and game design (rewarding/documenting, bonus/no bonus, punishing/neutral, surprising/regular, competitive/individual, cooperation possible/cooperation impossible).

Gamification should be distinguished from serious games. While gamification and serious games share a common goal of utilizing the popularity and allure of gaming to influence real-world behaviors effectively, they diverge in terms of their primary scope and objectives. Gamification integrates game mechanics, like points and rewards, into non-game contexts to enhance user engagement and motivation for specific behaviors. It is a versatile strategy applied across various domains, aiming to make activities more interactive and enjoyable. On the other hand, serious games are dedicated gaming applications developed with a specific educational or training purpose. These games combine entertainment with learning objectives, providing an interactive and

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engaging environment to educate users on particular subjects or simulate real-world scenarios for training purposes. While gamification enhances existing processes, serious games are purposefully designed for immersive learning experiences. Both strategies contribute to enhancing user interaction but cater to distinct goals and applications within the broader gamified landscape.

A growing number of serious games have been developed throughout the last years for individual sustainable consumption (Wu et al., 2020) but also for a variety of other environment related purposes such as biodiversity and agricultural preservation, sustainable city development, eco-innovation, etc (Stanitsas et al., 2019). The serious games developed were online, video, computer simulation, online sandbox games as well as board, card, dice, and Role-Playing Games (RPG). However, just one third of them were found to fully contribute to all educational attributes of sustainability's triple-bottom line (economic, social, and environmental dimension); only 1% addressed the economic dimension of sustainability.

Despite the fact that serious games seem to have a positive impact on players' learning, more empirical studies with robust research design should be conducted in order to identify which types of game elements and design decisions can support learning and engagement in sustainability issues.

Furthermore, there has been limited effort to identify specific strategies that actively promote wider public engagement in ECs. The main paper that sheds light on the topic is (Nykyri et al., 2022) which presents five digital games that integrate an energy community point of view or goal setting. The scarcity of research in this emerging nexus of GS and ECs has led us to conduct research that aims to explore the landscape of serious games tailored for public outreach within ECs, examining their objectives, target audiences, and the mediums commonly utilized for their development. More specifically, the following research questions will be addressed:

R1. Which GS have been specifically designed for public outreach in ECs?
R2. What mediums are commonly used for the development of these GS?
R3. What specific objectives do these GS aim to achieve in terms of awareness, education, or behavior change?
R4. Who are the primary target groups for these GS?

3.1.1. Literature Review

To initiate this investigation, the Scopus database was systematically queried using a defined search string aimed at capturing studies related to serious games, gamification, and ECs:

TITLE-ABS-KEY (((serious AND game) OR gamification OR gamified OR persuasive) AND energy AND communities).

The initial search yielded 137 studies, and specific inclusion and exclusion criteria were subsequently applied to refine the selection.

The inclusion criteria that were used are the following:

- Studies conducted during the last 5 years, to ensure relevance and recency.
- Studies presenting GS clearly connected to ECs: introducing the concept of ECs, simulating ECs, etc.

The exclusion criteria that were used are the following:

- Studies that primarily address the engagement of members within an energy community (since this will be the focus of the research presented in D2.3)
- Studies where the terms "game" or "gamification" are used in the context of mathematical theory.
- Studies conducted in languages other than English.
- Review studies.

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Given the limited number of studies meeting these criteria, the scope was broadened to include research involving a collective decision-making structure within the game, simulating the dynamics of an energy community. This expansion aims to capture valuable insights into the GS employed for community-oriented decision-making.

10 studies were initially identified to meet the criteria. Subsequently, 4 additional studies were incorporated into the list through reviews, exploration of other references, and research within European project databases.

3.1.2. Results

The following table includes the final list of GS that fulfilled the inclusion and exclusion criteria. The table includes the GS' names, types, objectives, target group as presented in the relevant resources.

Table 2: Papers included in the Literature Review on GS and the respective results.

#	Title	Name of game	Type	Objective	Target group
1	Collective attention and active consumer participation in community energy systems (Bourazeri & Pitt, 2018)	Social Mpower	Computer	• Increase collective attention in a decentralised community energy system • Observe the immediate weather changes and understand the use of renewable energy • share any remaining energy with the rest of the community	Citizens
2	Multiplayer game for decision-making in ECs (Brakovska et al., 2023)	Energy Community Game	Web-based	• Decide on measures from a list of proposed energy efficiency and renewable energy solutions based on their preferences. • Evaluate players' decisions and their impact over several rounds and adjust until a decision satisfies the wishes of the entire community (players involved). • Form an understanding that the selfish interests of each individual can either improve or (most likely) worsen the overall result.	Residents of certain multi-apartment residential buildings who delegate house elders to represent their community within the game.
3	" Electric city": Uncovering social dimensions and values of sharing renewable energy through gaming (Singh et al., 2015)	Electric City	Android	• Stimulating players to think and reflect upon different abstract concepts for sharing of renewable energy • Reflect and discuss various preconditions and requirements of renewable sharing services both in the game world as well as in the real world	Citizens
4	Examining community-level collaborative vs. competitive approaches to enhance household	Social Power	Mobile app	• Increase knowledge on sustainable electricity use behavior • Motivate short-term electricity savings through behavior change	Citizens

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	electricity-saving behavior				
5	SOCIALENERGY: A Gaming and Social Network Platform for Evolving Energy Markets' Operation and Educating Virtual ECs (Makris et al., 2018)	SOCIALENERGY	Web based / mobile app	• Educate on the best practices about energy efficiency • Serve as a (near) real-life testbed to help in quantifying user's behaviour change through time • Build and strengthen a strong core of digital trust increasing customer satisfaction and minimising churn rate. • Exploit the deep insight into energy use consumption to engage customers on cross-sell options that fit their needs, resulting in new revenue streams	Citizens
6	Towards an Energy Social Network: Lessons Learned from Gamification as On-board Engagement Tool for Energy Communities in Domestic Units (Converso et al., 2023)	ReDream Energy Platform	Mobile app	• Guide the user engagement in the ReDream ecosystem • Support the feeling of the energy community	Citizens
7	Playful interventions for sustainability awareness in educational environments: A longitudinal, large-scale study in three countries (Mylonas et al., 2023)	GAIA Challenge	Web-based	• Introduction to a number of sustainability concepts and practices • Become familiar with the GAIA project as a whole • Motivate engagement with energy saving topics	Primary and secondary school students
8	Minecraft Game as a New Opportunity for Teaching Renewable Energy Topics (Kersánszki et al., 2023)	Minecraft camp	Minecraft based	• Master the knowledge on renewable energy topics • Enhance skills in effective task solving • cooperation	Primary and secondary school students

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9	Lessons About Learning from Serious Games: The Learning Potential of Co-creation and Gameplay in Participatory Urban Planning Processes (Ampatzidou, 2020)	Energy Safari	Board game	• Explore the energy transition in the province of Groningen, the Netherlands, and its challenges and opportunities. • Make informed decisions that have an impact on the urban carbon footprints • Learn about the different perspectives and interests of various stakeholders involved in the energy transition, such as citizens, energy companies, and local authorities.	Young adults
10	Using Serious Games and Simulations for Teaching Co-Operative Decision-making (Stefan et al., 2019)	Indesen Simulation Tool	Simulation Tool	• Articulate design considerations that reflect both individual and societal concerns for managing renewable energy parks • Analyze the behaviour of realistic nonlinear systems and assess the impact of your decisions on the performance and sustainability of the energy parks. • Communicate, negotiate, coordinate, and resolve conflicts effectively with other participants in the indesen simulation tool.	Students of Higher Education Institutions and trainees
11	"Changing the Game—Neighbourhood": An Energy Transition Board Game, Developed in a Co-Design Process: A Case Study (Lanezki et al., 2020)	Changing the Game—Neighbourhood	Board game	• Increase the awareness and knowledge of the participants about the energy transition and its challenges at the neighbourhood level. • Stimulate the participants to reflect on their own energy consumption and behaviour and to explore alternative solutions for reducing their environmental impact. • Foster the participants' skills and attitudes for co-operative decision-making and collaboration with other stakeholders in the context of energy transition.	Citizens older than 16 years old

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12	Using Serious Gaming to Discover and Understand Distributed Ledger Technology (DLT) in Distributed Energy Systems (DES) (Veeningen & Szirbik, 2018)	Energy Trading and Investing Game	Computer	• Experience the benefits and challenges of using DLT for energy trading and investing in a realistic and interactive simulation environment • Explore different scenarios and strategies for applying DLT in DES and to compare their results with and without DLT • Collaborate and compete to solve problems in the context of DES	Not specified
13	Making Cool Choices for sustainability: testing the effectiveness of a game-based approach to promoting pro-environmental behaviors (Ro et al., 2017)	Cool Choices	Board game	• Increase the awareness and knowledge of the participants about the energy transition and its challenges at the household level. • Reflect on own energy consumption and behaviour and to explore alternative solutions for reducing their environmental impact. • Co-operative decision-making and collaboration with other players	Employees
14	A Survey on the Design of Gamified Systems for Energy and Water Sustainability (Albertarelli et al., 2017)	Funergy	Web-based & card	• Increase awareness of the benefits and challenges of saving energy for yourself and society • Evaluate the energy potential and constraints of various locations and situations. • Familiarize with European Energy Scale	Primary school students

Mediums

The GS have been developed as web-based, computer, mobile and board games. The GS also include a simulation tool, a minecraft-based game and a card game. There are not enough studies or relevant research questions to support the identification of differences between the different mediums (computer, mobile phone, etc) or non-tech options.

Objectives

The included GS aim to increase knowledge and understanding of renewable energy, energy efficiency, and sustainable practices. Some of them include a self-reflection of household and individual energy practices (SOCIALENERGY, ReDream Energy Platform, GAIA, Funergy). Few of the games collected through the literature review set the direct focus on energy communities or energy sharing as a community practice (Social Mpower, Energy Community Game, Electric City). Others aim to promote collaborative approaches and participatory planning in energy systems and infrastructure (Minecraft camp, Changing the Game—Neighbourhood, Energy Safari, Cool Choices). Finally, some of them provide realistic simulations to teach about the complexity of energy systems and the impact of individual and collective decisions (Energy Trading and Investing Game, Indesen Simulation Tool).

Target groups

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Most of the GS aim to engage citizens and the general public in understanding and participating in ECs. Others target primary and secondary school students with GS designed for younger audiences in formal education settings. Additionally, some of the GS focus on younger adults and students of Higher Education Institutions. There are also more specific applications for employees and residents of multi-apartment residential buildings.

Other games

Furthermore, several other serious games targeting the wider public and focusing on ECs were discovered through the consortium's networking with other European projects and educational initiatives, as well as a few commercial options. There were three that met the inclusion criteria mentioned above:

1. **Energopoly**[9]
   The aim of the board game is to acquaint the players with the new institution of Energy Communities as well as with the benefits of cooperation and cooperative thought, in improving the standard of living. The game measures both the income and expenses of the players, as well as the well-being records of themselves and the environment.It is a strategy and simulation game of participating in an Energy Community.

Figure 3: The board game energopoly

2. **Milwatteur**[10]
   This card game is a readaptation of the concept of a famous French game called "Mille Bornes":the player must achieve a certain number of energy savings to win the game. Unexpected events can prevent them from progressing: a harsh winter, a heatwave or even a broken fridge can block you for several turns.

[9] https://communityenergyriver.com/energopoly/
[10] https://www.enercoop.fr/blog/actualites/nationale/economes-organisent-soiree-jeux-decouvrez-milwatteur

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Figure 4: The card game Milwateur

3. **Games by the EC Energie Partagee**[11]
   Several games are available (in French) via the Energie Partagee energy community. For example the card game Frizzle which leads the players to explore the different stages and key points of setting up a citizen renewable energy production project in three stages:
   - The fundamentals of any citizen renewable energy project.
   - The specificities of each project.
   - The entire ecosystem of professionals which is useful at every stage of the project's life at the national level, with possible specification of regional actors.

   All the 52 pieces of the puzzle make it possible to address all aspects exhaustively: economic, legal and technical.

