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Introduction

Aim and objectives of the project

The aim of this report is to present a summary of the objectives, methodology and overall results of Workpackage 1 – Analyses of Energy Communities, which has been structured in three tasks, namely: (1) analysis of the legal framework through a desk research and direct interviews with stakeholders in the target countries (Italy, Greece and Spain); (2) mapping and analysis of the existing energy communities (ECs), carried out also through a desk research and direct interviews with stakeholders; and (3) cross-analyses and identification of case studies, thus providing an overview of the situation in other EU countries, both in terms of legislation and the development of initiatives of interest to the project.

To this end, this document provides a summary of the following:

- a) an overview of the main legislative, economic, administrative, technical and social issues that have an impact on the creation and maintenance of ECs in each of the participating countries;
- b) a cross-country analysis identifying the main similarities and differences between the legislations of the three target countries (Italy, Greece, and Spain),
- c) a mapping of the existing ECs in the target countries, including a description of the ECs (energy sources and technologies used, size range),
- d) an overview of the most successful energy communities in other EU countries,
- e) an overview of ongoing initiatives and funding schemes that support the implementation of ECs in the target countries, with a special focus on the funding available for ECs in the national plan of the EU's Next Generation EU Programme.

The qualitative study that was carried out was based on direct interviews with 20 key stakeholders from the target countries. In Italy, two direct interviews have been carried out, one with ENEA and one with GSE. Four direct interviews have been carried out in Greece with experts from ECs, a policy maker and Electra Energy, a social cooperative that promotes ECs. In the case of Spain, six direct interviews were conducted with Energy Communities, four interviews with second-degree entities that promote ECs creation and provide advice and/or services to ECs. In addition, two direct interviews with European Projects partners that facilitate the future development of ECs and one with the Head of Solar and Self-consumption Department of IDEA were conducted in the case Spain.

Definition of Energy Communities

Energy Community (EC) is a new concept in Europe and, even if some initiatives, particularly in northern European Countries, have been around for long time, EU regulations recognised this entity

just recently, with two directives: Directive EU 2018/2001 and Directive EU 2019/944, which introduce the concept of Energy Communities in EU Countries legislations. These directives consider two principal ways of understanding energy communities: as a *renewable energy community* (REC) and as a *citizen energy community* (CEC) (Frieden et al, 2019).

The Directive EU 2018/2001, which establishes a common framework for promoting energy from renewable resources, defines a *REC* as a legal entity (Art. 2):

- a) which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the renewable energy projects that are owned and developed by that legal entity;
- b) the shareholders or members of which are natural persons, SMEs or local authorities, including municipalities;
- c) the primary purpose of which is to provide environmental, economic, or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits

The Directive EU 2019/944 defines a *CEC* as a new type of entity (Art. 1) of a legal nature, and which (Art. 2):

- a) is based on voluntary and open participation, and whose effective control is exercised by partners or members who are natural persons, local authorities, including municipalities, or small businesses,
- b) has as its main objective to provide environmental, economic, or social benefits to its members or partners or to the locality in which it carries out its activity, rather than generating a financial return, and
- c) participates in the generation, including that from renewable sources, the distribution, the supply, the consumption, aggregation, energy storage, provision of energy efficiency services or, provision of charging services for electric vehicles or other energy services to its members or partners.

These European directives give communities and individuals the right to generate, store, consume and sell their own energy (Friends of the Earth Europe, 2018), and point out the requirement of "a legal entity as a coordinator and effective control by certain participants" (Frieden et al., 2019, p. 2); i.e. the creation and the management of these communities will require the development of new professional figures that will be responsible for leading the design, development, implementation and management of energy programs for the entire community and leading the Community's goal of reducing community-wide greenhouse gas emissions. To do this, three key points that are common to all operational definitions of CEs should be taken into

consideration, as aggregators of potential enabling factors for CEs (Sciullo et al., 2022; namely (1) energy system and electrical energy (market and structure); (2) energy policies and regulatory framework; (3) sociocultural attitudes towards the environment and cooperative models.

Thus, it can be summarised that an EC is a **community of users** (private, public, or mixed) located in a **specific area**, in which end users (citizens, businesses, public administration, etc.), market players (utilities, etc.), designers, planners and politicians actively cooperate to develop **high levels of “smart” energy supply**, favouring the optimization of the use of renewable sources and technological innovation in distributed generation and enabling the application efficiency measures, in order to obtain benefits on **economy, sustainability and energy security**.

Analysis of the legal framework

This chapter presents a summary of the analysis conducted for the three target countries (Italy, Greece and Spain) in relation to the energy policies and regulatory framework, the procedures for starting and financing an EC as well as any regulatory, administrative and technical barriers associated with ECs.

The case of Italy

Italy adopted EU Directive 2018/2001 (RED II) with the Legislative Decree 199 of November 8th, 2021 and EU Directive 2019/944 (Internal Market for Electricity) with the Legislative Decree 210 of November 8th, 2021. Specifically, article 22 of RED II was adopted in the article 31 of Legislative Decree 199 of November 8, 2021.

Italian legislation defines a **Renewable Energy Community (REC)** as a legal entity whose shareholders or members who exercise control power are natural persons, small and medium-sized enterprises (SMEs), territorial bodies or local authorities or municipal administrators, research and training bodies, religious bodies, third sector and environmental protection bodies as well as local administrations contained in the list of public administrations disclosed by the National Institute of Statistics (ISTAT), located in the territory of the same Municipalities where the production plants owned by the EC are located. Private companies can also participate in a REC as long as their participation does not constitute the main commercial and / or industrial activity.

Similarly, a **Citizen Energy Community (CEC)** is defined as a subject of law, with or without legal entity, based on voluntary and open participation and controlled by members or shareholders that are natural persons, small enterprises, or local authorities, including municipalities, research institutions, environmental, economic, or social community benefits to its members or shareholders or to the local areas where it operates rather than to generate financial profits.

The Italian regulatory framework about ECs is composed by the following regulations:

- Law decree 162/2019 - Article 42-bis adopts the articles 21 and 22 of the directive

on the renewable self-consumers and starts the experimental phase

- Resolution 318/2020 defines the economic aspects of the shared energy
- Decree September 16, 2020, defines the incentives for the renewable self-consumers
- DMEA/EFR/6/2020 defines the technical regulations to access to incentives for the shared electricity – edition December 2020
- Legislative Decree of November 8, 2021, n. 199 adopts the DIRECTIVE (EU) 2018/2001 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of December 11, 2018, on the promotion of the use of energy from renewable sources (recast)
- Legislative Decree of November 8, 2021, n. 210 adopts the DIRECTIVE (EU) 2019/944 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of June 5, 2019, on common rules for the internal market for electricity and amending Directive 2012/27/EU (recast)
- Updating of the technical regulations to access to incentives for the shared electricity – edition April 2022

Concerning the compliance of Italian RECs with fair, proportionate, and transparent procedures, it can be said that the variable parts of the general system charges are applied to electricity withdrawn from public networks, including the shared one. A qualification system is envisaged only for ECs that must access the incentives.

Also, the 2020 National Energy and Climate Plan talks about RECs and promotes their development to support the economies of small municipalities, often rich in renewable resources, and to provide opportunities for the local production and consumption of renewable energy in those contexts in which self-consumption is technically difficult.

With regard to the *specific regulatory and fiscal measures to support ECs*, the discipline introduced by **article 42bis of Decree-Law 162/19** applies to production plants or portions of production plants powered by renewable sources, which came into operation after the date of entry into force of the law converting the decree-law 162/19 (i.e. starting from March 1, 2020) and continues to apply until the adoption by MiTE and ARERA of the related provisions, pursuant to the provisions of articles 8 and 32 of Legislative Decree 199/21. For **each kWh of shared electricity** (equal to the minimum, on an hourly basis, between the electricity fed into the grid and the electricity taken from the connection points that are relevant for configuration purposes) **it is recognized by the GSE, for a period of 20 years:**

- A unit fee (sum of the transmission tariff for low voltage users, equal to € 7.78 / MWh for the year 2022, and the higher value of the variable distribution component for

users' other low voltage uses, equal to 0.59 €/MWh for the year 2022).

- A premium rate (equal to 100 €/MWh for groups of self-consumers and 110 €/MWh for communities).

