# How local ecosystems can support energy communities: insights from Debagoiena Region

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## Abstract

Energy communities are increasingly seen as a key lever for the energy transition. However, energy communities need supportive ecosystems to overcome the challenges they face individually. This study explores the development of a supportive ecosystem for energy communities in the Debagoiena region, driven by the collaborative network D2030. Following a participatory action research approach, presents a retrospective case study addressing three key questions: How to build supportive local ecosystems for energy communities, the importance and contribution of these ecosystems to energy community deployment, and the challenges in their creation. Key mechanisms identified in the supportive ecosystem for energy communities include Laboratories (open learning communities), a working group for energy community members, and the Community Transformation Office (open to civil society). The research highlights the importance of adaptable, responsive, and community-driven ecosystems in supporting the growth and deployment of energy communities. Leveraging cooperative values and structures, as exhibited by D2030, can be instrumental in overcoming challenges and fostering a successful transition towards a sustainable energy future.

## Keywords

Sustainable Business Model, Collaborations, Networks, Regional development, Sustainable Development

# Introduction

Faced with the challenge of climate change, the energy sector is undergoing a transformation in which end consumers are increasingly assuming a more active role, coordinating their efforts through the establishment of energy communities (Gjorgievski et al., 2021). The development of energy communities has been driven by the approval of the legislative package "Clean Energy for All," which defines energy communities as non-commercial legal entities based on the open and voluntary participation of their members, who can be individuals, small and medium-sized enterprises (SMEs), or local authorities, provided that their main activity is not related to energy (Reis et al., 2021).

Renewable energy generation by community-owned projects has the potential to increase energy efficiency, reduce CO2 emissions, lower consumers' energy bills, foster the creation of new jobs and promote citizen empowerment, social cohesion, and social equity (Kiamba et al., 2022; Mendoza et al., 2022). Furthermore, energy communities are seen as a key lever for the energy transition. The European Commission estimates that by 2030, more than 50 GW of wind energy and over 50 GW of solar energy could be owned by energy communities, representing respectively 17% and 21% of the installed capacity (Vernay and Sebi, 2020), while by 2050, almost half of European households are expected to participate in renewable energy generation, 37% of them in collective projects (Kampman et al., 2016; REScoop, 2018).

However, energy communities face various technological, organisational, financial, and legislative challenges that hinder their growth and development (Ibarra et al., 2023). According to Herbes et al. (2021), initiators of energy community projects, often from civil society, require critical knowledge and skills that they must learn for the successful completion of the projects, including aspects related to technology and technical matters, business, legal issues, project management, marketing and public relations, sales, human resources management and leadership, tax knowledge, and practical knowledge about cooperative enterprises.

According to several authors (d'Oca et al., 2021; Kooij et al., 2018; Vernay and Sebi, 2020), if energy communities collectively confront these challenges rather than individually, and rely on key external actors (e.g. local networks, lobbying, financial and technical support), they can enhance their resilience and accelerate their deployment.

In this regard, there is a growing interest in understanding the role played by supportive ecosystems in the emergence and growth of energy communities. For instance, Van Der Schoor et al. (2016) examine the creation of local initiatives and regional energy networks, and the role of intermediary actors in the Netherlands. They analyse the goals, organisational structure, and activities of local and regional networks through case studies. They conclude that members of the energy movements organise around an ideological vision related to sustainability, regional economy, and democracy, challenging the current

governance of the energy system. The energy projects studied by Van Der Schoor et al. (2016) exhibit a strong and widespread common vision, which the authors consider a crucial factor for success. They also find that energy communities are closely linked to the specific culture and mentality of the region, evidenced by the use of regional language for communication and the organisational structure following provincial boundaries.

Vernay and Sebi 2020) compare the ecosystems of French and Dutch energy communities with the aim of better understanding how an ecosystem should be structured to support the deployment of energy communities. The authors demonstrate how the ecosystem concept is useful to study energy communities and provide guidance for structuring the analysis based on three characteristics: ecosystem actors, their functions, and their interactions. Their findings highlight the role of "local capacity builders," who can centralise and mutualise information, act as intermediaries providing access to the supporting ecosystem, facilitate the initiation of larger projects, and become local trustees for energy communities (Vernay and Sebi, 2020).