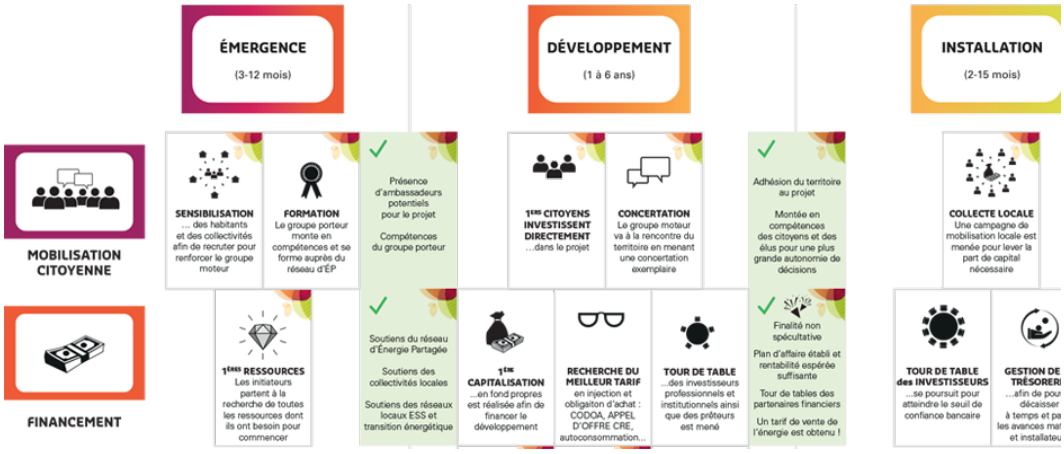

Figure 5: The card game Frizzle

[11] https://energie-partagee.org/ressource/jouer/

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3.1.3. Discussion

Our literature review reveals the existence of various GS specifically designed to support public outreach in ECs. These GS address diverse knowledge aspects, simulate scenarios, and aim to motivate behavior change. Determining the optimal medium for GS implementation remains inconclusive, as it heavily depends on the target group and contextual factors for each intervention. When crafting such interventions, it is crucial to explicitly identify the target audience and objectives, choosing the medium accordingly.

A recurring issue observed across studies is the lack of comprehensive information on GS, such as detailed descriptions of intended learning outcomes, game mechanics, and target groups ideally based on a specific game design, behavior change, or educational framework. Additionally, most studies lack explicit reporting on research questions and study structures, leading to a lack of transparency and replicability. Notably, there is a dearth of studies focusing on the sustainability of behavior changes or knowledge acquired through GS. Moreover, there are a lot of promising GS that have been developed as part of EU projects, specifically focusing on ECs, that remain to be further explored in practice, in other regions or projects.

This study contributes to research, firstly, by mapping available GS, the mediums, objectives and target groups. Furthermore, by highlighting the need for more in-depth studies in the field. Lastly, recognizing the significance of integrating GS into ECs public outreach efforts, whether by leveraging existing strategies or developing new ones, the study advocates for the creation of a simple and consistent way to support co-designing for the development of GS. This includes the establishment of an inspiration pool and an easy-to-use co-design toolkit, a goal that the RESCHOOL co-design and gamification framework seeks to accomplish.

3.2. Co-creation and co-design

Co-creation is a non-linear process that involves multiple actors and stakeholders in the ideation, implementation and assessment of product services, policies and systems. It aims to improve their efficiency and effectiveness, and the satisfaction of those who take part in the process (SISCODE project, 2019)[12].

Co-design is inclusive, encompassing collaborative, co-operative, participatory, socio-technical and community design (journal Co-Design by Taylor & Francis[13]).

The terms co-design and co-creation are today often confused or treated synonymously with one another. They are linked historically with *participatory design*. As mentioned in (Mironcika et al., 2008): "Co-creation is a very broad term with applications ranging from the physical to the metaphysical and from the material to the spiritual, as can be seen by the output of search engines. By co-design we indicate collective creativity as it is applied across the whole span of a design process (…). Thus, co-design is a specific instance of co-creation". Also, Voorberg et al. (2014) recognize co-design as one of the three levels of citizen co-creation along with citizen *co-implementation* and *citizens as initiators*.

Co-creation has been defined in various ways during the last 30 years (Ryszawska et al., 2021). The main keywords included in the definitions of co-creation are *cooperation, communication, actor involvement, exchange, doing something together* and *democratization*. These terms emphasize the active engagement of citizens and stakeholders, the sense of empowerment and citizenship, the establishment of trust among stakeholders and communities, the distribution of power and responsibility, improvements in the social legitimacy of decision-making, and the timely and efficient delivery of solutions.

Great expectations have been articulated regarding the co-creation process, for example Itten et al. (2021) claim that "it is an iterative, reflexive approach that can be useful in mitigating climate change as it encourages interaction between citizens and stakeholders potentially providing a means of facilitating rapid and extensive transitions". Co-creation processes can create spaces that foster collaborative partnerships and prompt essential engagements with local issues and co-benefits.

[12] SISCODE. (2019). SISCODE Toolbox for co-creation journeys https://siscodeproject.eu/wp-content/uploads/2019/09/toolkit-27092019-1.pdf

[13] Aims and scope: https://www.tandfonline.com/action/journalInformation?show=aimsScope&journalCode=ncdn20

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As far as the energy systems are concerned, co-creation has been identified as a potential approach for increased public participation in the energy transition as it could potentially unravel the complexities associated with both the supply and demand side of the energy systems.

However, several crucial considerations are necessary for the process to be effective. According to Sillak et al. (2021) co-creation in energy transitions can be effective when actors (state, market, community, and third sector) participate in different phases, engage in expectation alignment, social learning, resource acquisition, assessment, and evaluation, and produce new knowledge, relationships, and solutions.

As far as co-design is considered, engaging diverse stakeholders in co-design activities is seen as advantageous for processes like ideation, exploration, and learning. It facilitates improved communication and reduces biases among game designers (Ampatzidou & Gugerell, 2019).

3.2.1. Existing frameworks

Co-design has been previously successfully employed as a strategic approach in the development of GS for the energy transition. For this reason, several frameworks have been developed and applied. These frameworks provide structured methodologies, principles, and guidelines to ensure a systematic and comprehensive approach to co-design. For this reason, we set the following research question:

R5. Which GS for ECs have been co-created and based on which framework?

One of the aforementioned GS that were co-created is the board game *Changing the game-neighbourhood* (Lanezki et al., 2020) which followed a similar approach to the *informant design* framework. *Informant design* (Scaife et al., 1997) is more practical as it defines four phases of design and specifically indicates what to accomplish and which stakeholders should be included in each phase of the design process based on their expertise. The stakeholders offer crucial insights and feedback based on their expertise and experience during particular stages of the development process. This approach is flexible regarding time, location, and the number of participants. Moreover, it proves time-efficient for the participating co-designers, eliminating the need for them to acquire extensive knowledge about game design before actively engaging in the development process. In contrast to informant design, Lanezki et al. (2020) had already started to create game materials in the first phase in order to use them in the first co-design phase. The core game development team consisted of three scientists with knowledge in industrial engineering, renewable energies, and computer science and 117 co-developers which were end-users and stakeholders with completely different background.

In the case of Energy Safari (Ampatzidou et. al, 2020) various groups of stakeholders were involved: planning professionals and participatory process facilitators were interviewed; game designers, researchers in the fields of urban and energy planning, economic and cultural geography, sociology, public administration employees from the City of Groningen, and members of civic initiatives, SMEs, and energy cooperatives based in Groningen were involved in the design and development of the game prototype, and a wide range of people were engaged in playing and evaluating the game. The various groups were involved across four categories (Mildner & Mueller, 2016) in different degrees: (i) as users, engaging with the game; (ii) as testers, testing playable prototypes; (iii) as informants, consulting the design team; and (iv) as design partners fully incorporated in the co-design process. Throughout this research project, this approach contributed to a balanced process in terms of respecting the limited time stakeholders could invest, while engaging them in as many meaningful activities as they desired.

A rather different approach is cooperative inquiry (De Jans et al., 2017). In cooperative inquiry, every stakeholder becomes part of a core design group comprising a team of designers with equal participation rights, and all decisions are collectively agreed upon. This approach is rather time intensive and requires small groups and individuals with equal participation skills.

3.3. Priorities and preferences

While D2.3 will focus on GS options for the engagement of EC members, this report aims to uncover the priorities guiding public outreach in ECs. These include the initiatives aimed at expanding the size of ECs and initiatives designed to raise awareness and gain support from the broader public for these ECs.

The main research questions are:

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R6. What are the key priorities for public outreach in ECs?
R7. What specific behavior changes or learning outcomes are ECs aiming to attain through their public outreach initiatives?
R8. What are the preferences of stakeholders in terms of GS for ECs?

To answer these questions, we conducted:

- interviews with the pilots
- and an EU survey with EC members and other stakeholders.

3.3.1. Interviews with the RESCHOOL pilots

Initially, a consortium-wide research initiative was undertaken to systematically address questions R6-R8 mentioned above, within the framework of the RESCHOOL project. A series of interviews with the four pilot communities in RESCHOOL were conducted to specify the open issues and questions on public outreach. These interviews aimed to provide a nuanced understanding of the unique challenges, aspirations, and contextual factors that each pilot community encountered in the integration of gamified strategies. The insights derived from these interviews contributed to a richer understanding of the complexities inherent in public outreach and served as a foundation for the subsequent survey. Seven people were interviewed from the four different pilots of RESCHOOL, and four out of seven were women.

The questions of the interviews were the following:

1. Your EC is interested in (scale[14]):
    - attracting new members.
    - organizing educational workshops for neighbors/schools.
    - involving other stakeholders.
    - team-building activities for the members of the EC.
2. Examples of outreach activities run by the community / plans.
3. Do you receive applications of new members / expression of interest? How often?
4. What's the entry cost and the entry procedure?
5. Which may be the barriers for a person to enter your community?
6. What do you think is important to know before entering an EC?
7. What do you think is important to know before creating an EC?

The interviews were conducted via the collaborative platform Miro[15] where notes were taken down by the interviewees and the interviewers. CERTH conducted the interviews and the summarization. These notes were then collected and summarized.

[14] The scale was a line assigned with not at all and very much at its two ends and the respondents placed a post-it note at the points which best reflected their answer
[15] https://miro.com

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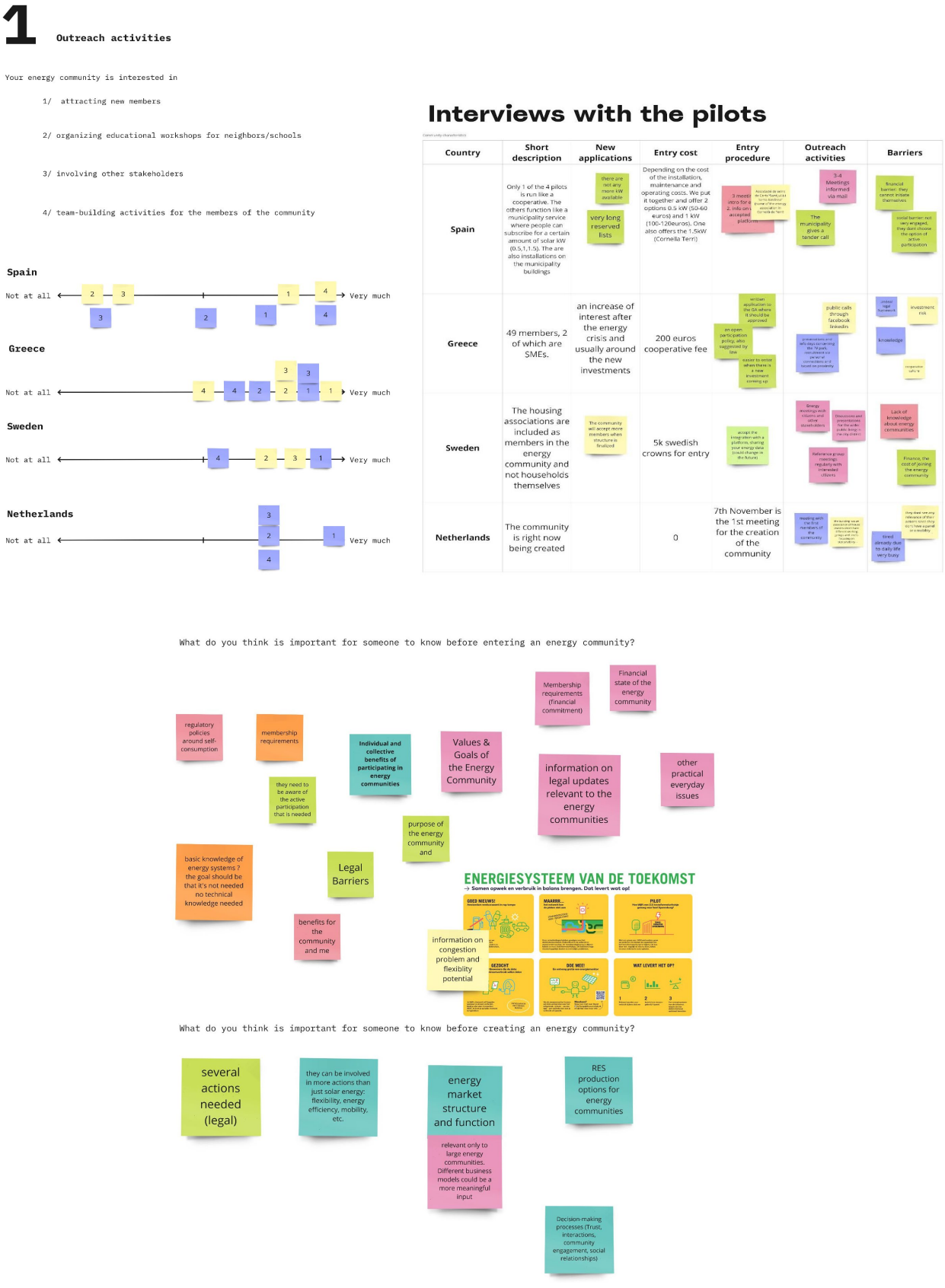

