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# Scalability of Low Carbon Energy Communities in Spain: An Empiric Approach from the Renewed Commons Paradigm

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**Abstract:** Through the implementation of low carbon-based energy systems and participatory modes of governance, there are countless collective initiatives progressing towards a sustainable and resilient energy model. Local alternatives necessarily have to be able to scale in order to address global challenges. From the renewed paradigm of the commons, this empirical research provides a precise picture of the present scalability of these (self) transformative initiatives in Spain. Based on the identification and qualitative analysis of 18 of them via semi-structured in-depth interviews, the article explores their upper and lower limits; the importance of power distribution and citizen participation; the relational dimension of the scale; the upscaling forms and the role of public institutions. On the basis of the results obtained, the article finally presents recommendations aimed at strengthening this scalability of the energy commons.

**Keywords:** energy; sustainability; commons; scalability; community

## 1. Introduction

With the view of reducing the impact of COVID-19, months-long restrictions on mobility and social and economic activity are producing in absolute terms a never-seen-before planetary demand decline [1–3]. What is now being dubbed *The Great Shutdown* [4] and *The Great Lockdown* [5] has revealed once again [6–8] the global energy systems insufficient resilience and ongoing exposure to economic, geopolitical, environmental and social disturbances [9–14].

This insufficiency is structural, since it is due in an extent to its constitution as a concentrated and competitive system, controlled by large corporations. A system of these characteristics ends up configuring what Von Neumann [15] called *artifact machines*, made up of elements each of them extremely reliable but which make the machine as a whole much less reliable than each of its components; in the words of Morin: “It only takes a change in one or its constituent parts for the whole to be blocked, to break down, so that it can only be repaired by an external intervention (the mechanic)”. On the contrary, a distributed and cooperative energy model (and this is one of the main ideas defended in this research) would allow the constitution of *living machines* (self-organized), characterized by a paradoxical “great reliability of the whole and weak reliability of the parts.” [16]; in other words, much more resilient and adaptable, insofar as they facilitate compliance with the criteria of availability, accessibility, affordability and acceptability, conditions of a sustainable energy system [17].

Is in this context in which the Sustainable Recovery Plan, spearheaded by the International Energy Agency, in cooperation with the International Monetary Fund, has led the call to build a more resilient

and cleaner system [2] (p. 104). A transition to be made shifting towards resilience thinking and modes of governance that are both adaptive and ecosystemic [18]. Resilience that do not only require the development of new kinds of renewable technologies but also the transformation of current economic and political institutions and social values [19,20]. Even the OECD (2015) has called upon its member countries to align its policies for a transition to a low carbon economy [21].

These transformations could be fueled by the spread of sustainable energy grassroots initiatives [22–24]. Local and collective initiatives that take on different types of shapes and models. From sustainability-oriented grassroots initiatives [25], to eco-cities and ecovillages [26,27], low-carbon based initiatives and communities [28], and sustainable communities and neighbourhoods [29–33], movements such as *Transition Towns* [34], low-carbon smart cities [35,36] and on the whole, low-carbon or decarbonised cities [37–39], and even renewable energy cooperatives founded directly by citizens [40]; they should all converge, acknowledge each other and be scaled in order to tackle issues that exist on a global scale.

All of them form part of a rich constellation of the renewed paradigm of the commons [41] for their ability to govern sustainably and democratically common goods such as energy. As detailed hereinafter, commons include initiatives, movements and projects that through the use of sustainable environmental technologies are able to provide democratic governance to a social good as it is in fact the energy [42]. From social enterprises and cooperative societies to current transformative social movements, they all seem to have the potential of upscaling towards greater sustainability and resilience to external disturbances.

In fact, scalability of local initiatives and experiences play a key role in the mentioned necessary transformation [43,44]. As Mignolo observed, global designs of contemporary socioeconomic system can only be altered from local stories and experiences [45]. For his part, Wright reminds us of the emancipatory potential that lives in civil society, whose origin lies in ‘people’s ability to form alliances in order to push forward collective objectives’ ([46], p. 157). Based on daily community-based activities, behaviours and reciprocity, these diverse initiatives needs to upscale in order to respond to issues that exist at the global level.