The projects developed by ECs do not have priority access to grids in Italy, or any other type of incentive, nor any benefit/advantage in terms of project authorization. Note that there is a lack of standardization about administrative process among different Italian regional governments for electricity production plants powered by renewable sources, since the authorization process is divided between the State, regions, and local authorities; but these regional and local governments do not make available public areas to promote ECs.

Beyond this potential limitation in terms of **administrative and financial procedures**, no other existing barriers have been assessed, nor has the potential for the development of the RECs. Tools to facilitate access to **finance and information** are also lacking. Further, other **unjustified regulatory and administrative barriers** remain to be revealed in terms of:

1. Legal form
2. Energy sharing
3. Ownership
4. Distribution Systems Operator (DSO) role
5. Existing plants
6. Incentives
7. Proximity

The scope of an EC is **clearly described in Italian national legislation** (only as a non-profit entity, as there are no for profit-making forms). To qualify for incentives, the **statutes** of ECs must:

- a) provide for the maintenance of the end-customer's rights, including the right to choose his own seller;
- b) uniquely identify a delegated entity responsible for the distribution of shared electricity to which the entities may also delegate the management of the payment and collection elements to the trading companies and the GSE; and
- c) allow all parties to withdraw at one point in time and exit the configuration, without prejudice to the investment fees agreed in case of early withdrawal for distribution, which must in any case be fair and proportionate.

Energy Communities in Italy experiment **difficulties in financing their projects**. Today, ECs and self-consumption are convenient configurations thanks to self-production and the incentives they benefit from, but their development is slowed down by the *barrier that banks have raised against*

new legal entities, such as ECs, which do not offer guarantees, and they cannot do it indirectly through the shareholders. Therefore, the operators are asking for the establishment of a **Guarantee Fund** for the ECs in order to guarantee partial insurance for the loans granted by the banks for the realization of these configurations.

As for **alternative ways to finance projects** owned by ECs, unfortunately, so far, the proposal to set up a guarantee fund for ECs as well as for collective self-consumption has not been accepted. Nevertheless, **funds are available for ECs in the PNRR**. Specifically, under the M2C2 task - *Renewable Energy, Hydrogen, Sustainable Grid and Mobility* - this plan provides 2.2-billion-euro specific funding for the promotion of renewable energy for ECs and self-consumption. The target of the investment is the transposition of the RED II Directive to a "more significant" dimension, identifying PA, families and micro-enterprises in municipalities with less than 5 thousand inhabitants who can benefit from the energy communities in terms of support for the economy, cohesion social, as well as to combat depopulation.

The **main regulatory and administrative barriers to ECs** are open questions to which operators expect specific answers concerning, as mentioned above: its legal form, the energy sharing, the ownership, the DSO role, the existing plants, the incentives, and the proximity. It would be necessary to set up a guarantee fund for ECs to guarantee partial insurance for loans granted by banks for the construction of renewable communities.

Regarding this last topic, also related to **technical barriers**, there is a maximum distance between associated users. That is, energy can be shared within the same market zone but to access the incentives, customers may be connected to the same primary substation. Now and until the Ministry publishes the specific implementing decree of the Legislative Decree 199 of November 8, 2021, members must be connected to the same secondary substation to access the incentives. Also, it is possible for an EC to carry out both a low and medium-voltage grid connection. The proximity condition necessary for the establishment of an EC is satisfied when the holders of connections on the low voltage electricity network are powered by the same medium/low voltage transformer substation.

The case of Greece

Greece **has not yet fully adopted EU directives 2001/2018 (RED II) and 944/2019 (internal market for electricity)**. However, regulations related to ECs have been transposed to national legislation with Law 4513/2018 Government Gazette A' 9/23.01.2018.

The **specific regulations** in Greece regarding ECs are the following:

- Law 4843/2021 Articles 36-40
- Law 4759/2020 Par.2 Article 160
- Law 4618/2019 Article 8

- Law 4513/2018

The above regulations cover the basic guidelines of the EU Directives, i.e., the right of ECs to:

- ✓ produce, consume, store and sell renewable energy, including through renewables power purchase agreements;
- ✓ share, within the renewable energy community, renewable energy that is produced by the production units owned by that renewable energy community;
- ✓ access all suitable energy markets both directly and through aggregation in a non-discriminatory manner.

An **assessment** about the *existing barriers and potential of development* of REC has been elaborated in Greece. More specifically, in November 2021 “The Green Tank”, which is an independent, non-profit think tank developing policy solutions for a sustainable future, published a report on ‘*Energy Communities in lignite mining areas in Greece*’ that includes an assessment on that.

In Greece, although **most regulatory and administrative barriers to RECs have been removed**, there is still room for improvements. In most cases there is **positive discrimination favouring ECs**. It can be considered that the requirement by EU Directives for energy communities to be “subjected to fair, proportionate and transparent procedures, including registration and licensing procedures, and cost-reflective network charges, as well as relevant charges, levies and taxes, ensuring that they contribute, in an adequate, fair and balanced way, to the overall cost sharing of the system in line with a transparent cost-benefit analysis of distributed energy sources developed by the national competent authorities” is met.

Financing is a major problem especially for ECs aiming at self-consumption. For those ECs aiming at selling of all produced energy (through feed-in-tariffs) the usual financing procedures are followed by the Banking sector. Information for setting-up ECs is available by the Center for Renewable Energy Sources and Saving (a state body) and by NGOs (such as Greenpeace).

The **National Energy and Climate Plan (NECP)** of Greece (2019), which is the main action plan for meeting mitigation climate change targets by 2030 and preparing the country for reaching a net-zero economy by 2050, refers to the role of ECs in the energy transition but does not set any specific targets, or specific regulatory and fiscal measures.

The projects developed by ECs have priority access to grids in Greece. There is a priority list set by Ministerial Decision YPEN/GDE/84014/7123, OJ 4333B/12.8.2022 which gives priority to Energy Communities especially those which aim at self-consumption. The support scheme for Energy Communities is through Feed-in-tariffs. In addition, Energy Communities usually must pay fewer guarantees at different stages of authorisation.

There is no additional regulatory support for energy related social innovations to the basic framework. Regional or Local governments do not make available any public areas to promote Energy Communities.

The legal entity form of ECs in Greece resembles that of a **co-operative society**. The administrative process for ECs is the same throughout the country. So far, ECs are compensated through **feed-in-tariffs**. As of 2023 however, most ECs wishing to construct more than 1 MW PV will have to participate in dedicated auctions. Details of such auctions are not known yet.

The scope of ECs is clearly described by national legislation and Bylaws should abide to these regulations. The national legislation (law 4513/2018, art. 6) distinguishes between **for-profit and non-profit Energy Communities** based on the criterion of sharing or not dividend among their members: (a) non-profit energy communities, which do not share surplus use among their members, and (b) for-profit energy communities, which share surplus use among their members. Both types share the same scope of activities.

Furthermore, there is an *assessment about time and cost needed for setting up an Energy Community*¹. The tax related issues for ECs are also clear.

In Greece, especially those ECs aiming at self-consumption face **difficulties in financing their projects**. Some banks are keen to financing ECs aiming at selling all their production through a contract with the Electricity Market Operator. However, they are reluctant to finance Energy Communities aiming at self-consumption. However, there are new initiatives taken by special funds², the results of which are yet to be seen.

Regarding the availability of funds for ECs from the **“Next Generation EU” funds** and more specifically from the National Recovery and Resilience Plan, the Just Transition Development Plans, the Rural Development Plan, the Operational Programs of ESIF, or other plans, there is not something specific yet, although there are announcements that in 2023 some €100 mil. will be granted to ECs developed by Municipalities for supporting poor households.

The **regulatory and administrative barriers** associated with the development of an EC are the same as private investments, in general. Authorisation could become much easier, especially when it comes to relatively small projects such as those developed by ECs.

There is a **geographical proximity requirement** that at least 50% of all members of an EC must live or own a property in the same Region. An EC is allowed to carry out both a low and medium-voltage grid connection. If an EC applies for a support through the system of feed-in-tariffs, there is a limit for maximum power for each connection. If an EC participates in RES auctions, there is no limit.

A **problem emerged of the national framework** is related to virtual net-metering and power

¹ https://www.greenpeace.org/static/planet4-greece-stateless/2021/05/b52e6e5e-odigos_systasis_energeiakon_koinotiton.pdf

² E.g., Genervest at <https://genervest.org/>

providers of the members of the EC. More specifically, virtual net-metering by ECs can only be exercised if all members have a contract with the same power provider. New regulations allow representation by different power providers but only on non-interconnected islands. This is not the case in mainland Greece. This is a serious red-tape for collective self-consumption schemes.