To identify the most common approaches and processes for the creation and growth of energy communities, Boulanger et al. (2021) conducted a qualitative review of European-funded projects under the Horizon 2020 work program and a set of success cases in Europe. Boulanger et al. (2021) suggest three key aspects for the successful deployment of energy communities: 1) knowledge sharing and participation mechanisms, as well as nudging actions oriented towards collective behavioral change, 2) the use of collaborative platforms supporting interaction among stakeholders (platforms), and 3) personal relationships among people and the effectiveness of the community created.

Recently, Ibarra et al. (2023) systematise sustainable business model patterns for renewable energy communities and their ecosystem (i.e. key actors that support business model innovation by providing legal, financial and technical assistance) based on a systematic literature review. The authors concluded that the greater the decentralisation of energy ownership and distribution, the greater the number of actors. The results highlight the need to understand how different stakeholders (e.g. OEM, prosumers, community members, service providers, grid operators and policy makers) interact within collaborative networks to accelerate the deployment of renewable energy communities.

While literature highlights how local initiatives increasingly form networks across different geographic scales to provide mutual support, more research is needed on how that support is organised and structured. This article aims to contribute to this research stream by addressing the following research questions:

1) How to build supportive local ecosystems for energy communities?

2) What is the importance and contribution of supportive local ecosystems to the deployment of energy communities?

3) What are the challenges for building supportive local ecosystems for energy communities?

To address the research questions, a retrospective case study (Bocken et al., 2018; Thomas, 2011) is developed on the ecosystem created in the Debagoiena region to support local energy communities driven by the inititative Debagoiena 2030 (D2030).

D2030 is a collaborative network created to promote the transformation of Debagoiena region toward an intelligent, inclusive and climate neutral territory by 2050, intensifying local sustainable development. The collaborative network consists of representatives from public administration, cooperatives and other economic agents, education actors and organised citizenship.

D2030 has been implementing its strategy to promote energy transition in the Debagoiena region since 2020. In January 2024, D2030 introduced its Community Transformation Office (CTO) for the promotion and dynamization of energy communities. The creation of this CTO has been possible thanks to the assistance granted by the IDAE under the Recovery, Transformation, and Resilience Plan funded by the European Union - NextGenerationEU.

This study explores in depth the emergence and evolution over three years of the supportive ecosystem for energy communities in the Debagoiena region, driven by D2030. The study delves from the initial exploratory phases to the current situation, including the establishment of the CTO, the creation of the local energy communities working group and the knowledge sharing laboratory.

# Method

The methodology consist of a participatory action research (PAR) approach (Bocken et al., 2018). PAR is often applied in community-based research (Lykes, 2013) and aims to integrate knowledge and action in order to foster enduring and beneficial social transformation (Torre et al., 2015). It embodies a collaborative research approach that inclusively engages community members, researchers, and various stakeholders throughout the research process, acknowledging and leveraging the distinct strengths each entity contributes (Collins et al., 2018). PAR is commonly used in the field of sustainable business models research as it is considered particularly useful for accelerating research related to sustainability challenges and synergizes well with case studies (N.M.P. Bocken et al., 2018).

Mondragon University is part of the D2030 network and several of the authors have been actively participating in the development of various activities of the initiative since October 2022, including running workshops, conducting interviews and participating in project meetings, all of which were used to collect and analyse data. Additionally, desk research

was done to complete data collection, including information provided on D2030 and CTO websites, social media, media releases and videos, reports, and meeting minutes.

To structure the data analysis around the research questions a thematic analysis approach (Fiorentino et al., 2020) was followed. Transcripts, researchers' notebooks, workshop materials and documents related to the case study were critically analysed using thematic qualitative coding techniques. During the data analysis, definitions and themes were drawn from the existing literature.