In this sense, there seems to be an opportunity in Spain to contribute to this transformation. Spaniards have thus proven to be willing to create, share and manage renewable energies [47]. The transition to alternative, eco-social energy models is not only necessary, but seems achievable. However, the contrasting difficulties of confluence and scaling capacity that sustainable communities and transformative practices should not be underestimated [48]. A complexity that is particularly accentuated in communities who are part of the *global commons*; a movement of movements or a coalition of coalitions of heterogeneous communities [49] defending a plethora of common goods, in such disparate fields such as the fight against biopiracy, food sovereignty [50], and agroecology [51]; or energy management.

Alongside the progress that these communities themselves achieve from the praxis, academic contributions articulating a constellation of different practices capable of overcoming the local scale is not only necessary, but indispensable. The role that local communities must undertake in the creation of change at the global scale is palpable. In this matter, from a Spanish energy commons standpoint, what are some of the core elements that underscore the scalability of local communities? What strategies do they employ? In this context, what is the status of low carbon-based, energy commons and initiatives in Spain? Answering to these relevant questions is the main contribution of the present research.

If we focus on the area of energy and its materialisation as an instituting praxis, this empirical study demonstrates the contribution that the renewed common paradigm provides to the scalability of local sustainable communities. It reveals and qualitatively analyses, by way of in-depth interviews, local, (self)-transformative practices which have been democratically and cooperatively launched and implemented in the area of energy for an eco-social transition. In addition, this work observes and studies the interactions and cooperation that is currently taking place between these low-carbon communities that make up the constellation of commons in Spain.

## 2. Materials and Methods

In order to respond to the aforementioned questions, a dialogic research has been developed through a non-probabilistic sampling method. For it, units of analysis were selected, that is, low-carbon initiatives that comply with the characterisation of *common instituting praxis* which in turn represent cognizant collective activities that can give rise to a new institution [41,52]. Based on secondary sources such as their own web pages or external reports, 40 initiatives were identified and analysed. For that purpose, detailed in Appendix A, fact sheets for each initiative were fulfilled. Among them, based on their compatibility with the paradigm of the commons, 18 were selected so that a second phase of in-depth interviews could be performed. The following table (Table 1) shows the dimensions of the Commons and the guiding questions that were defined for the selection of these 18 initiatives:

**Table 1.** Normative and applied dimension of the commons.

Normative Dimensions	Applied Dimensions	Guiding Questions
1. Reciprocity and co-activity	1.1 Cooperative governance	<ul style="list-style-type: none"> <li>• Are the relationships between members primarily cooperative?</li> <li>• Are spaces for participation and inclusion encouraged?</li> <li>• Have norms and rules been collectively and horizontally agreed?</li> </ul>
	1.2 Network building	<ul style="list-style-type: none"> <li>• Does it cooperate with other initiatives?</li> <li>• Does the cooperation take place with practices from the same field or from others?</li> <li>• Has it been able to create synergies with other initiatives?</li> </ul>
2. Human autonomy	2.1 Voluntary association	<ul style="list-style-type: none"> <li>• Who can be part of the initiative?</li> <li>• How can you become part of the initiative? Are there different types of membership?</li> <li>• Is an economic contribution determinant to be part of the initiative?</li> <li>• Is there a mechanism to facilitate the process of disassociation of members?</li> </ul>
	2.2 Self-sufficiency and autonomy	<ul style="list-style-type: none"> <li>• What kind of needs does the initiative answer to? Does answering to these needs result in greater autonomy?</li> <li>• Are autonomous relations of the members promoted with respect to the market or the State logics?</li> <li>• How does such an improvement in autonomy or reduction in dependency occur?</li> <li>• Is the initiative viable without the economic support from public administrations or private corporations?</li> </ul>

Table 1. Cont.