In general, there are not any social barriers or misinformation about environmental or economic impacts of the energy communities. It can be considered that the concept of ECs is well received by the Greek public.

The case of Spain

Spain has not fully adopted the Directives 2001/2018 (RED II) - neither the regulations described in Article 22 related to the EC nor 944/2019 on the internal electricity market. Royal Decree-Law 23/2020 provides, in Article 4, an amendment to Law 24/2013 (Article 6, Epigraph “j”) on the Electricity Sector where a Renewable Energy Community is defined as follows:

Renewable energy communities (RECs), which are legal entities based on open and voluntary participation, autonomous and effectively controlled by partners or members who are located in the vicinity of renewable energy projects owned and developed by such legal entities, whose partners or members are natural persons, SMEs or local authorities, including municipalities, and whose primary purpose is to provide environmental, economic or social benefits to their partners or members or to the local areas where they operate, rather than financial gain.

The definition of **Citizen Energy Communities (CECs)** has not been transposed to Spanish legislation.

Finally, although the rights described in article 22 of RED II (related to Energy Communities) were mainly adopted in the Royal Decree-Law 23/2020, the enabling framework is not fully developed.

The Spanish regulatory framework regarding ECs is composed by the following documents:

- Royal Decree 244/2019, April 5th, which regulates the administrative, technical, and economic conditions for the self-consumption of electricity (RD 244).
- Royal Decree-Law 23/2020, June 23rd, which approves measures in the field of energy and other areas for economic recovery (RD-L 23).
- Royal Decree-Law 29/2021, December 21st, adopting urgent measures in the energy field to promote electric mobility, self-consumption, and the deployment of renewable energies (RD-L 29).

In relation to the basic EU guidelines that these regulations cover, it can be noted that from April 2019, RD 244 (Articles 3 and 4) - that does define and/or include ECs - allows various consumers in the same community (community of owners, a neighbourhood, an industrial estate, etc.) to collectively benefit from the same generation facilities located in the vicinity of the

community. This document established compensation mechanisms and their restrictions (supply with self-consumption and surplus) as follows:

- the facility has to use a renewable energy source,
- the power of each plant cannot exceed 100 kW,
- plants and consumers must be situated within a maximum distance of 500 m,
- production and consumption points must be connected by means of a low-voltage grid.

Regarding the compliance of Spanish RECs with **fair, proportionate and transparent procedures** note that, in a context in which the regulatory framework is not fully adapted, there are no specific targets for ECs in the National Energy Poverty Strategy 2019-2024 or in the Just Transition Strategy (Ministry for Ecological Transition, 2019), but the National Energy and Climate Plan (NECP, 2020) fostered the implementation of one-stop scheme, as well as indicated the need for simplification of procedures in the processes linked to local EC projects, with the aim of reducing administrative barriers. The lack of process standardisation has the result of administrative procedures being time-consuming. It is necessary to highlight the difficulty to obtain grid connection authorization. In this sense, although the NECP does not include any specific objective for ECs, this is one of the measures considered to promote distributed generation and renewable generation. In turn, this forecast is supported by RD 244, which is being used by many energy communities to initiate its development mainly through the installation of photovoltaic systems.

As regards specific regulatory and fiscal measures to support ECs, although measure 1.13 of the NECP (2020) introduces for the first time the concept of Local Energy Communities (which encompasses both RECs and CECs), the purpose of this new figure, as well as the mechanisms for action and those responsible for carrying it out. No specific regulatory and/or fiscal measures are emphasized. The support schemes for ECs found are as follows:

- The Recovery, Transformation and Resilience Plan (PERTE) support scheme for renewable energy, hydrogen, and storage in application of the 'Next Generation EU' funds.
- The Plan for the Promotion of Local Energy Communities elaborated by the Government of the Generalitat Valenciana, on its own, with the aim to propose a series of aids to promote Promotion of Local Energy Communities (LECs) in that region.

Note that the specific regulatory and/or fiscal measures are not emphasized, nor do the ECs have any benefits/advantages in terms of project authorisation.

There are no other incentives for ECs in Spain, nor do they have any benefits/advantages in terms of project authorisation. As for the standard legal entity forms for ECs, that, since neither the CER nor the CEC have been transposed into Spanish law, ECs have to adopt existing legal forms within the current legal system. This must allow them to operate as such, and at the same time,

respecting the conditions imposed by European legislation. According to the International Institute of Law and Environment (IIDMA), the legal forms of Spanish law that are best suited to these constraints (open, voluntary, participatory, autonomous, with legal personality and capacity to act...) are cooperatives and associations.

In order to target to renewable public auctions, although the Order TED/1161/2020, of December 4th, which regulates the first auction mechanism for the granting of the economic regime for renewable energies and establishes the indicative calendar for the period 2020-2025, does not mention ECs at any point, it does establish that the auctions will be open to all the technologies mentioned in RD-960/2020, of November 3rd and mentions the possibility of considering the particularities of the ECs in the definition of criteria and the functioning of the auction, including mechanisms for joining the auction, so they can compete for access to the economic regime on an equal footing with other market participants (article 8.13).

Regarding the **administrative processing** of a self-consumption installation, each region establishes a series of administrative guidelines both at regional and local level. As far as ECs are concerned, there is no standard described in statutes and/or official bases. To minimize this problem, the creation of Community Transformation Offices (CTOs) to promote and empower ECs will be subsidized. The subsidies granted will cover up to 80% of these costs and the projects must be completed before December 31, 2025.

In terms of **barriers and potentialities** for the development of RECs in legal, administrative, technical, and financial terms the NECP 2021-2030 (2020) proposes instruments and measures to strengthen the role of LECs. Specifically in Measure 1.13, it states that an assessment of existing barriers and their potential development will be carried out. In the same measure, a series of barriers to be tackled are listed, as well as the mechanisms for action to break down these barriers for local energy communities. This is also what the Self-consumption Roadmap does in its Measure 19. In addition, the MITECO launched a public consultation on ECs from November 17th to December 2nd, 2020, to ascertain public opinion and thus resolve a series of problems that affect them in terms of regulations (general framework, legal aspects, barriers, enabling framework, or possible drivers).

Moreover, regarding the unjustified regulatory and administrative barriers to REC in Spain, there are still several necessary issues to be solved:

- 1) What kind of legal form can be used by EC.
- 2) Administrative processes standardization (Lack of protocol to create an EC).
- 3) The lack of definition of the legal capacities of the ECs and how to reflect them in their statutory purposes.
- 4) Impact of regional legislation in the EC Creation.

- 5) What kind of technologies can be used by ECs.
- 6) Role of DSO in the foster of EC.

To facilitate **access to finance** and make information search easier, there are stimulus packages, launched by the MITECO in its Recovery, Transformation and Resilience Plan (PRTR) (Component 7), approved on June 16th, 2021. These specific lines of aid, named CE-Aprende, CE-Planifica, and CE-Implementa, have the aim of promoting and empowering the processes to create these communities.

- CE-Aprende: Aims to help individuals or organisations interested in setting up an EC to familiarise themselves with the concept and identify future partners or members. It will subsidise actions such as expenses associated with the empowerment, promotion and publicity of the community.

- CE-Planifica: Also of simple concurrence, it is oriented to the planning and constitution of the EC itself. This programme includes the financing of studies and model contracts or specialised technical assistance and legal advice.

- CE-Implementa: Once legally constituted, the EC will be eligible for funding from the third line (CE-Implementa), which is organised on a competitive basis. This will be used to subsidise comprehensive and cross-cutting projects in the field of renewable electrical and thermal energy, energy efficiency and electric mobility.

These lines will be complemented by a network of Community Transformation Offices which, coordinated by the IDAE and distributed throughout the country, will advise ECs throughout their development chain, and facilitate access to each line of aid.

Finally, regarding the **existence of tools for access to information and support for innovation**, although the figure of the independent aggregator has been transposed and the possibility of using electrical storage has been introduced within the regulatory framework, these measures have not yet been developed. Therefore, they have not yet been able to promote technical and social innovation in this area.