# Results

The following lines present the findings of the analyzed case regarding how the supportive local ecosystems for energy communities are built (RQ1), the importance and contribution of supportive local ecosystems to the deployment of energy communities (RQ2), and the challenges for building supportive local ecosystems for energy communities (RQ3).

## 1. Building supportive ecosystems for energy communities

Fig. 1 illustrates the evolution of the supportive ecosystem for energy communities in the Debagoiena region, driven by D2030, from its inception to the present day. In December 2020, the D2030 initiative launched an intervention proposal called "*Eraginez piztu*" to address the regional energy challenges through the deployment of several projects, being one of the projects the creation of the 1st Laboratory for local renewable energies.

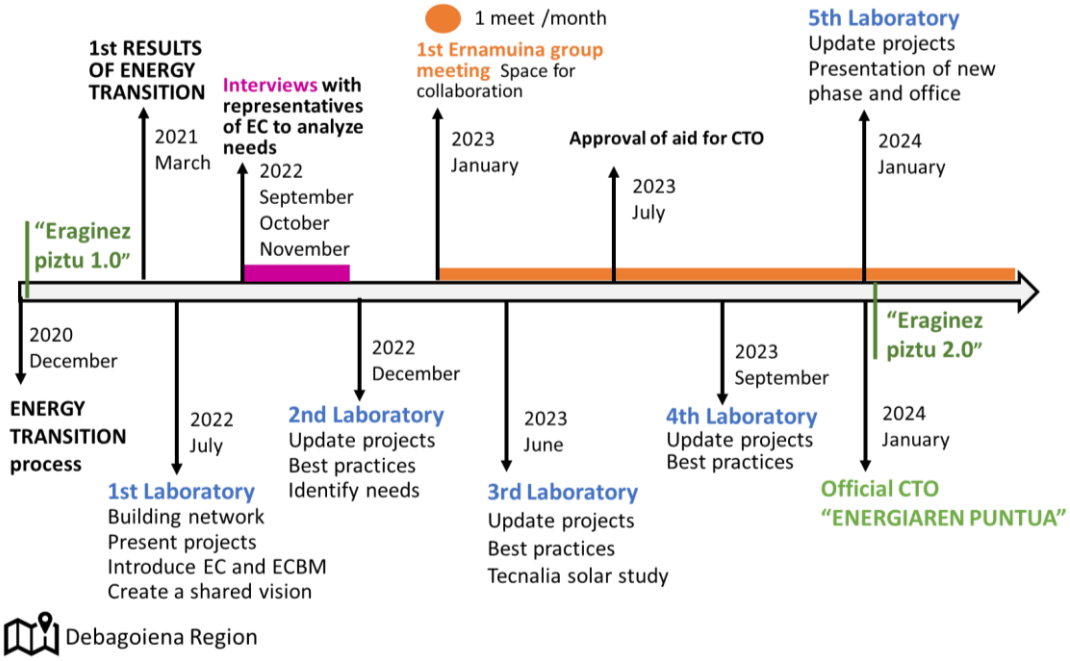


Fig. 1 Chronological description and main keystones of ecosystem building. Acronyms: CTO (Community Transformation Office), EC (Energy communities)

1st Laboratory was in July 2022 and its aim was to start building a network of actors around energy communities and that actors get to know each other and start collaborating. Among the attendees were energy community initiators, technicians and majors of the municipalities, energy service providers and university researchers). The activities developed during the laboratory included getting to know, firsthand presentations of energy community projects in the region, reflecting and creating shared knowledge about what an energy community is and what different types of business models can be developed, and the creation of a shared vision on how to collaboratively address the energy transition and the challenge of energy communities.

After the first laboratory, interviews were held with representatives of different energy communities in the Debagoiena region to identify the needs and challenges they had and would like to address in the laboratories.