Normative Dimensions	Applied Dimensions	Guiding Questions
3. Social justice	3.1 Mechanisms to promote equality and reduce the risk of exclusion	<ul style="list-style-type: none"> <li>Does the initiative have mechanisms for the reduction of inequalities that may occur among community members? And with respect to other communities?</li> <li>If so, what types of inequalities are being addressed: social, cultural, ethnic, economic, gender?</li> </ul>
	3.2 Democratization	<ul style="list-style-type: none"> <li>Who can take part in the decisions?</li> <li>How can community members take part in decisions?</li> <li>Which are the mechanisms applied for participation in decision-making?</li> <li>Are spaces provided for the shared and collective (re)configuration of the initiative?</li> <li>Are members encouraged to critically question the initiative? How?</li> <li>Does the initiative contribute to the democratization of other public and private spaces and institutions?</li> </ul>
	3.3 Social purpose	<ul style="list-style-type: none"> <li>Which is the purpose of the practice?</li> <li>If the initiative has financial benefits, what are they used for?</li> </ul>
	3.4 Socioeconomic impacts	<ul style="list-style-type: none"> <li>Does the initiative have tools for measuring the social and economic impact generated by its activity?</li> <li>If so, is such information used to (re)align the initiative with the rest of the dimensions of the commons?</li> </ul>
4. Ecological justice	4.1 Environmental technologies	<ul style="list-style-type: none"> <li>Does the initiative make use of environmentally respectful technologies?</li> </ul>
	4.2 Circular activity	<ul style="list-style-type: none"> <li>Within the framework of circular economy: to what extent is the initiative capable of "closing cycles", taking responsibility for the waste generated in the development of its activity?</li> <li>In order to reduce pollution and unnecessary use of resources, does the practice cooperate with others that are geographically close?</li> <li>In the development of its activity, does the practice cooperate with others that also have an ecologically respectful behaviour?</li> <li>Does the initiative attempt to influence production and consumption models by making them socially, economically, and ecologically more sustainable?</li> </ul>
	4.3 Environmental impacts	<ul style="list-style-type: none"> <li>Which is the ecological footprint generated by the activity?</li> <li>Which is the ecological footprint compared to other initiatives in the same field?</li> <li>Does the initiative protect any natural good in the development of its activity?</li> </ul>

Given the breadth of spaces that commons could emerge in the form of low-carbon initiatives and communities, an open and inclusive approach was chosen which led to the detection of collective initiatives that range from (1) solely electricity generating to (2) Spanish eco-villages that perform

their day-to-day activities based on strong sustainability logics or (3) collectives that are dedicated to research and forward-thinking activities regarding the energy model. From communities and initiatives that seem the closest to market logics to those located in the non-state-public sphere.

Therefore, the results presented herein are based on the analysis of findings and insights of seven, self-managed, community-based initiatives (*Instituto de Transición Rompe el Círculo*, *Arterra Bizimodu*, *Cardedeu en Transició*, *Sunseed Desert Technology*, *Lakabe*, *Astra* and *the Observatorio Crítico de la Energía*), represented by the acronym 'INA' for coding purposes; four renewable energy cooperatives (*Goiener*, *Megara*, *Som Energia y Solabria/Enerplus*), identified as 'CER'; two social enterprises (*Ecooo* and *Eolpop*), identified as 'ESO'; two municipal initiatives for a transition towards energy autonomy (*Rubí Brilla* and *Barcelona Energía*), identified as 'IMU'; and three non-profit associations or foundations (*Amigos de la Tierra*, *Fundación Desarrollo Sostenible* and *Fundación Renovables*), identified as 'ASO'. They all form part of the constellation of commons and low-carbon based initiatives. Appendices B and C provide an explanation of each code and a brief description of these selected initiatives.