The Royal Decree-Law 23/2020, which defines RECs, states:

Directive (EU) 2018/2001 of the European Parliament and of the Council of December 11, 2018 on the promotion of the use of energy from renewable sources is partially transposed regarding renewable energy communities.

Despite the partial transposition, the scope of an EC, as required by EU guidelines, is not specifically and clearly described. In addition, the Spanish regulations have not incorporated the CEC. In this way, a better description of the statutes and scopes of these entities in Spanish legal framework is necessary, as well as specifying which legal forms are adequate to make an EC as it is

expressed by NECP in one of its action measures on LECs.

There is no clear **assessment of the time and costs to establish an EC** in Spain. The institutional sphere is promoting the creation of a network of advice points [Community Transformation Offices (OTC) - IDAE, Oficina de Transición Energética y Acompañamiento (OTEA) - Generalitat Valenciana] with the aim of increasing the number of initiatives and reducing the time it takes to create these initiatives at regional level.

In addition, **taxes related issues** for ECs are also unclear. Due to the undefined legal framework, the fees applicable to ECs depend on the statutory purposes of the entity and the activity carried out. For instance, it should be specified that, if the electricity distribution grids were not used, they would be exempt from certain costs and taxes, the methodology for determining these charges associated with the costs of the electricity system having been established in Royal Decree 148/2021 March 9th.

Also, Royal Decree Law 19/2021 sets out deductions in the IRPF for the installation of solar panels or other renewable energies in homes, with deductions of between 20%, 40% and 60%, with maximum deductible bases of €5,000, €7,500 and €15,000, respectively. These deductions will be applied on the basis of an efficiency requirement.

Finally, Royal Decree Law 2/2004 empowers, among other things, municipalities to levy property tax (IBI). This regulation also enables municipalities to grant rebates to those who install systems for the electrical or thermal use of solar energy, with rebates of up to 50% of the full amount of IBI. This amount varies according to the municipality, as well as the requirements to be able to access it. There is also the possibility for local councils to grant reductions in the tax on constructions, installations and works (ICIO) for the implementation of self-consumption photovoltaic systems. This tax and the rebates are stipulated by each municipality.

Spanish ECs face particular difficulties in financing of their projects. Although different calls for public funding are being made available to ECs, the lack of legislative definition creates uncertainty in this kind of projects and makes it more difficult to access private financing. Therefore, cooperatives are placing emphasis on complementing investments with contributions from members.

Regarding the role of the banks and other financing bodies, most of the ECs base the start of their activity on shared electricity self-consumption, and for that reason, the involvement of financial institutions varies depending on the implementation strategy of ECs; that is:

- In top-down strategies, large energy companies reach agreements with municipalities for the creation of shared self-consumption, in most cases using photovoltaic technology.
- In the bottom-up model, it is the partners who create the EC and try to bring in new entities such as municipalities or surroundings companies.

As an alternative way of financing projects owned by ECs in Spain, following the Regulation (EU) 2020/1503 of the European Parliament and of the Council on European providers of crowdfunding services, there are crowdfunding alternatives for ECs.

Additionally, 'Next Generation EU' funds for ECs in Spain are available through Order TED/1446/2021, of December the 22nd, which approves the regulatory bases for the granting of aid under the programme of incentives for singular pilot projects for energy communities. These funds, endowed with 40 million euros, are framed in Spain's National Recovery, Transformation and Resilience Plan within the EC-Implementa aid programme. No funds are available for ECs in the Just Transition Development Plans, Rural Development Plans, Operational Programmes or other plans.

The main barriers are due to the legislative uncertainties related to the kind of legal form and technologies that can be used by an EC, the lack of protocol to create an EC and of definition of the legal capacities of ECs and how to reflect them in their statutory purposes, the impact of regional legislation in the EC creation, as well as the role of DSO in the foster of EC. In addition to the search for and grouping of persons or entities that make up the EC, at an administrative level the granting of the discharge point by the DSO is one of the most time-consuming and lengthy requirements for the implementation of the energy communities, since the ECs do not have any priority access, nor are the DSOs forced to reduce response times.

In terms of **technical barriers**, given that most of the ECs base their initial activity on shared electricity self-consumption, their installations are configured on the basis of RD 244. Therefore, they must comply, among others, with some conditions to qualify for self-consumption with surplus and compensation modality.

An EC can carry out both a low and medium-voltage grid connection due to the modification that RD-L 29 (21/12/21) made of its articles, eliminating the restriction of the RD 244 which obliged the connection of self-consumption installations at low voltage. However, Spanish regulations do not directly limit the power installed by energy communities. They must comply with certain requirements if they wish to apply: (a) both the modality of shared self-consumption with excesses and compensation (RD 244), where the installed capacity must not exceed 100 kW, and (b) the public energy auctions (TED 1161), where the capacity must be less than 5 MW.

Mapping and analysis of existing Energy

Communities

The case of Italy

In Italy there are **20 ECs**. The **number of people** who participate in the ECs **depend on the nature of the ECs**. Generally, the community is built by a municipality for which the energy

produced is used to meet the energy needs of municipal users (e.g., gym, town hall, school) and the surplus is exchanged with the families participating in the community.

A summary of the characteristic data of the ECs in terms of organization, property of power grid, direct jobs generation, public economic support and supplies covered by the ECs is presented below.

- **Forms of organization:** Concentrated. Energy can be shared within the same market zone, but to access the incentives, customers may be connected to the same primary substation. Now and until the Ministry publishes the specific implementing decree of the DL199 of November 8, 2021, members must be connected to the same secondary substation to access the incentives.
- **Power grid owner:** production facilities must be available to the community, not necessarily owned.
- **Public economic support:** not available information.
- **Use of technology:** ECs often use solar or hydroelectric power.
- **Size of the system per project:** detailed information can be found at *Orange Book* (Recerca Sistema Energetico, 2022).
- **RES electricity covered by ECs:** the average size of the photovoltaic system is between 20-50 kWp. ECs are using also mini-hydro.
- **Heat/cooling covered by ECs:** it depends on the nature of the EC. It can even reach 100% and, in these cases, a part of the energy produced also serves to satisfy the energy needs of the members.

The governance usually arises from stakeholders (condominium administrators' associations, business groups or a group of citizens). The possibility of adopting governance does not always depend on funded projects, but on the intentions of the members to leverage local institutions to undertake energy and sustainable solutions. Different stages give rise to various models of governance that emerge from an evolutionary process that feeds the entry of new elements into the governance system:

- **Governance activated by experimentation with new energy saving technologies in residential structures:** this initial model can then be extended to the condominium and neighbourhood surrounding giving back a greater organization of the actors or active volunteers of recalling a collectivizing capacity, communities initially, individually.
- **Governance based on a collective initiative:** at a later stage, governance can lead to the creation of a collective body, a cooperative, a living lab or a community association for governance itself. The roles of organizations already present in the area can be integrated

with the governance principles adopted by the community. As a result, a governance entity is created or an existing one is renewed by integrating its objectives with those of a community governance.

All social and structural levels involved must necessarily go back to feeding also the first stage of governance or a citizen interested with his own users to participate in the EC. In short, the ECs allow the development of a new welfare that allows to satisfy economic needs but also to involve citizens, public administrations, and companies more directly.

The case of Greece

In Greece, according to data from the General Commercial Registry (<https://www.businessportal.gr/>), there are 986 ECs of which 163 have already realized RES projects (status May 2022). There are not any statistics on the number of people participating in ECs. However, considering the total number and the fact that the minimum number of people participating in an EC (for profit) is 15, it is estimated that ca. 15,000 people participate in ECs in Greece.

Based on applications, the energy sources used in ECs are predominately **photovoltaics** (99.7%), **wind power** (0.1%), **biogas** (0.07%), **biomass** (0.07%), **co-generation** (0.1%), and **hydropower** (0.04%). When it comes to connected and operating RES power stations (879 projects until May 2022) all systems (with the exception of one small hydro plant) are based on PV technology.

In total, 879 projects have been realized (May 2022) by 163 ECs, i.e., each EC has developed 5.4 projects (points of generation) on average. Considering that from 2019 to 2021, 523.5 MW of PV projects by ECs have been connected to the grid, it is estimated that on average 3,500 direct jobs (150 in 2019, 4,570 in 2020, and 5,770 in 2021) have been generated in that period (plus 7,700 indirect and induced jobs on average created or sustained).