Figure 6: Interviews with the PILOTs - notes

GR, SE and NL pilots set as a first priority the attraction of new members and the ES pilot prioritized the increase of engagement within the community. The rest of the public outreach activities were prioritized differently,

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based on each pilots' developmental stage and context. The communities publish open calls for new members when they are in the first stage of development or there is a new round of investment. The ES pilot has set a standarized entry procedure of 3 stages. Only the NL pilot does not include an entry fee for enrolment. The open calls were published through social media, personal networks and in some cases the municipality (ES). In the SE pilot frequent meetings are organized between the reference group that is leading the creation of the EC and interested citizens.

Finally, regarding barriers to entrance, the financial barrier was mentioned by ES, GR and SE. NL underlined the lack of time as a barrier for interested people but also the lack of understanding of individual benefits. ES underlined the lack of motivation to collaborate and co-create. The lack of cooperative culture was also mentioned by GR.

An important difference that arose between the pilots is the existence of housing or building associations in the SE and NL pilots that serve as a social structure for collective decision making.

3.3.2. Survey

Through the series of interviews conducted within the RESCHOOL project, specific hypotheses were formulated, aiming to discern prevalent beliefs, preferences, and expectations within ECs. This survey represents a first step in testing these hypotheses. The primary objectives are to understand the priorities of ECs, evaluate the perceived impact of gamification strategies, and outline the informational needs crucial for attracting new members. Additionally, the survey aims to investigate technological preferences, optimal GS characteristics, and potential gender considerations, providing a holistic view of the gamification landscape within ECs.

Hypotheses tested based on the interviews include the following:

1. It is a top priority for the communities to attract new members and involve other stakeholders.
2. The adoption of gamification strategies is believed to increase the impact of the public outreach campaigns for the promotion of ECs.
3. The information that the new members need to enter is individual and collective benefits of participation in an EC, the values of each EC, membership requirements.
4. The most suitable games are low-tech.
5. The gamified interactions should last a few minutes, offered on-site, and played with other people.
6. There are not important gender preferences in the types of GS suggested.

The survey was distributed through RESCHOOL's network and connections, through the Bridge newsletter on 10/12/202 and, in the SIPAG consortium[16] and remained open till 21st January 2023. It is included in the Annex(a) of this report. The survey was completed by 22 people, 32% women and 68% men, all between 25-61 years old. Their background can be seen in Figure 7:

[16] Social Innovation and Policy Advisory group (SIPAG) is a group of representatives, created under RESCHOOL, drawn from key stakeholders aiming to provide advice, knowledge and guidance for a better development of energy communities across EU. The SIPAG is expected to contribute to improve the awareness and engagement strategies, identification of technological requirements, support to define innovative business models and policy roadmaps or advice on regulatory boundaries, among others.

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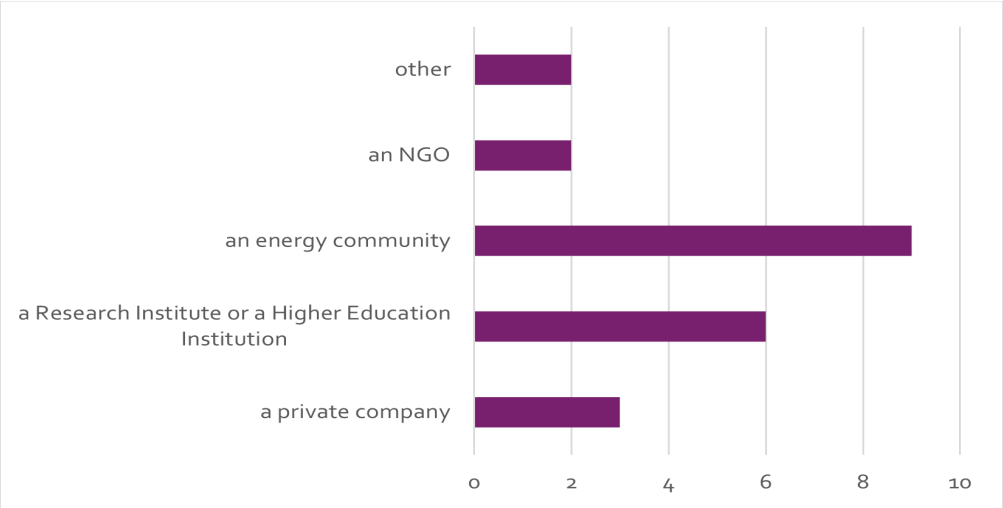

Figure 7: Background of the survey respondents.

Priorities and knowledge

Among the 22 respondents, 21 highlighted the attraction of new members as a primary concern for the ECs, while 12 identified increasing awareness among the wider public as another top priority. Following closely were concerns about involving other stakeholders, with 8 respondents expressing interest, and lastly, attracting funding, which was noted by 2 respondents.

The respondents also added other priorities that were not included in the multiple-choice question and more specifically: promotion of projects and strategies, improvement of the understanding of energy, highlighting the added value of the energy community (not a classical company), sharing knowledge and experiences so that more energy communities are created and thrive, local cohesion / sense of community / community building.

As far as the knowledge that should be shared through the public outreach activities the respondents recognized the collective benefits of ECs as the most important information followed closely by the individual benefits, values and goals of each energy community, membership requirements of each energy community and options for renewable energy generation and consumption investments for energy communities. Other information that was added to the list was the objectives, targets and operation processes, the benefits of a just and inclusive energy transition beyond the local community: fight climate change, increase energy independence, promote democratic processes and citizen participation, care for the common good and finally the economic benefits and other non-monetary and/or social value.

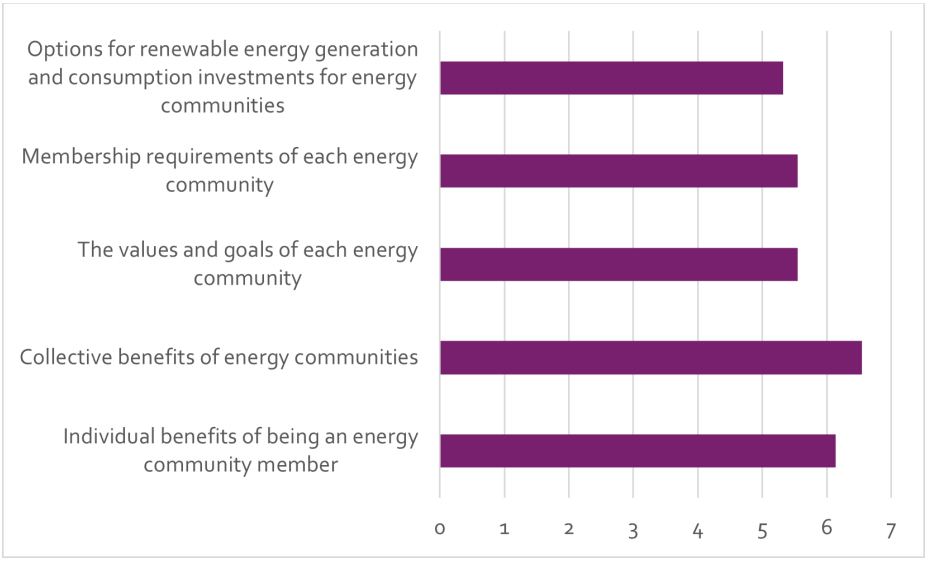

Figure 8: Learning outcomes of the GS as prioritized by the survey respondents

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Needs and preferences for gamified strategies

Most respondents (86.36%) recognized the potential of gamification as a tool to increase the impact of public outreach campaigns of ECs.

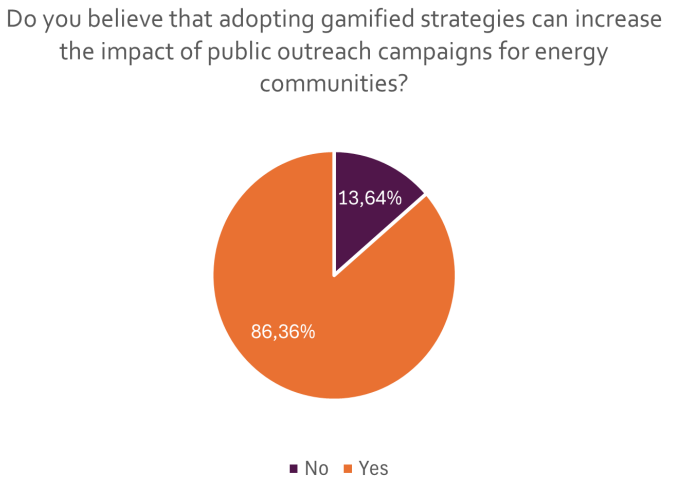

Figure 9: Beliefs of the survey respondents regarding the potential of GS for public outreach of ECs

Collaboration and competition are powerful motivators that can enhance learning and engagement in a serious game. (Fijnheer, 2021). The preferences for gamified strategies among respondents reveal a preference towards collaborative approaches, with 432.86% expressing a preference for collaborative gaming experiences, while a minority (4.76%) indicated a preference for competitive strategies and the majority (52.38%) favored a combination of both collaborative and competitive elements. In terms of the mode of engagement, the majority (57.14%) preferred on-site participation, suggesting a preference for in-person gaming experiences. However, a substantial portion (42.86%) showed interest in remote gaming strategies, emphasizing a desire for flexibility and virtual engagement. Additionally, a significant majority (76.19%) expressed a preference for gamified activities conducted together with other people, underscoring the social and interactive nature of these strategies, while a minority (23.81%) indicated a preference for individual participation. These preferences collectively underscore the importance of offering a versatile range of gamified strategies that accommodate both collaborative and competitive elements, cater to different engagement settings, and align with diverse social preferences.

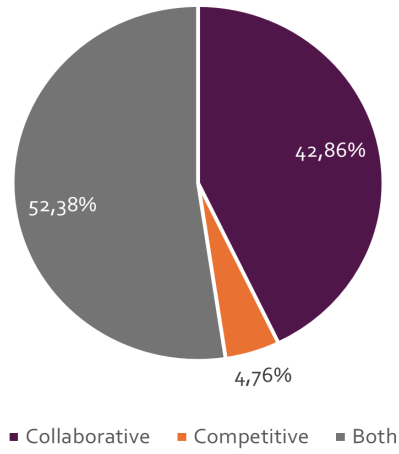

Figure 10: Collaborative vs competitive gameplays according to the survey respondents

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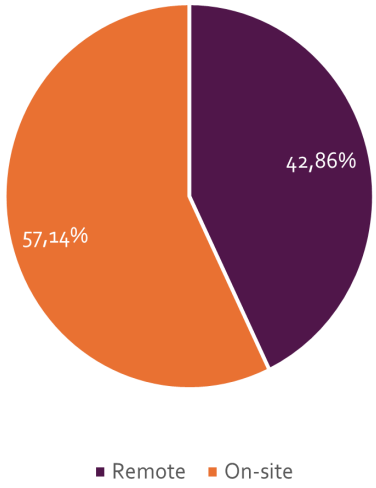

Figure 11: Remote Vs online as preferred by the survey respondents

As far as the duration of the GS is concerned, some participants prefer shorter and focused activities, while others advocate for longer sessions, indicating that the mean duration could fall within a range rather than a specific fixed value. Ultimately, the consensus is on tailoring the duration to ensure optimal engagement and effectiveness, considering the diverse preferences and needs of participants within ECs.