These 18 selected initiatives were the subject of semi-structured in-depth interviews lasting approximately one and a half hours each one of them. Collected qualitative data was codified and systematically analysed. This allowed deepening in the described guiding questions. Once having understood their paths, developed actions, network participation and the intricacies of each of them, a comprehensive assessment of their scalability was performed. In addition to the conclusions which were drawn on scalability and against the erroneous belief of the lack of alternatives, the work showcases part of the praxis that currently operates in Spain, enabling more sustainable social and environmental collective behaviours.

### 3. Understanding Low-Carbon Energy Communities from the Commons Paradigm

Forms of community-based management are not a novel practice, or at least not in all its aspects. Traditionally, the notion of common goods, or as coined by E. Ostrom *common pool resources* (1990), were mainly circumscribed to self-management models of natural resources such as water, land and forests [53]. However, the continuous progress that is being achieved in the fields of biotechnology and Information and Communication Technologies (ICT), its impact on intellectual and cultural property, and greater political awareness in some areas of society, have facilitated the penetration of the paradigm of the commons in environments previously unimaginable. Ancestral experiences, such as the Water Tribunal of the plain of Valencia [53], to modern-day movements, such as *Copyleft*, the creative commons licences, open-source software programmes, or the actions of the *Occupy* movement, demonstrate the wide variety of forms the common praxis can acquire.

*Community-based resource management* [53], *common goods governance* [54], *common democracy* [55], *procommons* [56] and *common instituting praxis* [40] are conceptualisations that, recurrent in time, have strived to demonstrate models of community-based governance of social goods that differentiate from those from the public-state and private-market as we understand them. Overlooking the paternalistic relationship with the public and/or the blind acceptance of market forces, the commons reveal the possibilities and potential of collective self-organisation for sustainable management of different social goods.

The paradigm of the commons, as instituting praxis [41], becomes one of several proposals that attempts to understand and recognise this constellation of local initiatives and communities that put forward a sustainable and resilient governance of goods. It includes all (self)-transformative activities, performed by subjects that through collective action, are able to create new institutions in search of higher degrees of human autonomy [41] and sustainability.

The commons perspective disrupts this unstable balance between the private and the public because it highlights that any good belongs to all but no one at the same time. In the same way that goods can be commodified and/or managed and protected through state intervention, can also be communally (re)-appropriated [57]. This is the case of low-carbon collective initiatives whose characteristics are not possible to locate in what we conventionally understand as public-state or

private-market management. The commons presents itself as one of the last spaces available to citizens to safeguard and/or recover in order to develop new, transformative, community-based actions.

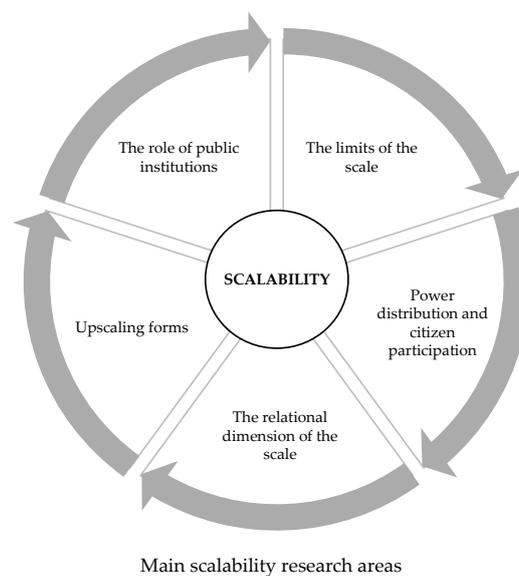
Thus, the self-governments developed in communities to manage (use, distribution, care, administration, etc.) a good and the ethical principles that they defend are what determine if an initiative is part of the common instituting practice. “The so-called common goods are not just goods; they are not “things” that are separate from us, they aren’t even just shared goods. ( . . . ) They are social practices of commoning, based on the principles of sharing, caring and producing jointly” [56]. In other words, a community’s decision to self-organise in order to manage a good based on solidarity, social and environmental sustainability [58], ([59] p.10) and democratic values, such as freedom, equality and fraternity, are elements that foster commoning. Thus, low-carbon based initiatives are, in fact, commoners. Collective subjects that facilitate commoning. Following the examples such as the *Occupy* movement, proposed by Rayner [60], low-carbon communities also recover spaces that were traditionally managed by public and private administrations and establish community-based and sustainable governance models of social goods, such as energy.