The main characteristics of the ECs in Greece can be summarised as follows:

- **Forms of organization:** dispersed within the same administrative region. However, there is a proximity requirement that at least 50% of all members must live or own a property in the same Region. In addition, they are categorized as non-profit and for-profit. There are no data available about the share of non-profit and for-profit ECs, but the vast majority are for-profit.
- **Power grid owner:** ECs are not the owners of the power grid. Each member may hold, in addition to the mandatory shares, one or more optional shares, with a maximum participation limit of 20% in the cooperative capital, except for the Local Authorities, who can participate with a maximum of 50% (areas with population <3,100 inhabitants), and 40% for the rest.

- **Public economic support:** they have not received any economic public support. However, public administration can be members of ECs.
- **Size of the system per project:** it ranges from 29.68-1,000 kW. The average size is 697 kW.
- **RES electricity covered by ECs:** the total installed power capacity equals 613 MW (as of May 2022).
- **Heat/cooling covered by ECs:** In 2021, the photovoltaics owned by ECs represented 12.7% of total installed PV capacity in Greece. The share of heat/cooling is covered by ECs is only 0.1%.

With relation to the **typology of ECs**, they are categorized as **non-profit and for-profit**. There are no data available about the share of non-profit and for-profit energy communities. However, it should be noted that **the vast majority of ECs are for-profit**. Furthermore, there is **no regional differentiation** within Greece. Regarding the sharing agreement, each member of the EC may hold, in addition to the mandatory shares, one or more optional shares, with a maximum participation limit of 20% in the cooperative capital, except for the Local Authorities, who can participate with cooperative capital with a maximum of:

- a) 50% for Local Authorities of island areas with population less than 3,100 inhabitants according to the latest census.
- b) 40% for the rest Local Authorities.

As indicated above, public administration, and more specific local authorities can be members of ECs.

The **model of governance** that has been adopted by ECs is that of **Cooperatives** (Law 4513/2018 article 1). An EC Manager (Referent) is nominated to represent the EC in all its activities. Each member of the EC, regardless of the number of shares it holds, participates with only one vote in the general meeting.

One of the main objectives of ECs is **to implement actions to support vulnerable consumers and to address energy poverty** for citizens living below the poverty line.

The case of Spain

In Spain there are 14 ECs in operation and 32 more in different stages of implementation. In addition, on the 30th of May, another 46 ECs received funding from the CE Implementa program. The number of members of the ECs in operation varies between 20 and 300 users. However, most of them have around 50 members.

Some of the main characteristics of the ECs in Spain are presented below.

- **Forms of organization:** semi-dispersed. Most of them base their initial activity on shared

electricity self-consumption, so their installations are configured according to RD 244.

- **Power grid owner:** some ECs have their own distribution network, but most of the installations use the distribution network for exchanging electricity between their users.
- **Public economic support:** even though some ECs have been created under European projects, subsidies vary between 30-60% depending on the technology mix used (electric, thermal, electric mobility measures, energy efficiency solutions, demand-side management improvement measures).
- **Use of technology:** although a couple of ECs also share thermal energy through a DH with Biomass, most of the initiatives are putting faith in self-consumption of electricity with solar photovoltaic to start their activity.
- **Size of the system per project:** they can have one or more generation points with a total capacity between 16-125 kWp. The power per user ratio varies between 0.5-1.5 kWp.
- **RES electricity covered by ECs:** in most cases it is still too early to tell, since they have only been in operation for a short time, but estimates foresee coverage ratios of between 40-60%.
- **Heat/cooling covered by ECs:** In the case of thermal energy, they provide heating and DHW but not cooling. ECs cover all the thermal needs of these users.

Finally, in terms of governance of the ECs, no law has been enacted that specifies the points and characteristics that the statutes of an EC should have. Although current legislation allows ECs to achieve a certain degree of autonomy from the electricity system, it does not yet allow it to empower itself as a player in the electricity market. Most of ECs in operation are adopting cooperative or participative association statutes, where each member has one vote and working groups are created to address the objectives. These projects, the distribution of production percentages, the entry of new members or the approval of accounts must be approved by the assembly. In many cases, the assembly creates a governing body, freely elected among all members, in charge of executing their objectives and manage the community. The aim is to create autonomous entities that promote the community wellbeing over individual benefits and are open to the inclusion of all types of people and entities aligned with their objectives.

Cross-analyses and identification of case studies

Legal framework in other EU member states

Energy Communities are defined in two separate laws of the Clean Energy Package, the revised Renewable Energy Directive (EU) 2018/2001 and the revised Internal Electricity Market Directive (EU) 2019/944. These regulations oblige all EU Member States to provide an enabling regulatory framework for ECs. Therefore, an overview of the situation existing in the other EU

countries along with a cross analysis is thoroughly presented in this chapter.

Table 1 Overview of national legislation and transposition of relevant EU directives

Country	Transposition of EU Directives
Austria	The basic regulations are in the Carinthia Electricity Industry and Organization Law (BGBl. I No. 110/2010) and in the Renewable Energy Expansion Act “REEA” (BGBl. I No. 150/2021), although the latter focuses on RECs. This regulation has transposed the community directives in relation to ECs.
Belgium	There is regulation for both CECs and RECs.
Bulgaria	There is an enabling framework for self-consumption but there is no detailed legal framework yet.
Croatia	The term EC was transposed in the national regulatory framework very recently.
Cyprus	Cyprus has not yet presented concepts for collective self-consumption and energy communities according to the EU framework (Frieden et al., 2020). The transposition process in Cyprus has started but is not completed yet.
Czech Republic	The Czech Republic has not yet legislated on ECs. However, a new Czech Energy Act is in the process of providing the basic framework for ECs in the Czech Republic.
Denmark	The regulations for ECs in Denmark were modified in order to adapt to the EU Directives. The essential regulation is found in the Electric Power Supply Act (No. 279 of 2012), which has introduced ECs through various regulatory reforms, and in Executive Order (No. 1069 of May 30, 2021) on RECs and CECs.
Estonia	In September 2021 the Estonian government adopted the Electricity Market Act.
France	The EU Directives on ECs have been transposed.
Finland	
Germany	The legal structure of ECs is not fully adapted to EU Directives. The main regulation is the Law for the expansion of renewable energies (Germany’s Renewables Energy Act, EEG, 2021), which partially transposes the EU Directives; although it is considered that these are not fully transposed.
Hungary	In 2021 a legislative process for a new electric law has started in Hungary, which provides a definition for active consumer as well as for RECs, however limited to electricity.
Ireland	The transposition of articles 21 and 22 of Directive (EU) 2018/2001 and Articles 15 and 16 of Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 has been carried out through the Statutory Instrument 76/2022. In addition, the ECs are linked to a pre-existing reality in the country: the sustainable energy community (SEC).
Latvia	The transposition process of the EU Directives is in progress.
Lithuania	RECs are defined at the Law of the Republic of Lithuania on Renewable Energy (the 2021 consolidated version). However, there is still further work to be done on the transposition, as there is no CEC definition yet.
Luxembourg	The main regulations are in the Law of February 3, 2021, which modifies the Law of August 1, 2007, regarding the organization of the electricity market
Malta	The electrical system in Malta is very specific. The company Enemalta is the exclusive supplier of electricity. The specific nature of Malta’s electricity system is fully recognized in Directive (EU) 2019/944 on Common Rules for the Internal Market for Electricity, which grants Malta exemptions on third party access, choice of supplier and provisions related to unbundling. For these reasons, ECs are not expected to develop in the country in the short term and do not have specific regulations.
The Netherlands	There is a draft proposal for an Energy Act that has not yet been approved. This bill regulates ECs based on the provisions of European directives.

Poland	Poland has proposed legislation on CECs, while it is also working on developing provisions for RECs.
Portugal	The basic regulation is in Decree-Law 15/2022, in which Directives 2019/944 and 2018/2001 are transposed. This legal norm includes the Citizen Energy Communities (CEC) and the Renewable Energy Communities (REC) within those involved in the National Electric System. In this Decree-Law, these communities are defined in a similar way to the European norm.
Romania	Recently, the revised Internal Electricity Market Directive (EU) 2019/944 was transposed to Romanian legislation, which simply copies and pastes the directive itself. As such, the EU level CEC definition serves as the de facto definition of CECs in Romania
Slovakia	Slovakia is preparing a new energy law. The law amending the energy law of 2012 will have a strong focus on deregulation, but will also include the concepts of active consumers, energy communities, and will provide for a better market access for aggregators. The law will be forwarded to parliament by the end of the year, to come into force on 1.1.2023
Slovenia	Slovenia has adopted a bylaw (Regulation on self-supply with electricity from renewable energy sources) that entered into force on May 1st, 2019 (Government of the Republic of Slovenia 2019). Slovenia treats the regulation not yet as a transposition of the Clean Energy Package but to stimulate the private investments into renewable energy (RES) generation and an important step towards a later transposition.
Sweden	There are several forms of collective energy ownership in the country that existed prior to the two main EU Directives. For this reason, Directives 2018/2001 and 2019/944 have not been transposed.