The survey results reveal diverse preferences for engaging activities. Quiz sessions, Virtual Reality (VR) tours/games, escape rooms, and hands-on games with tools like sticky notes and pens garnered notable interest. Arts and creativity competitions, spanning storytelling and photography, also received favorable responses. Social media challenges and bingo also contributed to the diversity of preferred activities, underscoring the importance of offering a variety of options to cater to the varied interests within the surveyed group.

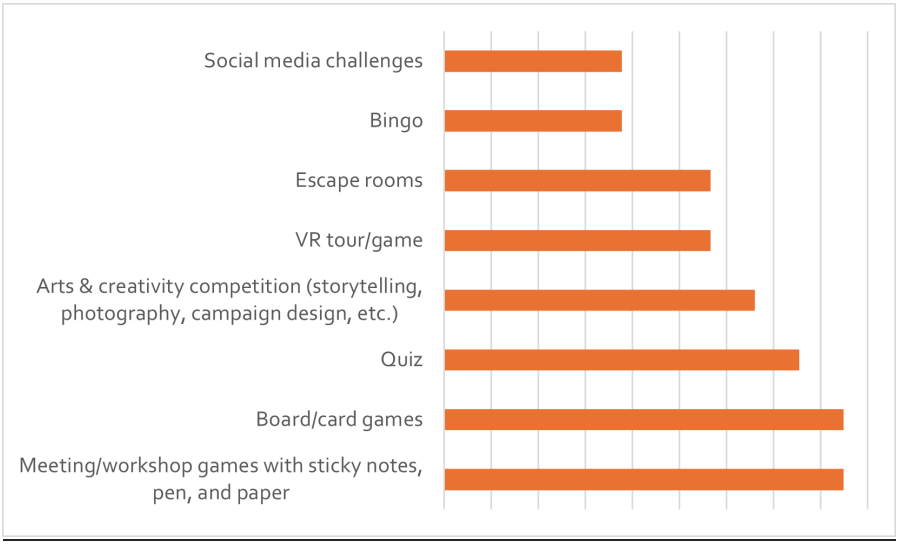

Figure 12: Most preferred mediums of GS for the public outreach of ECs according to the survey respondents

Gender considerations

The majority of respondents, comprising 68.2%, expressed a belief that there are no significant considerations to be taken into account when co-designing GS for energy communities (ECs). Notably, gender did not appear to influence this perspective, with 33.33% of men and 28.37% of women agreeing on the importance of incorporating a gender lens in the co-design process. This may indicate a need for greater awareness and promotion of gender equality values among EC members and stakeholders, as emphasized by the Gender

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Power Working Group of RESCOOP[17]. The people which identified the importance of integrating a gender lens, mentioned that:

- It is important to recognize and address gender differences in motivation when designing community activities.
- Strategies that avoid gender stereotypes can help attract a diverse audience.
- Activities emphasizing technical aspects tend to attract more men, while those emphasizing social and collective elements tend to attract more women.
- Further research is suggested to explore specific strategies for engaging different genders in community participation.

3.3.3. Survey conclusions

The survey results offer valuable insights into the preferences for gamified strategies among the respondents. The substantial preference for collaborative approaches, indicated by 42.86% of participants, underscores the importance of fostering teamwork and shared experiences in gamified activities, a finding that is greatly aligned with the community and collaboration as core values of ECs. The finding that 52.38% prefer a combination of both collaborative and competitive elements suggests the potential effectiveness of hybrid strategies that cater to a diverse range of preferences. Moreover, the strong inclination towards on-site participation (57.14%) highlights the enduring appeal of in-person engagement, while the significant interest in remote options (42.86%) signals a growing demand for flexible and virtual gaming experiences.

Future steps could include the creation of versatile gaming experiences that cater to the diverse preferences revealed in the survey. Additionally, the exploration of innovative ways to integrate technology and remote participation into collaborative gaming activities can enhance accessibility and accommodate evolving preferences. Furthermore, the strong preference (76.19%) for gamified activities conducted together with others suggests the importance of promoting social interaction within these strategies. Future initiatives should focus on fostering community engagement and creating opportunities for participants to connect and collaborate. Finally, ongoing research and regular feedback mechanisms will be essential to adapt gamified strategies to evolving preferences and ensure continued effectiveness in promoting participation and achieving desired outcomes as well as ensure a gender equal motivation and participation.

[17] https://www.rescoop.eu/gender-power#gender-power-working-group

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4. RESCHOOL Co-design and Gamification framework

Following the above research, we created a framework to assess and design GS for ECs, keeping in mind that it should be an easy-to-use tool for any stakeholder with interest in organizing public outreach activities related to ECs.

The framework aims to:

- structure the co-design process
- inspire the creation of GS for ECs

Similar frameworks have been developed for example to create game-based approaches for sustainable water governance (Aubert et al., 2019) or policy design.

4.1. Steps

There are four phases in the co-design process of the informant design framework (Scaife et al.,1997):

- Phase 1: Define Domain and Problems
- Phase 2: Translation of Specification
- Phase 3: Design low-tech material and test
- Phase 4: Design and test high-tech material

The SISCODE project[18] which created a toolkit for co-creating policies, has also recognized 4 phases:

- Analyse context
- Reframe problem
- Envision alternatives
- Prototype and experiment

Other design frameworks such as the Design Thinking Framework Process have 6 steps:

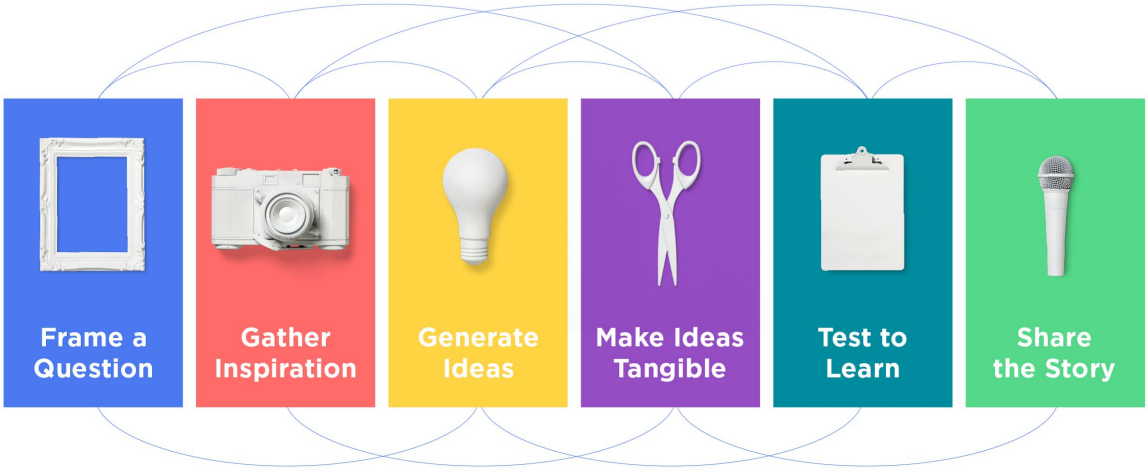

Figure 13: IDEO Design thinking Framework process[19]

For the RESCHOOL Co-Design and Gamification Framework we decided to favor simplicity by dividing the tasks in four steps: Connect, Brainstorm, Design and Test. The steps, their objectives and relevant activities are included in the Table 3:

[18] https://siscodeproject.eu/about/

[19] https://www.ideou.com/blogs/inspiration/design-thinking-process

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Table 3: Steps of the RESCHOOL co-design and gamification framework

Step	Objective	Activities
Connect	Initiate the design process by establishing a clear understanding of the problem, context, and stakeholders.	• Connect with stakeholders, end-users, and relevant sources to gather insights. • Define the problem statement and project goals. • Identify constraints and considerations that might impact the design.
Brainstorm	Generate a diverse range of ideas and solutions to address the identified problem.	• Conduct brainstorming sessions involving cross-disciplinary teams. • Encourage the free flow of ideas without immediate evaluation. • Explore various creative techniques to stimulate innovative thinking.
Design	Develop a detailed plan or prototype based on the selected ideas from the brainstorming phase.	• Translate conceptual ideas into tangible designs, considering user experience and functionality. • Collaborate with relevant experts to refine the technical aspects of the solution. • Create prototypes, wireframes, or mock-ups to visualize the design.
Test	Evaluate the designed solution to gather feedback, identify strengths and weaknesses, and inform necessary adjustments.	• Implement usability testing with representative users. • Gather feedback on functionality, user experience, and overall effectiveness. • Analyze test results and iterate on the design based on the insights gained.

The co-design process is an iterative process, meaning that the nature of the design workflow is repetitive and cyclical, where designers revisit and refine various stages of the project to improve and optimize the outcome. This iterative approach allows for continuous refinement, adaptation, and enhancement of the design based on insights gained through each iteration. It is a flexible and responsive method that helps address challenges, incorporate user feedback, and ultimately achieve a more polished and effective design solution.

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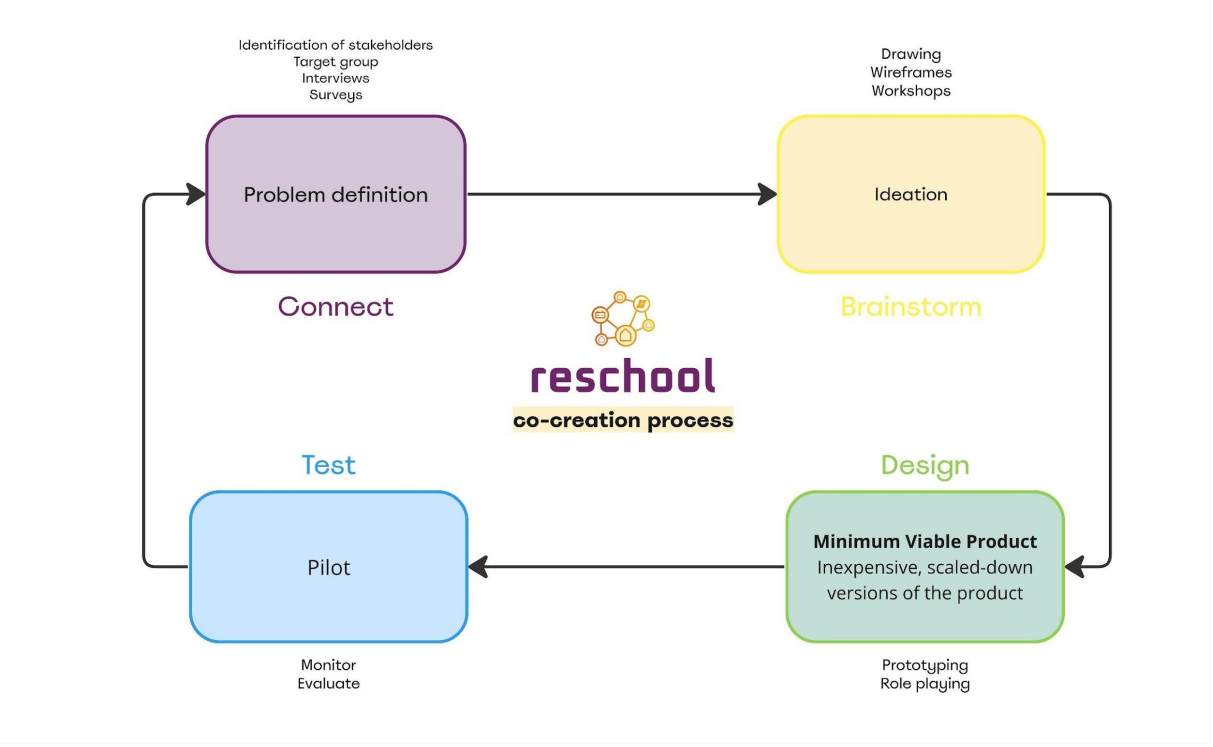

Figure 14: Steps of the RESCHOOL co-design and gamification framework

4.2. Connect - template

The co-design process is initiated by any stakeholder that is interested to integrate GS to support the public outreach of ECs. To facilitate the first step of the co-design process, a template was created which includes a series of straightforward questions.