In December 2022, the 2nd laboratory was conducted. In this case, and in response to the demand from the interviewees to learn about real experiences from other regions, the laboratory focused on 1) presenting the current situation and progress made since the last laboratory in each local energy community and 2) two talks on experiences and best practices from other regions. The conclusions of the interviews conducted were also presented, and a dynamic session was carried out with the attendees to prioritise the needs and challenges to be addressed in the following laboratories.

A key outcome of the lessons learned from the first two labs was the need for a task force focused specifically on the needs of initiators and members of the energy communities. Thus, the working group "*Ernamuina"* was built in January 2023. "*Ernamuina"* is a space for dialogue with the aim of elaborating, sharing and starting the way to a cooperation strategy for the emergence and growth of energy communities. This specific working group meets every month in Mondragon and the working sessions are facilitated by D2030.

In the 3rd and 4th held in June 2023 and September 2023 respectively, a common dynamic began to be established: First, the representatives update the status of their energy community projects and then, two external experiences were presented to share best practices. In the fourth laboratory, it was observed that the participation and the network of actors increases.

The last laboratory developed to date was hold in January 2024. The 5th laboratory consisted on the update of energy community projects and the presentation of the new energy transition strategy developed on the basis of the lessons learnt to date called "*Eraginez piztu 2.0*". Also, the new CTO (community transformation office), called "Energiaren puntua" was presented.

"*Eraginez piztu 2.0*" has three fundamental lines of work, (1) promotion of energy communities (2) Deliberation process to elaborate in a consensual way the bases of the energy transition of Debagoiena and (3) Civil society empowerment for energy transition.

The aim is to continue completing and reinforcing the relationships between the different agents, to promote the logic of community development and to join the challenge of mobility to the energy challenge.

Moreover D2030 presents the Community Transformation Office (CTO) named "*Energiaren puntua*", a virtual office that aims to promote the creation of energy communities. To develop the project, the initiative has been supported by Next Generation and the IDAE with the call for the incentive program for Community Transformation Offices for the promotion and dynamization of Energy Communities (BOE, 2022; IDAE, 2022). This office is born with this funding as a transformation office in Debagoiena, the region to which it will offer information and assistance generally through the virtual office.

As illustrated in Fig. 1, the chronological description and key components of ecosystem development reveal three key mechanisms that emerged over the three years of the energy transition intervention proposal (Fig. 2) to promote supportive ecosystems for energy communities: 1) Laboratories (open knowledge communities), 2) "Ernamuina" (working groups for energy community members), and 3) Community Transformation Offices (open to civil society).

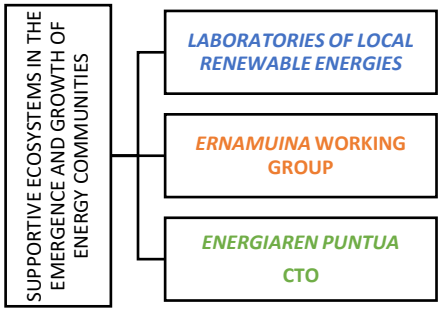


Fig. 2 Three key mechanisms of the supportive ecosystem for energy communities in Debagoiena Region. CTO: Community Transformation Office

LABORATORIES OF LOCAL RENEWABLE ENERGIES are learning communities that provide a framework for sharing knowledge, experiences, and existing studies in the region regarding renewable energies, where collaborative attention is given to the needs, opportunities, and challenges that may arise are addressed in a collaborative manner. Laboratories are developed every 5 months, and they are open to different agents working around energy communities including energy community members, energy providers, mayors and city council technicians and university researchers.

*ERNAMUINA* is a Working group for energy community members of the region of Debagoiena. Integrated by representatives of the energy communities, it is a space to

identify needs, ideate solutions and give answers together. Ernamuina members meet once a month.

Participation: Members of the Energy Communities of the Region It is made up of the energy communities of Elgeta, Bergara, Leintz Bailara Ekiola, Otxandio, Elorrio and Renteria, as well as members of the group working in the Escoriatza Energy Community. Goiener, Mondragon Unibertsitatea and members of D2030 are also part of Ernamuina.