According to ASSET (2019), the specific number of ECs is difficult to estimate, but according to REScoop, there were around 3,000 energy communities across Europe by that year. With our state of the arts by May 2022 – as can be seen in Table 10 – it is observed that no comprehensive databases on registered ECs are available either at the EU or national level, and most statistics on the reports available are based on the analysis of a set of case studies.

Table 2 Overview of number of Ecs and their field of operation

Country	No of ECs	Field of operation
Austria	18	District heating, energy efficiency, hydropower, sun, wind and biomass
Belgium	34	Hydropower, mobility, energy efficiency, sun, wind, biomass, flexibility and district heating
Bulgaria	1	Solar power
Croatia	2	Solar power and wind power
Cyprus	-	-
Czech Republic	-	-
Denmark	700	district heating and wind power
Estonia	-	-
France	70	Mobility, energy efficiency, community development, building renovation, research, solar power, wind power, flexibility, hydropower and district heating
Finland	2	Biomass and district heating
Germany	1750	Community development, mobility, solar power, wind power, biomass, district heating,

		flexibility, hydropower, and energy efficiency
Hungary	1	Solar power
Ireland	6	Solar power, wind power, hydropower, community development, energy efficiency, building renovation and research
Latvia	-	-
Lithuania	-	-
Luxembourg	1	Solar power, wind power and biomass
Malta	-	-
The Netherlands	500	Solar power, wind power, hydropower, district heating, energy efficiency, flexibility, building renovation
Poland	34	Biomass, district heating, mobility, solar power
Portugal	7	Flexibility, energy efficiency and solar power
Romania	2	Solar power and energy efficiency
Slovakia	-	-
Slovenia	1	Solar power
Sweden	200	Not specified

Note: information from REScoop (2022) contains data related to Cooperatives, since Caramizaru & Uihlein (2020) informs specifically about Energy Communities.

In terms of the **statistics on the number of people participating in ECs** it has been difficult to get estimates on the number of ECs in each EU country, let alone the number of participants. The only information available derives from RESCOOP -the European federation of citizen energy cooperatives- that currently has 1,900 members and 1.25 million participating citizens. In terms of **organizational form**, the regulatory framework at European level allows ECs to take any form of legal entity: association, cooperative, partnership, non-profit organisation, small/medium-sized enterprise (SME), etc. With relation to the **investments**, the Statistical Pocketbook 2021 – EU energy in figures by the European Commission provides statistics on the RES shares of the gross final energy by countries (EC 2021, p.126).

In relation to the **standard legal entity forms dictated in the framework in each for ECs**, the regulatory framework at the European level does not impose any restrictions on the legal type. The purpose is to make it easier for its citizens, together with other market players, to team up and jointly invest in energy assets (see table 7). The only restriction imposed is that both types of ECs: **CEC in the Directive (EU) 2019/944**, and **REC in the Directive (EU) 2018/2001** must be set up as a legal person and must be effectively controlled by their shareholders or members. However, a range of MS include in the relevant national legislation requirements about the legal entities allowed for ECs (REScoop.EU, 2022). These requirements, on the one hand impose limitations on the types of legal forms allowed, but on the other hand provide legal clarity to the interested stakeholders.

There are several barriers that affect the development and operation of ECs. The most significant one that was mentioned also at most interviews with the stakeholders is the lack of

accessible, targeted, and consistent funding and financing. Government programmes and instruments providing grant support, allowing for a functioning business model, are essential in the initial stages of setting up and developing ECs.

Apart from the barriers directly linked to financial factor, there are barriers which arise well before the implementation of a financing scheme and are as follows (REScoop.EU, 2013):

1. Cultural and political factors
 - Lack of knowledge concerning the cooperative model
 - Lack of legitimacy as a real market player and low trust in the cooperative model as an effective economic alternative
 - Level of political support to RES and to citizen-led initiatives
2. Economic and management factors
 - Pre-planning stage barriers
 - Lack of guarantees
 - Size of projects
3. Legal and administrative factors
 - Public offering regulation (access to equity capital)
 - Administrative barriers: cost and access to the grid
 - Unstable regulation

Based on a survey targeted National Authorities of a range of MS during the ASSET study on ECs in the European, the main regulatory and administrative barriers are the lack of guidance and access to information on possibly existing relevant laws and regulations at local levels, followed by the end of non-premium based feed-in tariffs in the EU (ASSET, 2020). Table 20 presents a summary of the main barriers to the development of ECs in the EU countries, based on the regulations governing the creation, development and maintenance of ECs in each country.

Identification of case studies

Energy Community 'City Hall' – A realised case study from Italy

The Municipality of Magliano Alpi, attentive to new energy models, wanted to concretely acknowledge its adhesion to the Energy Communities Manifesto for an active centrality of the Citizen in the new energy market, promoted by the Energy Center of the Polytechnic of Turin, giving life to the first EC in northern Italy, registered as an association with the Revenue Agency under the name of Comunità Energetica Rinnovabile Energy City Hall.

The EC developed a solar photovoltaic system of about 20 kW, installed on the roof of the Town Hall. It is connected to the POD of the Town Hall and aims to meet the electricity needs of the building itself, the library, the gymnasium and the municipal schools and to exchange surplus energy with 5 participating families in order to meet 40% of electricity consumption, as well as powering a charging station for electric cars, free for CER members.

The project was financed 100% by municipal funds.

GECO: A case study to be realised in Italy

The GEGO (Green Energy Community) project concerns the creation of the first EC virtual reality of Emilia-Romagna, in the districts of Pilastro and Roveri in Bologna, using the existing network in areas where consumption is currently recorded of electricity equal to 430 MWh per year. The center of the community citizens and companies will play an active role in the process of creation, production, energy distribution and consumption.

The development area includes a residential area of 7,500 inhabitants, of which 1,400 in social housing, a commercial area of 200,000 m² which hosts an agri-food park, two shopping centers, and an industrial area of over 1 million m², where there are currently solar photovoltaic systems with total capacity of 16 MW on the roofs of Agri-food Center of Bologna-CAAB and of the FICO Foundation, and solar systems with total capacity of 2 MW in the Roveri industrial area.

Through GECO, eight new plants from renewable sources associated with systems of accumulation will be built, transforming companies and citizens into prosumers. In particular, a photovoltaic plant of 200 kW for the CAAB/FICO agro-industrial center; a biogas plant of 20 kWe and 30 kWt for the organic waste disposal. In addition, a solar photovoltaic plant of 100 kW on residential buildings and another 200 kW in the shopping center Pilastro and nearby condominiums will be installed.

Also, two solar plants of 200 kW will be installed on the roofs of the Fashion Research Institute, ZR Experience and the neighboring companies. Hence, a total of 14 MW of new power generated by photovoltaic systems, which will produce by 2023 over 15.4 million kWh/year, resulting to energy savings of 120 MWh/year and CO₂ savings of 58,000 tons of CO₂/year.

The project is in the development phase and is co-financed by the European fund EIT Climate-KIC, by the Agency for Energy and Sustainable Development, ENEA and the University of Bologna, with the participation of citizens, local associations and companies of the territory, such as the local Development Agency North East District Pillar and CAAB.

Minoan Energy – A case study from Greece

Minoan Energy Community, as an urban Cooperative of the social and solidarity economy, started its operation at the end of last year, with the sole purpose to generate, store, distribute and sell green energy to its members. They currently have 230 members that come from all over the island of Crete. They have completed the implementation of their first net metering project which concerns a solar photovoltaic power station of 405 kW. This project offers free electricity to 76 individuals (households), 18 companies and Legal entities of Prefecture of Crete and the Municipal Water Supply and Irrigation Company of Minoa Pediada. In terms of financing, the project was financed by 51% with equity and 49% loan.