Table 4: Connect - template

Who is your target group?	Identify the specific audience or community for whom the GS are being designed. This helps tailor the experience to the preferences, needs, and characteristics of the intended participants.
Problem definition	In this section, we aim to understand the needs and motivations of our players by taking their Point of View.
What should the players learn?	Clearly outline the intended outcomes of the GS. This includes specific knowledge, emotions, or overall experiences that participants should gain through engagement with the gamification elements. Adopt the players' point of view as much as possible.
Why should we use a gamification strategy?	Justify the use of gamification by highlighting how it can enhance engagement, motivate behavior change, and contribute to a more interactive and enjoyable experience for the target group, ultimately addressing the identified problems.
What the player does **not** want.	Acknowledge potential negative aspects or deterrents that participants may want to avoid in a gamified experience. This helps in avoiding design elements that might be counterproductive or unappealing.

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Where is the game happening?	Specify the physical or virtual spaces where the GS will take place. Whether it's online platforms, community events, or a combination, understanding the context is crucial for effective design.
When - how long does it take?	Define the timing and duration of the GS. This includes scheduling events or activities and determining the overall time commitment expected from participants.
Stakeholders	Identify the key stakeholders who should and could be part of the co-design process.

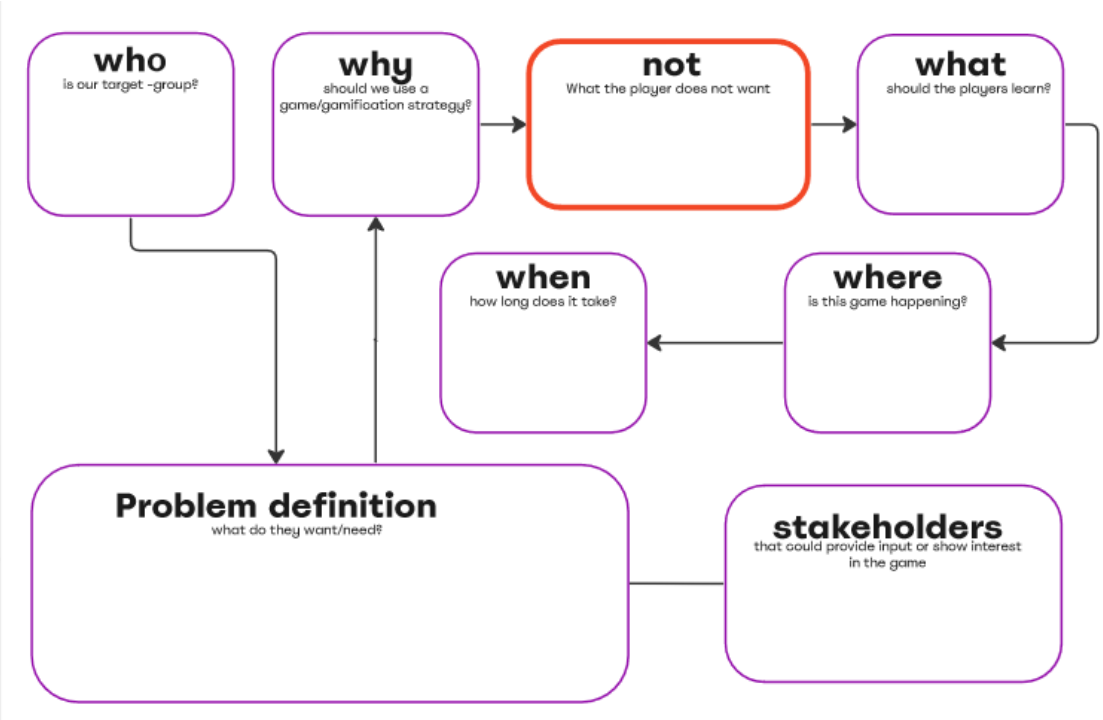

Figure 15: Connect - template

Additionally, we created an **Inspiration Canvas** where potential answers to all these questions were collected through our interviews and survey, to support and inspire ECs in their first step.

Table 5: Connect - inspiration canvas

Who is your target group?	Identify the target group for which you are developing your GS. The GS could be targeted to more than one, but it's better to focus as much as possible to the needs and preferences of one or two target groups: • Young people • Families • Citizens first hearing about ECs • Citizens interested to join an EC • Members of ECs • Other stakeholders
Problem definition: What do they want/need?	Take the standpoint of the player and imagine what they want to take back from this experience. Use phrases such as: 1. **When playing this game, I would like to…**

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	○ "...experience a strong sense of collaboration with other players." ○ "...challenge myself and test my skills in a competitive environment." ○ "...learn something new about ECs" ○ "...immerse myself in innovative technologies like Virtual Reality or Augmented Reality." ○ "...have the flexibility to participate either on-site or remotely." 2. **During the game, I hope to...** ○ "...interact socially with other players and build connections." ○ "...encounter a variety of challenges and game formats for a diverse experience." ○ "...be recognized and rewarded for my contributions." ○ "...see the real-world impact of sustainable actions within the game." ○ "...engage in inclusive gameplay that accommodates different skill levels and backgrounds." 3. **My ideal game would allow me to...** ○ "...express my creativity through artistic elements like storytelling or photography." ○ "...be part of a community where my input is valued." ○ "...understand the technical/technological/legal aspects related to ECs". ○ "...have the option to choose between competitive and collaborative elements." ○ "...experience both the virtual and tangible benefits of sustainable actions." 4. **To enhance my gaming experience, I would appreciate...** ○ "...innovative and cutting-edge technologies integrated into the gameplay." ○ "...flexible participation options that fit my schedule and preferences." ○ "...a variety of rewards and recognitions for different achievements." ○ "...clear communication on the real-world impact of my in-game decisions." ○ "...opportunities to contribute creatively to the overall game narrative."
What should the players learn?	This is an indicative list of learning goals of a GS related to ECs: <u>Collective Benefits:</u> ● Alleviate risks of social unrest and poverty. ● Ease economic pressure on businesses and industry, particularly at local levels. ● Advancing decentralization and digitalization for improved autonomy, energy security, and flexibility in balancing local supply and demand. ● Collective ownership and inclusive organizational and legal structures. ● Strengthen democratic processes, social cohesion, and transparent governance models. ● Make local communities more resilient through shorter supply and value chains. ● Trust and acceptance of local renewable energy projects.

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	Individual Benefits: ● Empowerment. ● STEM knowledge. ● Lower electricity prices. ● Sense of Community. Technical Aspects: ● Entry fee and entry procedure. ● Participation requirements/active involvement (frequency of GA - General Assembly). ● Energy system architecture and market. ● Self-consumption. ● Flexibility (Demand Response). ● Energy Sharing. ● Energy Storage. ● Electricity Generation. ● Grid Congestion. ● Legal Barriers.
Why should we use a gamification strategy?	Take a moment and list the added value of using a GS instead of other engagement techniques. What do you think will be different when you apply a GS compared to just providing information or asking for some actions? Pick your two or three priorities: ● Increased Motivation ● Active Participation ● Social Interaction ● Personalized Learning ● Feedback Mechanism ● Long-term Engagement ● Memorability ● Adaptable Approach ● Sense of Accomplishment ● Community Building
What the player does **not** want.	Identify two or three aspects, that seem relevant to your case, that the GS should avoid triggering in players: ● Monotony ● Overwhelming Complexity ● Lack of Clarity ● Excessive Competition ● Limited Interactivity ● Lack of Personalization ● Ineffective Feedback ● Unrealistic Challenges ● Inaccessible Technology ● Lack of Recognition ● Excessive Time Commitment ● Irrelevant Content ● Poorly Designed User Interface ● Disconnected Real-world Impact

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Where is the game happening?	Which is the context and setting of your GS? • meeting • workshop • classroom • conference • exhibition • home
When - how long does it take?	What would be the ideal duration of the gamified experience? • 5-15 min (quick round) • 16-30 min • 31 min - 1 hour • more than 1 hour
Stakeholders	Different stakeholders can be involved in the co-design process (Mildner & 'Floyd' Mueller, 2016): • as users (how they engage with the game), • as testers (testing playable prototypes), • as informants (consulting the design team) and • as design partners fully incorporated in a co-design process. Depending on your co-design aim the following stakeholders might be relevant to your development: • Energy experts • Policy experts • Teachers • Game designers • Graphic designers • Social scientists • Game developers

Figure 16: Connect - inspiration canvas

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The provided Connect template serves as a useful tool for both the creation and assessment of gamified strategies tailored to ECs. In the creation phase, the template prompts designers to define their target group, articulate the specific needs and challenges faced by the community, and establish the desired outcomes in terms of learning, emotions, and overall experiences. The "How might we...?" question encourages a creative brainstorming process, fostering a diverse range of game concepts. Once gamification elements are implemented, the same template becomes an evaluative instrument. By revisiting the initial questions, stakeholders can assess the effectiveness of the gamified strategy. They can analyze whether the designed elements align with the identified needs, if the game avoids what the players do not want, and if the intended outcomes are achieved. This iterative approach ensures a continuous refinement of GS, fostering engagement and sustainable behavior change within ECs.

4.3. Brainstorm

The next step of the co-design process is the brainstorming step. To facilitate the process, it's important to align the participants to the outcomes of the previous step. According to IDEO[20] there are 7 rules for brainstorming:

1. Defer Judgement
2. Encourage Wild Ideas
3. Build on the Ideas of Others
4. Stay Focused on the Topic
5. One Conversation at a Time
6. Be Visual
7. Go for Quantity

The MIT HR resources[21] suggest the following brainstorming steps:

1. Introduce the question to be brainstormed and review the rules of brainstorming:
    - All ideas are welcome
    - No comments or evaluation during the brainstorm
    - The more ideas the better
    - Don't worry about duplicate ideas at this point
2. Explain what will be done with the brainstormed ideas
3. Write the question to be brainstormed at the top of the first page of flipchart paper.
4. If you wish, offer a one minute "quiet period" before the brainstorm for people to think about the question and jot down a few ideas
5. Begin the brainstorm.
    - Guide the brainstorm by recording ideas on a flipchart or whiteboard as they come. You may wish to designate a recorder. Stop any comments that evaluate ideas. Invite new ideas, and encourage the group to share their ideas freely. Help generate energy and free-thinking through encouragement.
    - When one flipchart page is full, tear and post it where it is visible, then start the next page.
    - As the responses slow down, offer last chances for additional ideas, then stop the brainstorm. Ask the recorder for his or her ideas. Thank people for participating.
6. Number or letter the ideas when you have the full list, so people can more easily refer to a particular idea.
7. Ask for clarification of any ideas that are not clear to you or others.

Table 6: Brainstorming mediums for GS

How might we...? Brainstorm different types of games, go for quantity not	Foster a creative brainstorming process by encouraging a wide range of ideas without immediate evaluation. Brainstorm through sketching and prototyping and experimenting.

[20] https://www.ideou.com/blogs/inspiration/7-simple-rules-of-brainstorming
[21] https://hr.mit.edu/learning-topics/meetings/articles/brainstorming

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quality, defer judgment, encourage wild ideas.	Different mediums that you might want to remember while brainstorming: • Mobile Apps • Web-Based Platforms • Virtual Reality (VR) • Augmented Reality (AR) • Online Learning Platforms • Social Media Challenges • Board Games • Card Games • Interactive Workshops • Escape Room Experiences • Interactive Simulations • Storytelling Competitions • Quiz and Trivia Platforms • Scavenger Hunts • Community-Based Platforms • Arts and Creativity Competitions • Role-Playing Games (RPGs) • Point-Based Systems • Story-driven Apps • Gamified Physical Activities

4.4. Design, Test

In the Design step of the co-design process, the insights and outcomes generated during the Brainstorm step serve as the foundation for creating the Minimum Viable Product (MVP). This phase involves collaborating with experts such as game designers, graphic designers, and developers to bring the conceptualized ideas to life. The following experts could contribute to this step:

1. **Game Design Experts:**
   - Game designers play a crucial role in shaping the overall gameplay mechanics, structure, and dynamics of the gamified strategy. They translate the conceptual ideas generated during Brainstorm into a coherent and engaging game design. This includes defining rules, challenges, progression systems, and ensuring an optimal user experience.
2. **Graphic Designers:**
   - Graphic designers contribute by transforming abstract concepts into visually appealing elements. They design the user interface, create visual assets, and ensure a cohesive and aesthetically pleasing presentation. The visual elements should align with the intended theme, brand identity, and user experience to enhance engagement.
3. **Developers:**
   - In the case of a digital GS, developers use their technical expertise to implement the design concepts into a functional MVP. They are responsible for coding the game mechanics, integrating visual assets, and ensuring the technical feasibility of the gamification strategy. Collaboration between game designers and developers is crucial to align the creative vision with the technical execution.
4. **Iterative Prototyping:**
   - The co-design process emphasizes an iterative approach. Game design experts, graphic designers, and developers work collaboratively to create prototypes of the MVP. These prototypes are essential for testing and refining the gamified strategy based on user

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feedback, ensuring that it meets the intended objectives and engages the target audience effectively.