*ENERGIAREN PUTUA* is the Community Transformation Office (CTO). It adopts an online office format to help interested citizens to solve their doubts regarding new energy communities development. The CTO was launched in January 2024 and is now operational. The office offers the following services:

- Inform, train and empower the local community about the energy challenge and energy communities.

- Support citizens and agents interested in promoting energy communities through training, information, accompaniment and strategic linkage actions.

- Provide technical resources for the development of energy communities: technical, economic, legal and social advice.

- Monitor the processes of creation and development of energy communities, identifying, extracting, documenting and disseminating their knowledge, learning and good practices.

- To publicize the energy communities created in Debagoiena.

## 2. Significance and contribution of supportive ecosystems for energy communities

After analysing the supportive ecosystem for energy communities created over the past three years, four contributions emerge.

**1. Adaptability and redefinition:** The supportive ecosystem has constantly evolved redefining their boundaries and dynamics (Audretsch et al., 2019; Stam & van de Ven, 2021). The process carried out by D2030 in support of energy communities has shown that supportive ecosystems need to redefine their scope, structure, governance, organisation and support mechanism. Contrary to this position, it is also pointed out that such organisations must maintain their mission, values and ideological vision in relation to sustainability and a willingness to challenge existing energy systems; if they really want to play the role of local capacity builders, becoming local trustees of energy communities, able to centralise and mutualise information, and to act as intermediaries to facilitate the implementation of larger projects. The same applies to D2030's commitment to the well-being of the region, the pursuit of participatory governance, the articulation of a strong and

pervasive common vision, the use of a regional language for communication, and the organisational structure that follows regional boundaries.

**2. Responsiveness:** D2030 must develop effective mechanisms to respond to the needs arising from the energy communities (Theodoraki et al., 2018; Henriques et al., 2022), with a pragmatic vocation to respond to the needs defined by the energy communities, but without losing the holistic vision of the community and its needs. It is about establishing mechanisms to respond to short-term needs, while working on the challenges of the future. It is about accompanying communities while building with them (through other mechanisms more focused on reflection and experimentation) to foster innovation.

**3. Knowledge Management and Sharing:** A third aspect shown by the research, in line with some authors (Gomes et al., 2021), has to do with the importance of social innovation support networks also managing the knowledge they generate and capture. Thus, D2030 has established mechanisms, platforms and governance structures that favour the generation, capture and dissemination of knowledge generated around energy communities, including aspects related to technology and technical issues, business, legal issues, project management, marketing and public relations, sales, human resource management and leadership, fiscal knowledge and practical knowledge about cooperative enterprises.

**4. Community Involvement and Leadership:** the last contribution has to do with the involvement of the community and, more specifically, of people who, individually or on behalf of organisations, act as initiators of community energy initiatives (Herbes et al., 2021). In this respect, the cooperative culture of the regional environment in which D2030 operates, as well as the personal relationships between people and the effectiveness of the community created by D2030, have an important role to play. Having evolutionary mechanisms and knowledge that are generated and disseminated is not possible without the direct involvement (time and effort) of individual people who nurture and energise the collaborative network with their critical spirit, will and knowledge.

## 3. Challenges for building supportive ecosystems for energy communities

D2030, as a collaborative network supporting energy communities, is a collective of actors who share a common vision and mission to promote the transition to a more sustainable, democratic and participatory energy system. Despite D2030's capacity to evolve and respond to the needs of its stakeholders and the issues arising from its mission and commitment to the territory, the research also identifies several challenges that may be key for D2030 and other collaborative networks:

**1. Mission and values:** The network must define and communicate its mission and values clearly and consistently, and align them with the needs and aspirations of the energy

communities and the wider society. The network must also foster a culture of collaboration, solidarity, and mutual learning among its members and partners.

**2. Trust and commitment:** The network must build trust and confidence among the energy communities and other stakeholders, such as local authorities, regulators, utilities, and civil society organizations. The network must also mobilize and engage the energy communities and the people involved in them, and support their commitment and empowerment throughout the process.