Energy Community Ski Village Resort: A case study from Spain

The case study from Spain concerns the pilot site of Manzaneda as part of the Renaissance project which aims promoting clean systems integrated in local environments in a scalable way. The site is a remote rural village and ski resort consisting of 163 private households, 53 apartments owned by MEISA Hotel which are rented to tourists, commercial premises and related facilities (ski lifts, commercial area, shops, restaurant, swimming pool, multi sports hall, water treatment plant, artificial snow guns). The community of Manzaneda has a total installed photovoltaic capacity of 150 kW distributed to several locations and an 800 kW district heating system powered by biomass. The project involves 250 consumers and it was financed by 87% by Horizon 2020 (Renaissance Project 2019-2022).

RE/SOURCES project: A case study from Belgium

The case study selected for Belgium is the RE/SOURCED project which takes place in Zwevegem, a small town in West Flanders, Belgium. RE/SOURCED stands for Renewable Energy Solutions for Urban communities based on Circular Economy policies and DC backbones, focusing on sustainable energy maximization, heritage conversion, and circular economy.

The project aims at transforming a former power station (set up in 1912), Transfo, into an energy community. Transfo is a multifunctional site with homes, offices, and other structures. It is a 10-hectare site preserved for its heritage and with significance. The citizens of this community are to receive help from the local power grid that is being developed. The renewable energy source used is a 20 kW solar photovoltaic system.

The focus is on making circularity applicable in renewable energy. The DC grid brings together various renewable energy sources - wind turbines, solar panels, and storage facilities. The idea of a circular economy comes into play in using more efficient materials for the demand of steel, copper, lithium, and the like to be met. The factor of material usage is great in the sustainability of energy systems.

Coopérnico: A case study from Portugal

Coopérnico is a cooperative of renewable energies, which combines its social nature with the support of solidarity, educational or environmental protection projects. It has more than 1800 members – including citizens, small and medium-sized enterprises, and municipalities over Portugal –, who have invested more than 1.7 million euros in 21 solar farms with a total installed capacity of about 1.9 MWp. Specifically, it is the first cooperative in Portugal dedicated to sustainable development and selling renewable electricity. To act properly, they use a system in which:

1. They have created a large community of citizens and companies willing to contribute to a new energy, social and business model.
2. They have pooled part of our savings into investments in small renewable energy projects in which each person can own as much as they wish.
3. The electricity they produce is integrated into the electricity grid and is used to supply families and businesses.
4. Their projects generate economic benefits, through the sale of the electricity produced, and environmental benefits, through the production of clean electricity (without emissions of carbon dioxide and other pollutants).
5. They distribute the benefits generated between society, investors, and the environment.

Conclusions

This document presents a summary of the study conducted in the context of Workpackage 1 – Analyses of Energy Communities. The study was based on three common points in terms of the operation of Energy Communities, namely (1) energy system and electricity (market and structure); (2) energy policies and regulatory framework; (3) socio-cultural attitudes towards the environment and cooperative models (Sciullo et al., 2022). Thus, the analyses and mapping of the three target countries as well as cross analyses and identification of case studies was based on these three axes.

Regarding the possibilities and common challenges in the development of Energy Communities in the three target countries, the regulations applicable to Energy Communities should be clarified. This applies mainly in Italy and Spain where the European Directives have not been properly transposed to the national laws. As a result, there are doubts with various aspects such as the legal form of Energy Communities. In the case of Greece, the majority of regulatory and administrative barriers have been removed, but there is still room for improvements. Moreover, there are no clear incentives specifically adapted to Energy Communities and there are significant financial barriers that should be eliminated.

Energy Communities have enormous potential, as “contiguous processes of both energy transition and social innovation (that) can promote sustainable energy production and consumption practices” (Caramizaru & Uihlein, 2020, p. 4), provided they are driven by a regulatory and legal framework that ensures support, commitment, equality, and fairness with the ultimate aim of enabling the citizen to operate in the energy market and contribute to the transition, in an equitable manner (Roservi et al., 2022).

Furthermore, **Energy communities** play a key role in facilitating citizen participation in the energy system (Biresselioglu et al., 2021), understanding that individuals are the ones who need to self-organise and therefore government bodies should treat them as co-producers of solutions to the collective action problems they face and not as passive subjects (Marshall et al., 2017). Nevertheless, the way in which citizens and enterprises join forces to develop collective initiatives occurs at different scales in different European countries. The analysis carried out in this document revealed that the countries analysed are undergoing a process of change towards collaborative governance models that incorporate heterogeneous actors in building consensus around public policy objectives and priorities, although leadership is still in the hands of experts and advisors.

The result of Workpackage 1 improve understanding of the most relevant topics and contents to be included in the training course and help to find best practices and case studies to be used in the training of trainers and pilot courses. The target groups of the results will be not only the project partners but all institutions, policy makers and all industry associations and stakeholders in the energy sector.

The information gathered in this study has a wide potential for transferability to other energy sector contexts in the target countries and the method adopted could easily be used in other EU countries to conduct a similar study.

References

- Advanced System Studies for Energy Transition (2019). Energy Communities in the European Union. The ASSET projects.
- Advanced System Studies for Energy Transition (2020). EC, Directorate-General for Energy, ASSET STUDY on Energy Communities in the European Union. The ASSET projects.
- Autoriteit for Consument & Markt (n.d.). ACM [website]. <https://www.acm.nl/nl>
- Barroco, F., Borghetti, A., Cappellaro, F., Carani, C., Chiarini, R., D'Agosta, G., De Sabbata, P., Napolitano, F., Nigliaccio, G., Nucci, A.A., Orozco Corredor, C. Palumbo, C., Pizzuti, S., Pulazza, G., Romano, S., Tossani, F., & Valpreda, E. (2020). *Le comunità energetiche in Italia. Una guida per orientare i cittadini nel nuovo mercato dell'energia*. <https://doi.org/10.12910/DOC2020012>
- Biresselioglu, M.E., Limoncuoglu, S.A., Demir, M.H., Reichl, J., Burgstaller, K., Sciallo, A., & Ferrero, E. (2021). Legal provisions and market conditions for energy communities in Austria, Germany, Greece, Italy, Spain, and Turkey: A comparative assessment. *Sustainability*, 13, 11212. <https://doi.org/10.3390/su132011212>
- Bundesnetzagentur (n.d.). *Market master data register* [website]. <https://www.marktstammdatenregister.de/MaStR>
- Bündnis Bürgerenergie (n.d.). *Our map of citizen energy* [website]. <https://www.buendnis-buergerenergie.de/karte>
- Caramizaru, A., & Uihlein, A. (2020). *Energy communities: an overview of energy and social innovation*. <http://doi.org/10.2760/180576>
- Carinthia Electricity Industry and Organization Law 2011. BGBl. I No. 110/2010. FAO, FAOLEX.
- Commission de Régulation de l'Electricité et du Gaz (2008). *2008 annual report of Belgium to the European Commission. Summary and main developments*. CREG.
- Commission de régulation de l'énergie (n.d.). *Open data* [website]. <https://www.cre.fr/Pages-annexes/open-data>
- Commission for Electricity Regulation (n.d.). *About CRU* [website]. <https://www.cru.ie/>
- Couture, T.D., Stoyanova, T., & Pavlov, T. (2021). Scaling-up Energy Communities in Bulgaria. *E3 Analytics*. <https://www.e3analytics.eu/>
- Council of European Energy Regulators (2019). *Regulatory Aspects of Self-Consumption and Energy Communities CEER* (Report Ref: C18-CRM9_DS7-05-0325 June 2019). CEER.
- Council of European Energy Regulators (2021). *Status review of renewable support schemes in Europe for 2018 and 2019. CEER Report* (Report Ref: C20-RES-69-04 28 June 2021). CEER.

Danish Executive Order (No. 1069 of May 30, 2021)

Dansk Energy (n.d.). Danish Energy Regulatory Authority [website]. www.danskenergi.dk/

Decree of 12 April 2001 about the organization of the regional electricity market.