5. **User Experience (UX) Considerations:**
    - Incorporating UX principles is vital to the success of the MVP. Design experts, including those specialized in UX, contribute to creating an intuitive and user-friendly interface. They focus on ensuring that the gamified elements are easy to understand, navigate, and provide a positive overall experience.
6. **Alignment with Co-Design Goals:**
    - Throughout the design process, it's crucial to maintain alignment with the co-design goals established in earlier steps. The collaborative input from diverse stakeholders, including end-users and experts, ensures that the gamification strategy meets the needs and expectations of the intended audience.
7. **Documentation:**
    - Comprehensive documentation is created to communicate the design decisions, technical specifications, and visual guidelines to the entire co-design team. This documentation serves as a reference point for future iterations, scaling, or modifications to the gamification strategy.

In the Test step of the co-design process, the primary goal is to assess the effectiveness, usability, and overall impact of the Minimum Viable Product (MVP) developed in the Design step. This step involves gathering feedback from end-users and stakeholders to refine and enhance the GS. Here's an elaboration on some of the potential considerations during the Test step:

1. **User Testing:**
    - Conduct extensive testing with the target group to evaluate their interaction with the gamified strategy. This involves observing player behavior, collecting feedback, and identifying any usability issues or challenges they may encounter.
2. **Usability Testing:**
    - Evaluate the overall usability of the GS. Ensure that players can easily navigate through the platform, understand the game mechanics, and achieve the intended objectives without encountering significant obstacles.
3. **Accessibility Testing:**
    - Assess the accessibility of the GS to ensure inclusivity. Consider factors such as readability, color contrast, and navigation, making adjustments as needed to accommodate users with diverse needs.[22]
4. **Scalability Assessment:**
    - Evaluate the scalability of the GS to accommodate potential increases in players' number.
5. **Alignment with Co-Design Goals:**
    - Verify that the GS aligns with the co-design goals established in the step Connect. Ensure that the user experience, engagement mechanisms, and overall impact are consistent with the intended outcomes of the co-design process.
6. **Documentation of Findings:**
    - Document the findings and insights gathered during the testing phase. This documentation serves as a valuable resource for future iterations, providing a clear record of the testing process, identified issues, and implemented improvements.
7. **Communication with Stakeholders:**
    - Communicate the testing results and refinements to all relevant stakeholders, including the co-design team, developers, designers, and players. Transparency in sharing outcomes fosters a collaborative environment and ensures everyone is informed about the progress.
8. **Go/No-Go Decision:**

[22] More on accessibility testing can be found in Sauer, Jürgen & Sonderegger, Andreas & Schmutz, Sven. (2020). Usability, user experience and accessibility: towards an integrative model. Ergonomics. 63. 1-23. 10.1080/00140139.2020.1774080.

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- Based on the testing outcomes, make an informed decision on whether to proceed with the current version of the GS or to implement further refinements before a broader launch.

By emphasizing user testing, feedback collection, and iterative refinement, the Test step ensures that the GS is not only well-received but continuously evolves to meet the evolving needs and expectations of players and stakeholders.

4.5. Artificial Intelligence

Artificial Intelligence (AI) is currently revolutionizing several sectors, fundamentally changing, and redefining the way industries operate. AI could significantly enhance co-design processes by facilitating collaboration, creativity, and efficiency, especially in the initial steps of the co-design process. ECs, or any other initiator of the co-design process, could integrate diverse tools widely available on the internet to support the inspiration and collaboration during the sessions.

Artificial language models, particularly large-scale ones like GPT-3 (Generative Pre-trained Transformer 3), have been increasingly used in co-design and brainstorming processes. These language models have the capability to generate human-like text based on input prompts, making them valuable tools for ideation. Specialized ideation tools have also been created to support diverse human-computer partnerships for creating mood boards, aiding in exploration, visualization, and communication of ideas (Koch et al.,2020).

Furthermore, co-designers could also leverage language models for scenario exploration,devising and examining various situations pertinent to their GS. The language models could enhance their ability to anticipate challenges, envision alternative solutions, and ensure that the design addresses a wide array of potential circumstances, contributing to a more robust and adaptable GS.

Finally, AI image generation could significantly enhance co-design processes by providing diverse creative possibilities and expediting the ideation process (Verheijden & Funk, 2023). Text-to-image generation, for example, is the technique of creating realistic images based on text descriptions known as prompts. This capability is enabled by developments in deep learning and generative models, particularly those based on techniques like Generative Adversarial Networks (GANs), Variational Autoencoders (VAEs) or Diffusion Models (Zhan et al., 2023). Tools that utilize the aforementioned techniques such as GigaGAN (Kang et al.,2023), Parti (Yu et al., 2022), Stable Diffusion (Rombach et al.,2022), DALLE3 (Betker et al.,2023) are trained on huge amounts of images along with textual descriptions and afterwords each model can generate images from textual descriptions. Moreover, text to video generation is now possible due to AI tools like OpenAI Sora[23] and Google Genie[24] which can create interactive video games from simply text or image prompt without any prior training in game principles. From a practical perspective, text-to-image or video generation can be used to dynamically generate scenes, characters, and objects in virtual worlds and video games based on in-game interactions or narrative descriptions. Furthermore, they can help those with visual impairments by transforming written descriptions of images into understandable visual representations.

In a co-design setting, such tools can allow participants to quickly explore a wide range of design options and styles. By integrating AI-generated material into the collaborative process, teams can efficiently brainstorm, share, and iterate on ideas. The generated output serve as stimuli for inspiration, sparking discussions and fostering a dynamic exchange of creative concepts. This not only accelerates the co-creation workflow but also encourages a more inclusive and innovative design process by leveraging the diverse outputs generated by AI.

[23] https://openai.com/sora

[24] Genie: Generative Interactive Environments, https://arxiv.org/pdf/2402.15391.pdf

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5. Implementation

5.1. Energy Community Card Deck

During the brainstorm phase between game design and energy experts, the type of game that was chosen was a Top trumps card game. Top Trumps is a classic card game that emerged in the 1970s in the United Kingdom. The game features themed decks of cards, each highlighting different items or characters related to a specific topic, such as cars, animals, or historical figures. Each card in the deck is equipped with several attributes represented by numerical values, and players engage in rounds where they compare these attributes with those of their opponents. The player with the highest numerical value for a chosen attribute wins the round and collects the opponent's card. The goal is to either collect all the cards in the deck or, in some variations, accumulate the most cards by the end of the game.

Top trumps decks are serious games (Spandler, 2016; Davies,2020), serving as a creative and engaging tool for learning. By incorporating relevant attributes into the cards, educators can reinforce factual knowledge while promoting critical thinking and strategic decision-making. Students not only learn about the subject matter but also develop skills in data analysis as they compare numerical values and make informed choices during gameplay. Additionally, the visual and interactive nature of Top Trumps makes it a dynamic educational tool that caters to diverse learning styles, fostering a sense of enjoyment and competition that can enhance the learning experience. The game's versatility allows educators to adapt it to various age groups and learning objectives, making Top Trumps an effective and enjoyable educational resource. It is mainly targeted to young people aged 10-14 but it could also be used as an ice-breaking activity or as a conversation starter for any age group. The card games were identified as one of the most preferable mediums through our survey (Chapter 3.3.2)

5.1.1. Filling the template

The first step of the co-design process was completed by CERTH's team based on the input of the first WP2 meetings.

Table 7: Filling the template for the Energy Community Card Deck

Who is your target group?	Young people 10-14, Families, Citizens interested to join an EC
Problem definition: What do they want/need?	**When playing this game, I would like to** "...learn something new about ECs" **During the game, I hope to** "interact with others" **My ideal game would allow me to** "try different gameplays" **To enhance my gaming experience, I would appreciate** "extra information on technologies and policies of ECs"
Stakeholders	ECs, Schools, Policy/Energy Experts, Game Designers
Why should we use a gamification strategy?	• Social Interaction • Memorability
What the player does **not** want.	• Monotony • Lack of Clarity

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What do we want them to learn?	• The ECs' diverse fields of activity • The equity and participation aspects in ECs • Different types of RES • The names and cities of ECs across Europe
Where is the game happening?	Classroom, workshop, meeting, home
When - how long does it take?	10-15 min

5.1.2. Co-design session with ECs

The first co-design session included the RESCHOOL pilot partners and energy experts from the consortium, 12 people in total. The idea of the Energy Community Card Deck was presented and then a round discussion was conducted to identify the ideal attributes that could be included in the cards, advantages, and disadvantages. The questions were:

- Which attributes do you think that best describe an EC to a person that has no previous knowledge of ECs?
- Are these attributes easily quantifiable?
- Are data about these attributes widely available?

Figure 17: Notes of the first co-design session

A first list of potential attributes and sources of information was created.

5.1.3. Co-design session with schools

On December 7th and 14th 2023, 23 young people aged 14, participated in co-design sessions with a total duration of 135 minutes. after informed consent was obtained from each participant or their guardians prior to the continuation of the experiment.The workshop included an introduction to RESCHOOL and ECs, where the concepts and objectives were discussed. The use of Bing Image Creator[25] for image generation was demonstrated, followed by team formation and a discussion on the significance of energy community attributes. During the main activity, teams used Bing Image Creator to create images for a series of energy

[25] https://www.bing.com/images/create?FORM=GENILP

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communities and the respective attributes. The workshop concluded with discussion reflecting on students' experiences with ECs and image generation, emphasizing key takeaways.

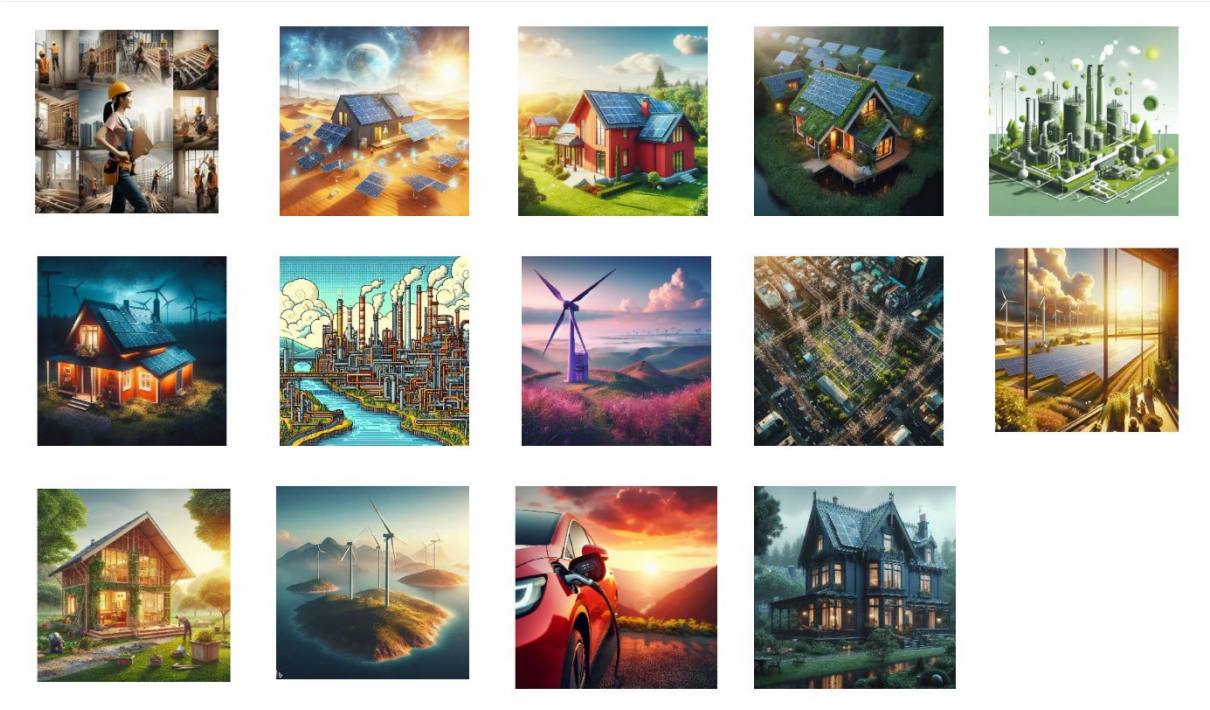

Figure 18: Images generated by students during the second co-design session

The students' prompts can be found in Annex (b). Based on the provided prompts, we can identify some students' preferences regarding the representation of ECs, including technologies, weather conditions, locations, and architectural features. Certain recurring themes could be observed:

- Solar panels and wind turbines: There was a notable emphasis on solar panels and wind turbines, suggesting a strong familiarization with these renewable energy technologies.
- Architectural integration: Many prompts involved integrating renewable energy features into various architectural styles and settings, reflecting an interest in the visual aesthetics and practical application of sustainable technologies in everyday life.
- Environmental integration: The prompts also highlight a consideration for the natural environment, with references to fields, flowers, woods, and less often the geographical context of certain countries.