**3. Support mechanisms and resources:** The network must provide adequate and tailored support mechanisms and resources to the energy communities, such as technical, legal, financial, and organizational assistance. The network must also leverage the existing capacities and assets of the energy communities and the region, and seek synergies and complementarities with other initiatives and programs.

**4. Involvement, respect, and results:** The network must involve and respect the diversity and plurality of the energy communities and their contexts, and ensure that their voices and interests are heard and represented. The network must also monitor and evaluate its activities and impacts, and demonstrate the benefits and outcomes of the energy communities for the region and the society.

Finally, this research also highlights the fact that D2030's rootedness in cooperative values and the nature of the network can help overcome these challenges, as they foster a sense of belonging, identity and ownership among energy communities and network members. Cooperative values and nature also promote democratic participation, transparency, accountability and social responsibility, which are essential for the success and sustainability of the whole network and energy communities in particular.

# Conclusions

This research explored the Debagoiena region's supportive ecosystem for energy communities, driven by D2030, a collaborative network promoting a sustainable and climate-neutral territory. The study underlines the importance of adaptable, responsive, and community-driven ecosystems in supporting energy communities. Leveraging cooperative values and nature, as exemplified by D2030, can be instrumental in overcoming challenges and fostering successful transitions towards a sustainable energy future.

Based on a participatory action research approach a retrospective case study is presented that address the following questions: 1) How to build supportive local ecosystems for energy communities, 2) The importance and contribution of supportive local ecosystems to the deployment of energy communities and 3) the challenges for building supportive local ecosystems for energy communities.

The results show that to build a supportive local ecosystem the response is based on the analysis of the "*Eraginez Piztu*" initiative in the Debagoiena region, a structured approach with defined phases focusing on knowledge building, pilot projects, and collaboration.

The chronological analysis of the energy transition intervention proposal over three years higlights three key mechanism to build supportive ecosystems for energy communities: 1) Laboratories (Open knowledge communities), (2) "*Ernamuina*" (Working group for energy community members) and (3) the Community transformation office (open to civil society).

The importance and contribution of supportive local ecosystems to the deployment of energy communities based on the three-year evolution of the Debagoiena region, highlights four main contributions: (1) Adaptability and redefinition, (2) Responsiveness, (3) Knowledge Management and Sharing and (4) Community Involvement and Leadership. This provides valuable insights for other regions seeking to create similar ecosystems and accelerate the transition towards sustainable energy.

The challenges for building supportive local ecosystems for energy communities are; (1) Defining and communicating mission and values, (2) Building trust and commitment, (3) Providing adequate support (4) Ensuring involvement and respect. By addressing these challenges, collaborative networks like D2030 can continue to play a vital role in building supportive local ecosystems and propelling the energy transition.

Finally as reported in other research Van Der Schoor et al. (2016), this study is center on a single case with high regional focus in Debagoiena. This is a limitation, but at the same time it is a reality since the energy communities need a specific and limited ecosystem for their deployment. Due to this regional focus, it would be interesting to analyse whether the insights identified in this case are present in other ecosystems, to generalise the results obtained. Furthermore, analysing other ecosystems can lead to comparisons that show if the insights obtained are aligned.

This analysis focuses on 3 years of an ecosystem building process that will continue. Taking into account that ecosystems are dynamic and alive, further analysis will show us how due to a changing environment with disruptions (legislative, technological…) this ecosystem evolves and adapts. In addition to external factors, internally considering that the communities are just emerging we do not know how this network will evolve once the communities have their installations in place. Developments may lead to new business models around smart grids or second-tier cooperatives for which new mechanisms will probably be needed. These examples reflect the willingness shown by the D2030 network to connect energy systems, smart grids and communities at the village and regional level.

Finally, given that this research area is emerging, further research should reflect on the methodological approaches required to delve into the analysis of ecosystems supporting energy communities, given their systemic, evolutionary, and dynamic nature.

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