Decree-Law No. 15/2022 on the National Power System. Diário da República, No. 10/2022. Série I de 2022-01-14. <https://data.dre.pt/eli/dec-lei/15/2022/01/14/p/dre/pt/html>

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 (recast). (Text with EEA relevance.). No. PE/48/2018/REV/1. <http://data.europa.eu/eli/dir/2018/2001/2018-12-21>

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 (Text with EEA relevance.). No. PE/10/2019/REV/1. <http://data.europa.eu/eli/dir/2019/944/oj>

Energy Communities Hub (2022). *Regulatory frameworks* [website]. <https://energycommunitieshub.com/>

Electricity Supply Act (No. 279 of 2012). Ordinance on Renewable Energy Communities and Citizens' Energy Communities and the Relationship between Renewable Energy Communities and Citizens' Energy Communities and Electricity Trading Companies and Collective Electricity Supply Companies. www.retsinformation.dk

Énergie Partagée (n.d.). *Carte des initiatives citoyennes* [website]. <https://energie-partagee.org/decouvrir/energie-citoyenne/tous-les-projets/>

Energie Samen (2022). Local energy monitor 2021: 15% growth in members. <https://energiesamen.nu/nieuws/2271/lokale-energie-monitor-2021-15-groei-in-leden>

Energie-Control Austria (n.d.). *For market players* [website]. https://www.e-control.at/en/home_de

Energie-Control Austria (2021). *Annual report on electricity labelling*. <https://www.e-control.at/de/publikationen/oeko-energie-und-energie-effizienz/berichte/stromkennzeichnungsbericht>

Energetický Regulační Úřad (n.d.). *Regulation* [website]. <https://www.eru.cz/>

Energimarknadsinspektionen (n.d.). *E-Services and self-service* [website]. <https://ei.se/e-tjanster-och-sjalvservice>

Entidade Reguladora dos Serviços Energéticos (n.d.). *Atos e documentos da ERSE* [website]. <https://www.erse.pt/biblioteca/atos-e-documentos-da-erse/>

European Commission (2021). *Statistical Pocketbook 2021 - EU*. https://transport.ec.europa.eu/media-corner/publications/statistical-pocketbook-2021_en

European Commission (2022). April infringements package: key decisions. https://ec.europa.eu/commission/presscorner/detail/en/inf_22_1769

French Energy Code, Articles L291-1-1 to L294-1

Frieden, D. Tuerk, A., Roberts, J., D'Herbemont, S., Gubina, A.F., & Komel, B. (2019). Overview of emerging regulatory frameworks on collective self-consumption and energy communities in Europe. Paper presented at the 16th *International Conference on the European Energy Market (EEM)*. <http://doi.org/10.1109/EEM.2019.8916222>

Friends of the Earth Europe (2018). *Unleashing the power of community renewable energy*. https://energy-cities.eu/wp-content/uploads/2019/02/community_energy_booklet_2018_en.pdf

Germany's Renewable Energy Act (EEG) 2021. Tel No. 65, from December 28, 2020. https://www.bgbl.de/xaver/bgbl/start.xav?startbk=Bundesanzeiger_BGBl&start=//%5B%40attr%3D%27bgbl120s3138.pdf%27%5D%201652859581643

Instituto Internacional de Derecho y Medio Ambiente (2021). *Comunidades energéticas: Aportaciones jurídicas para su desarrollo en España*. https://www.iidma.org/attachments/Publicaciones/Informe_CCEE.pdf

International Energy Agency (2020). *Luxembourg 2020. Energy Policy Review*. IEA. https://iea.blob.core.windows.net/assets/8875d562-756c-414c-bc7e-5fc115b1a38c/Luxembourg_2020_Energy_Policy_Review.pdf

International Energy Agency (2021a). *Czech Republic 2021. Energy Policy Review*. IEA. <https://www.iea.org/events/czech-republic-2021-energy-policy-review>

International Energy Agency (2021b). *Lithuania 2021. Energy Policy Review*. <https://doi.org/10.1787/db346bb1-en>

IEA Bioenergy (2021). *Implementation of bioenergy in Croatia 2021 update* [Report]. https://www.ieabioenergy.com/wp-content/uploads/2021/11/CountriesReport2021_final.pdf

Malta Resources Authority (n.d.). *Home* [website]. <https://mra.mt/>

Marshall, G.R., Hine, D.W., & East, M.J. (2017). Can community-based governance strengthen citizenship in support of climate change adaptation? Testing insights from Self-Determination Theory. *Environmental Science & Policy*, 72, 1-9. <https://doi.org/10.1016/j.envsci.2017.02.010>

Ministry of Climate and Environment of Poland (2021). *Energy Policy of Poland until 2040*, Warsaw 2021 [website]. <https://www.gov.pl/web/climate>

Ministry of Ecological Transition (2019). *National Strategy Against Energy Poverty 2019-2024*. https://www.miteco.gob.es/es/prensa/estrategianacionalcontralapobrezaenergetica2019-2024_tcm30-496282.pdf

National energy and climate plans (2019). *Integrated National Energy and Climate Plan 2021-*

2030. https://energy.ec.europa.eu/system/files/2020-03/el_final_necp_main_en_0.pdf

National energy and climate plans (2020). *Integrated National Energy and Climate Plan 2021-2030*. https://energy.ec.europa.eu/system/files/2020-06/es_final_necp_main_en_0.pdf

Next Generation EU (2021). *Recovery and resilience scoreboard. Thematic analysis: Clean power*. https://ec.europa.eu/economy_finance/recovery-and-resilience-scoreboard/assets/thematic_analysis/1_Clean.pdf

Recerca Sistema Energetico (2022). *La comunità energetiche in Italia. Orange book*. <https://www.rse-web.it/wp-content/uploads/2022/02/OrangeBook-22-Le-Comunita-Energetiche-in-Italia-DEF.pdf>

Orden TED/1446/2021, de 22 de diciembre, por la que se aprueban las bases reguladoras para la concesión de ayudas del programa de incentivos a proyectos piloto singulares de comunidades energéticas (Programa CE Implementa), en el marco del Plan de Recuperación, Transformación y Resiliencia.

Osservatorio Italiano sulla Povertà Energetica (2022). *Energy poverty* [website]. <https://oipeosservatorio.it/en/energy-poverty/>

Palm, J. (2021). The transposition of energy communities into Swedish regulations: overview and critique of emerging regulations. *Energies*, 4982. <http://doi.org/10.3390/en14164982>

Renewable Energy Policy Network for the 21st Century (2016). *Renewables 2016 Global Status Report. Key Findings 2016*. REN21 - Renewable Energy Policy Network.

Renewable Energy Expansion Act (REEA). BGBl. I Nr. 150/2021. <https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20011619>

REScoop.EU (2013). *Report on financial barriers and existing solutions*. EU.

REScoop.EU (2022). *Policy* [website]. <https://www.rescoop.eu/policy>

RESOLUCIÓN de 14 de marzo de 2022, del presidente del Instituto Valenciano de Competitividad Empresarial (IVACE), por la que se convocan ayudas destinadas al fomento de instalaciones de autoconsumo de energía eléctrica en régimen de comunidades de energías renovables, con cargo al presupuesto del ejercicio 2022. [2022/2307]

Roversi, R., Boeri, A., Pagliula, S., & Turci, G. (2022). Energy Community in action—Energy citizenship contract as tool for climate neutrality. *Smart Cities*, 5, 294–317. <https://doi.org/10.3390/smartcities5010018>

Schonher (2022). Croatia to start renewables auctions for large-scale projects in spring 2022 [website]. <https://www.schoenherr.eu/content/croatia-to-start-renewables-auctions-for-large-scale-projects-in-spring-2022/>

Sciullo, A., Gilcrease, G.W., Perugini, M., Padovan, D., Curli, B., Gregg, J.S., Arrobbio, O., Meynaerts, E., Delvaux, S., Polo-Álvarez, L., Candelise, C., van der Waal, E., van der Windt, H., Hbert, W., Ivask, N., & Muiste, M. (2022). Exploring Institutional and Socio-Economic Settings for the Development of Energy Communities in Europe. *Energies*, 15(4), 1597. <https://doi.org/10.3390/en15041597>

Statutory Instruments. S.I. No. 76 of 2022. European Union (Renewable Energy) Regulations 2022. <https://www.irishstatutebook.ie/eli/2022/si/76/made/en/pdf>

Wetsvoorstel Energiewet (2021). Draft bill containing rules on energy markets and energy systems (Energy Act). <https://www.rijksoverheid.nl/documenten/publicaties/2021/11/26/wetsvoorstel-energiewet-uh>