5.1.4. Co-design session with Game Design and AI experts

Based on the students' prompts and the final list of energy communities and attributes a co-design session with AI and Game Design experts was organised. The main objectives of the session were to:

- refine and enhance the prompts generated by students in accordance with the rules of AI prompts,
- incorporate elements specific to the location, such as landscapes, weather conditions, or cultural nuances,
- ensure representation of the diverse technologies in the images.

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The session was conducted online through the Miro platform[26]. 11 experts participated, 72% men. Initially, the experts were introduced to the concept of the Energy Community Card Deck and the contents and outcomes of previous co-design sessions.

The first step was the layout evaluation, where four alternatives based on the RESCHOOL logo colors (purple, orange) were assessed. The feedback of the participants can be summarized as following:

- Visibility and Contrast: White background for figures is favored for clarity, but some find white boxes too striking.
- Arrows: Arrows going up and down are suggested to indicate comparison, however, maybe they are not really needed in each card, or they could be fully aligned to point up or down
- Fields of activity: Some express concerns about information overload on the cards, particularly regarding the fields of activity. The use of icons was encouraged to enhance readability, that could also be marked from a fixed list.
- Information Clarification: Questions arose about certain attributes, like "vulnerable people," and there was a request for a tutorial playthrough or an introduction manual to clarify such information.

The second step was dedicated to the attribute analysis. The summary of the discussion is the following:

- Balance between "Correctness" and "Appeal": There was a discussion about finding the right balance between ensuring the correctness of information and maintaining visual appeal on the cards.
- Understanding Percentage in the Last GA: Some express that the percentage information from the last General Assembly (GA) may be challenging for people not directly involved to comprehend.
- Clarity for People Outside Energy Communities: Concerns were raised about potential difficulties for individuals outside the ECs in understanding certain attributes. Differentiation between a physical deck and a digital deck is suggested, with more information provided for the latter.
- Encouraging Gender Equality: Questions emerged regarding the ideal percentage of female participation and the learning objectives associated with this attribute.
- Additional Elements: Recommendations include adding a QR code for enhanced accessibility and linking to Key Performance Indicators (KPIs) of the RESCHOOL project.

The third step was the accuracy check on the prompts and the images created by the prompts. The summary of this part is the following:

- Consistency in Style: There is a preference for maintaining the same style across all images in the deck.
- Inclusion of People: Some participants express a desire to see people included in the images.
- Level of Fidelity to the Real World: Feedback suggests a desire for a certain level of fidelity to the real world in the images.
- Inclusion of Landmarks: Positive remarks are made about the inclusion of landmarks in the images, contributing to the recognition of specific areas.
- Accuracy of Images: Participants appreciate images that accurately represent the described locations, with specific mentions of accuracy for Tallinn and Amsterdam.

[26] https://miro.com

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- Preference for Realism: Some express a preference for images that are more realistic.

The final step of the co-design session included the assessment of existing Top Trumps Gameplays and an initial discussion on alternatives.

The typical gameplay, played individually and based on the comparison of the cards and the "best" attributes winning, was characterized as simple but potentially monotonous. The same risk was identified for the "Set of 4s" gameplay. Combined gameplays were suggested that need to be assessed through testing sessions with players.

5.1.5. Next steps

Based on the outcomes of the above co-design sessions, we have initiated the development of the first version of the Energy Community Card Deck. In this version, the attributes identified during the sessions have been incorporated.

Figure 19: Sample of cards as designed at the end of the first co-design iteration

However, we recognize the need for continuous improvement and inclusivity. Therefore, for future versions, we plan to introduce an environmental attribute (e.g., CO_2 avoided) to align more closely with the values of Energy Communities (ECs) in their commitment to environmental protection.

The initial list of participating communities for this version is outlined in Annex (d). In subsequent releases, we aim to diversify the inclusion of ECs, considering factors such as different technologies or a focus on rural and socially oriented ECs. We are exploring the possibility of allowing each EC to contribute by creating their own card, facilitated through a dedicated web platform. Additionally, we are considering the incorporation of a digital version of the game in future iterations, acknowledging the potential complexity involved.

Moving forward in the co-design process, our next steps include brainstorming potential gameplays that align with the identified attributes. Furthermore, we plan to conduct testing to evaluate the clarity and usability of the deck, ensuring it meets the needs and preferences of our target audience. We are committed to an iterative and collaborative approach, aiming to enhance the Energy Community Card Deck based on ongoing feedback and insights gained throughout the co-design journey.

5.2. PILOTs

Two of the PILOTs in RESCHOOL completed the template to initiate the co-design of GS for their public outreach campaigns and are included in the current deliverable. The other two PILOTs (SE and NL) initiated a co-design process focusing on the development of GS for EC members.

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5.2.1. GR PILOT

The target group chosen by the GR PILOT includes local citizens who will be encouraged to share personal data and increase their active participation. The desired outcomes include fostering a sense of community, understanding the benefits of energy efficiency, and promoting social awareness and solidarity. The game or workshop should not exceed 60 minutes in duration and aims to address the problem of efficient energy use. Stakeholders such as municipalities, universities/schools, and other energy communities in Greece are identified as potential participants or sources of input for the game.

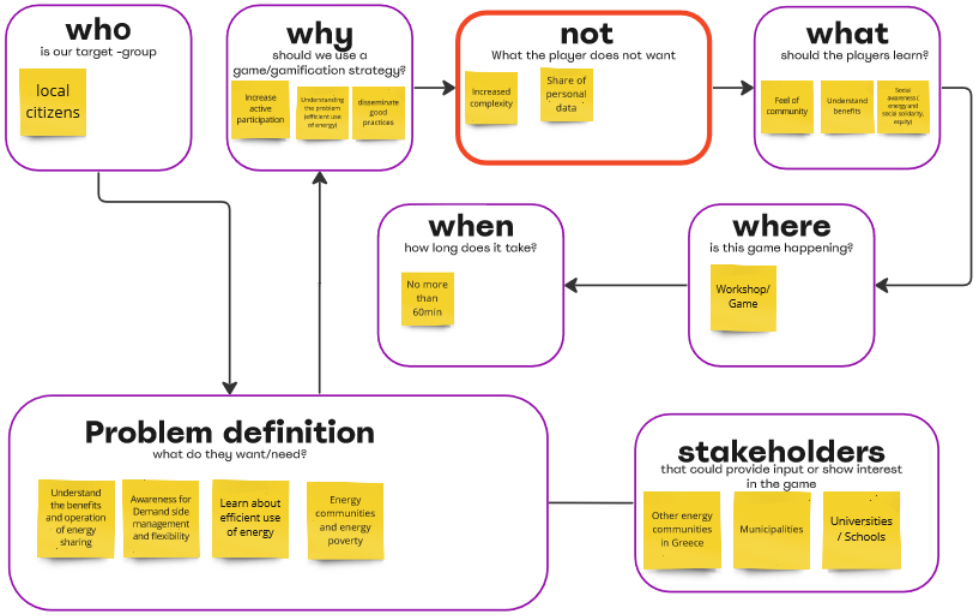

Figure 20: Connect template as completed by the GR PILOT

5.2.2. ES PILOT

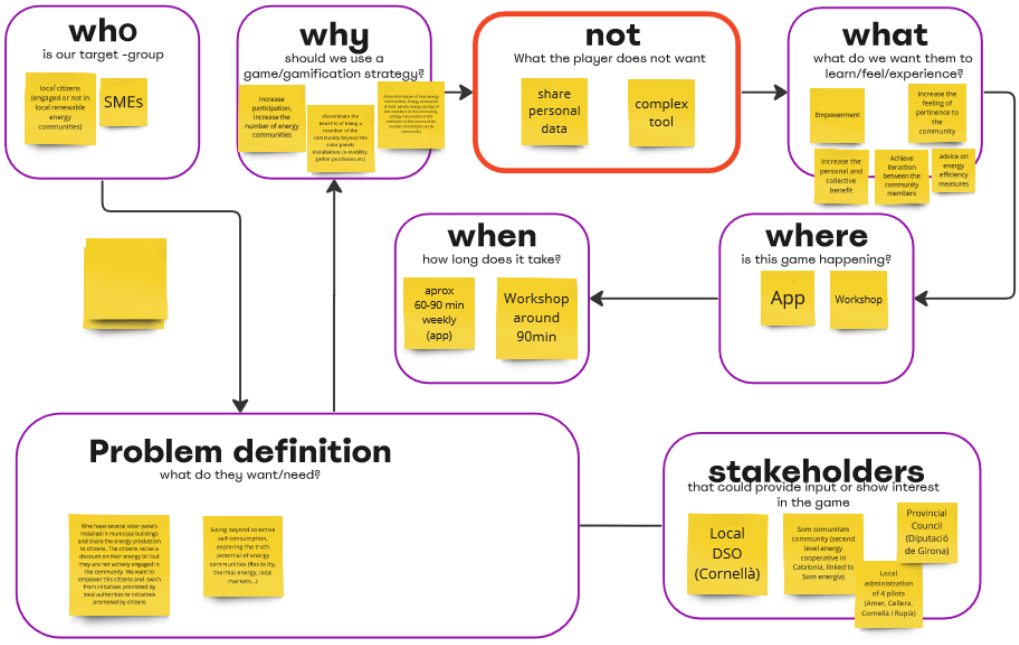

Figure 21: Connect template as completed by the ES PILOT

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The target audience of the ES PILOT comprises local citizens, both engaged and uninvolved in local renewable energy communities, and SMEs. The sharing of personal data and steering clear of complex tools should be avoided. The aim is to disseminate information on local energy communities, covering solar panel energy production, member energy savings, and consumption. The overarching goals are to boost participation, increase the number of energy communities, foster a sense of community belonging, and empower members. Leveraging a GS, the players could experience the benefits of community membership beyond solar installations, enhance personal and collective gains, provide energy efficiency advice, and stimulate interaction among community members. The initiative could either unfold through a dedicated app, requiring an engagement of approximately 60-90 minutes weekly, or a workshop lasting around 90 minutes. Other stakeholders that could be involved are the Provincial Council (Diputació de Girona), Local DSO (ElectroAvellana in Cornellà de Terri), Som comunitats community, and local administrations of four pilot locations (Amer, La Cellera de Ter, Cornellà de Terri and Rupià).

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6. Concluding notes

The synthesis of findings from this report is a synthesis of outcomes of the literature review, interviews, and survey, as well as the outcomes of the creation of the co-design and gamification framework and its implementation for the creation of the Energy Community Card Deck.

The literature review underscores the existence of several GS that could support public outreach in ECs. These GS cover diverse knowledge aspects, simulate scenarios, and target behavior change motivations. However, the optimal medium for GS implementation remains a challenging question, dependent on other variables such as target groups and contextual factors. A recurring issue across studies is the lack of comprehensive information on the structure and context of these GS, including detailed descriptions of intended learning outcomes, game mechanics, game design, behavior change, or educational frameworks. Furthermore, the sustainability of impact resulting from GS is inadequately addressed in the literature. Finally, a few promising GS developed as part of EU projects focused on ECs await practical exploration in other regions or projects.

The review contributes to existing research by providing a comprehensive map of available GS, including mediums, objectives, and target groups. It emphasizes the imperative for more in-depth studies in this field, addressing the existing gaps. Additionally, recognizing the crucial role of GS in ECs' public outreach, the study advocates for a simple and consistent approach to support co-designing GS. This includes the establishment of an inspiration pool and an easy-to-use co-design toolkit, that led to the development of the RESCHOOL co-design and gamification framework's goal.

The survey results offer invaluable insights into preferences for gamified strategies among respondents. These results suggest the need for versatile gaming experiences that accommodate varying preferences. Future steps could involve the creation of remote as well as on-site gaming experiences, with different gameplays (collaborative and competitive), mediums and duration.

In the co-design sessions, we have initiated the development of the first version of the Energy Community Card Deck, incorporating attributes identified during these sessions. Future versions plan to introduce an environmental attribute (e.g., CO_2 avoided) to align more closely with ECs' environmental values. The initial list of participating communities is outlined, with plans to diversify inclusion based on different technologies or a focus on rural and socially oriented ECs. Exploring the contribution of each EC through a dedicated web platform is also on the agenda, along with the consideration of a digital version of the game in future iterations. Moving forward, the co-design process will involve brainstorming potential gameplays aligned with identified attributes and testing for clarity and usability, ensuring alignment with the preferences and needs of the target audience. The commitment is to an iterative and collaborative approach, enhancing the Energy Community Card Deck based on ongoing feedback and insights gained throughout the co-design journey. In essence, the overarching goal remains to foster community engagement and deliver effective learning experiences within ECs. Finally, two of the PILOTs already used the RESCHOOL framework to initiate the co-designing processes for their ECs.

Throughout wp2, we have been hosting and providing support for ongoing workshops and co-design sessions post-launch to keep the content we generate fresh and relevant. These sessions commonly involve target audiences in the iterative development of game content and features, ensuring sustained engagement.

In the upcoming D2.3, the roadmap for implementing these strategies will be described, including scheduling workshops, content updates, and follow-up sessions. The intention is to focus on the importance of feedback loops for continuous improvement, and the contents of these implementation plans will also be flexible in the coming 4-5 months as WP4 with it's focus on engagement campaigns intensifies.

The engagement strategies will prioritize the needs and interests of energy community members rather than the wider public. This targeted approach aims to foster a strong sense of community and shared purpose, leveraging the game as a tool for communal energy-saving efforts. These engagement strategies have been effectively supported by implementing the collaborative game design process to co-design a serious game that focuses on helping users save energy in their homes and understand more about energy communities. Furthermore, a benchmarking of the existing serious games and gamification techniques that focus on energy-saving and community engagement will be included.

By integrating co-design and collaborative principles throughout the game development process, this approach ensures that the game not only educates and engages users in energy-saving behaviors but also strengthens the sense of community and collective action within energy communities. The future hand-in on engagement

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strategies will further elaborate on methods to sustain and deepen this engagement, ensuring the game's long-term impact.

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7. Acronyms

Table 8: Acronyms

WP	Work Package
T	Task
HLUC	High-Level Use Case
D	Deliverable
EC	Energy Community
GS	Gamified Strategy (a serious game or a gamification approach)
RES	Renewable Energy Sources
CEP	Clean Energy for all Europeans Package
RED	Renewable Energy Directive
IEMD	Internal Energy Market Directive
SME	Small and Medium Enterprise
CERTH	Center for Research and Technology Hellas
UU	Utrecht University
EREF	European Renewable Energies Federation
RISE	Research Institutes of Sweden
UiS	University of Stavanger
PILOTs	The four pilot cases in RESCHOOL (Athens, Amsterdam, Girona, Stockholm)
DSO	Distribution System Operator
TSO	Transmission System Operator
DLT	Distributed Ledger Technology
DES	Distributed Energy Systems
CEC	Citizen Energy Community
AI	Artificial Intelligence
REC	Renewable Energy Community

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Annex

a) EU survey: Gamified strategies for Energy Communities

What is your gender identity?

What is your age?

You respond in your capacity as member of:

- ○ an NGO
- ○ a Research Institute or a Higher Education Institution
- ○ a policy making body
- ○ a private company
- ○ an energy community
- ○ other

If your answer was other, please specify:

According to your opinion/experience, please select the top two most important reasons for an energy community to organize public outreach campaigns, workshops, activities:

- ☐ Attract new members
- ☐ Attract funding
- ☐ Involve other stakeholders
- ☐ Increase awareness of the wider public

Please add any other goals of ECs' outreach activities that you consider as important and are not included above:

Please rate the importance of providing the following information to citizens that express interest to participate in an energy community on a scale of 1 (least important) to 7 (most important):

	1	2	3	4	5	6	7
Individual benefits of being an energy community member							
Collective benefits of ECs							
The values and goals of each energy community							
Membership requirements of each energy community							
Options for renewable energy generation and consumption investments for ECs							

Please add any other information that should be provided to a person interested in becoming member of an existing energy community that was not mentioned above:

Do you believe that adopting gamified strategies can increase the impact of public outreach campaigns for ECs?

- ○ Yes

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- No

The gamified strategies developed to support ECs' outreach activities should be:

- Competitive
- Collaborative
- Both

The gamified strategies developed to support ECs' outreach activities should be played:

- Remote
- On-site

The gamified strategies developed to support ECs' outreach activities should be played:

- Individually
- Together with other people

The gamified strategies aiming to support ECs' outreach activities should last around (in min)

Which of the following gamified strategies, if any, do you believe would be more suitable for supporting ECs' outreach activities:

- ☐ Quiz
- ☐ Bingo
- ☐ Scavenger hunt
- ☐ VR tour/game
- ☐ Arts&creativity competition (storytelling, photography, campaign design, etc)
- ☐ Escape rooms
- ☐ Social media challenges
- ☐ Board/card games
- ☐ Meeting/workshop games with sticky notes, pen and paper

Other gamified strategies that could be engaging:

Please suggest up to six attributes from the following list that can be used to create a profile for an energy community to be utilized in gamified strategies:

- ☐ Year established
- ☐ Installed capacity
- ☐ Number of members
- ☐ Active in number of fields (district heating, electricity generation, demand response, etc)
- ☐ % women and non binary people/men
- ☐ % participants in last year's general assembly
- ☐ % vulnerable members
- ☐ Number of employees
- ☐ CO_2 avoided
- ☐ Energy efficiency

Other important attributes for each community might be:

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Do you believe there are gender considerations when it comes to the types of gamified strategies suggested for ECs? If your answer was yes, please explain your thoughts.

- Yes
- No

Are there any accessibility requirements that should be considered in designing the gamification strategies?

Could you please suggest any relevant projects or best practices that integrate gamified strategies as a means of wider public engagement in ECs?

Please share your name and email in case you want to be contacted back for an interview or in case you are interested in further collaboration in the development of the gamified strategies.

By inserting your email you are also accepting the terms regarding the confidentiality and use of your data.

b) Students' prompts

Table 9: Students' prompts for the generative AI image creator

Energy Community	Prompt s
CommonEn	generate a beautiful colourful house with solar panels in the middle of the desert in a sunny day
Deltawind	A realistic photo of a island with wind turbines in a sunny morning
EH!CO!CHE	A new electric red car where we can see the charging plug witha beautiful sunset as the background
ElectriCity	Electricity network
Energeiakh Koinothta Karditsas Synpe (ESEK)	Create an illustration of a solar panel at the roof of a redbuilding
Energie Samen	generate a dark blue Victorian style house in Netherlands with a lot of windows and solar panels in the garden during a gloomy day / generate a green cottage house in the Netherlands with solar panels during the day
Local Energy Communities	white houses next to each other brick roofs with panels and gardens with grass from really far
Middelgrunden	generate an illustration a purple wind generator on a hill with grass and flowers on a cloudy morning / generate an illustration of a district heating factory with many pipes in the outside next to a river
People Powered Retrofit	being energy efficient in great britain / building renovation
PIZTU Kooperatiba Sozietatea	Generate an illlustration of a red house with solar panels during a sunny day with open windows and with a beautiful garden with grass and flowers

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Energy Community	Prompt s
CommonEn	generate a beautiful colourful house with solar panels in the middle of the desert in a sunny day
Deltawind	A realistic photo of a island with wind turbines in a sunny morning
EH!CO!CHE	A new electric red car where we can see the charging plug witha beautiful sunset as the background
Südtiroler Energie Verband	create a field with woods, flowers and a small house next to sunny pannels
The Aran Islands Energy Co-op	make a renovated house taking advantage of nature with good weather and garden
Thermo Bello - EVA Lanxmeer Stichting	geothermal energy in the netherlands / under floor heating installation
TÜ Energiaühistu	generate an orange house in Estonia with solar panels on the roof during the night
Zelena Zadruga - Green Cooperative	tall houses in a city that have plant all over the walls realistic

c) EU survey: Co-creating an Energy Community Card Deck

This is the survey which was used to collect the information of the ECs that were interested to participate in the Energy Community Card Deck

https://ec.europa.eu/eusurvey/runner/reschoolECCD

It will remain open to facilitate the creation of more cards for the Energy Community Card Deck

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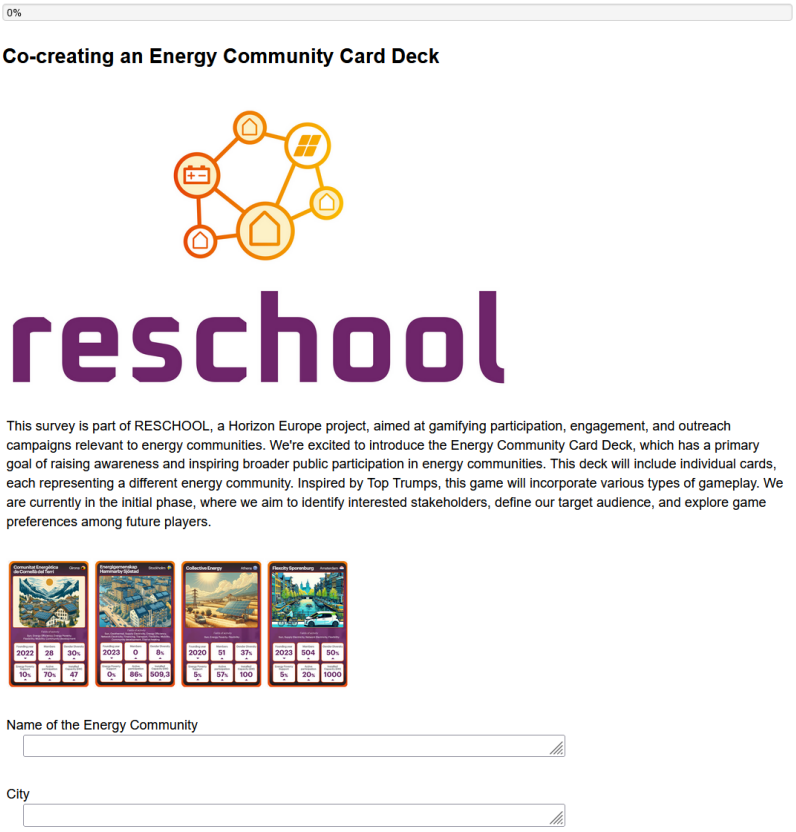

d) List of ECs included in the Energy Community Card Deck

This list is dynamic and currently 18 EC have been included. It will be updated I subsequent tasks.

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#	Energy Community	City	Country
1	Comunitat Energètica de Cornellà del Terri	Cornellà del Terri (Girona)	Spain
2	Comunitat Energètica d'Amer	Amer (Girona)	Spain
3	Comunitat Energètica de La Cellera de Ter	La Cellera de Ter (Girona)	Spain
4	Comunitat Energètica de Rupià	Rupià (Girona)	Spain
5	Aran Islands Energy Co-Operative	Aran Islands, Galway	Ireland
6	Energigemenskap Hammarby Sjöstad (Energy Community Hammarby Sjöstad)	Stockholm (Hammarby Sjöstad)	Sweden
7	Collective Energy (COEN)	Athens	Greece
8	Hyperion Energy Community	Athens	Greece
9	ENERGIE PARTAGÉE	PARIS	France
10	Goiener	Gasteiz	Spain
11	Vereniging Aardehuis Oost-Nederland (VAON)	Olst	Netherlands
12	Enherkom	Hernani	Spain
13	IZGREI BG	Plovdiv	Bulgaria
14	COMMONEN energy community	Ioannina	Greece
15	Energiaühistu TÜ	Tallinn	Estonia
16	Culatra 2030 - Comunidade Energética Sustentável	Culatra Island (Faro)	Portugal
17	Flexcity Sporenburg	Amsterdam	Netherlands
18	Energy Community of Karditsa SYN.PE.	Karditsa	Greece

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