As an alternative paradigm, the commons reveal new forms of cooperation that put forward a solution to the environmentally and socially unsustainable global energy model. From a local dimension and close connection with the territory, the commons contribute to (1) the visibility and comprehension of the physical limits that human activity must respect; (2) the understanding of the relational aspect for a dignified and independent life for all individuals and communities; and (3) the understanding that it is possible to satisfy communal needs without giving in to the logics of the market and State.

#### 4. Results: Scalability of Community-Based Low Carbon Spanish Initiatives from the Commons Approach

As exposed above, in a context of proliferation of global issues, it is necessary to analyse the scalability of energy commons such as community-based low carbon initiatives [61]. A scalability that could result in also global resilient systems made up of interconnected local initiatives.

This challenge is far from simple. We must not yield to the temptation of promoting an idealised image of the beauty of small local communities [62,63]. Indeed, there is no single approach to the way in which the commons can be scaled up to shape a global alternative. The results of this article provide a better understanding of the forms in which Spanish energy Commons are upscaling and the challenges they are facing in the process (Figure 1).



**Figure 1.** Section organization according to the findings.

#### 4.1. Between the Upper and the Lower Limits

Although it is not easy for these initiatives to identify the ideal scale for a community to acquire, in the energy field at least there seems to be a general leaning towards decentralisation and the networked action of local practices; both necessary conditions for the creation of a scalable resilient system. However, while initiatives clearly recognise that an increase in size weakens key aspects of the commons, such as their members' level of engagement and their democratic nature, they are unable to precisely determine the scale at which a large part of the praxis should take place.

*How small can something large become before it is no longer efficient? And how large can something small become before it is no longer beautiful? [ESO\_E2].*

Whether it be due to a loss of efficiency, a possible reduction in the diversity of community members, or a drop in its universalising capacity, it seems that it is important to consider not just the upper boundaries, but the lower ones also, when thinking about scale. Described in more detail on the following pages, the self-managed community initiatives are the ones that evince a greater concern over these lower boundaries (INA\_E1, INA\_E2, INA\_E3, INA\_E5). The level of complexity increases when we realise that although we are focused on the local level of action, there is not in fact one single scale of action that is optimal for the entire constellation of energy commons.

In fact, scale is determined by multiple different factors. The type of good (material or immaterial); the different activities that make up its governance (generation, distribution, consumption, etc.); the specificities of the place in which the initiative emerges (such as the existence of a cooperative tradition or other aspects of the local social and cultural capital); existing technologies and the characteristics of the need for which a response or solution is required; all directly influence the scale that can be acquired with the minimum possible sacrifice of democratic and participatory quality.

*What I am trying to say is that both the large and the small are context-dependent. Powering Barcelona with renewable energy requires large-scale projects because the city has a sizeable population. A smaller town or a less densely-populated region would require smaller projects. ( . . . ) I guess it depends on your point of view. If you compare it with a nuclear reactor, then it's tiny. [ESO\_E2].*

*( . . . ) this is very different from Som Energía which sells power locally. In this case, it's easier to create small islands, and then link them to a bridge to create a large-scale structure ( . . . ) [ASO\_E3].*

In the panorama constituted by the common instituting praxis in the energy field, the question of whether the initiative focuses exclusively on the generation of energy or also incorporates distribution will have different implications from the perspective of scale. It is easy to imagine micro-level renewable generation and consumption, such as that which may take place within a single household. In the transformation of values towards self-sufficiency and self-containment, reducing the scale in both production and consumption is seen as something positive, but at what scale should we be designing the infrastructures required for the networked distribution of power from areas where there is overproduction to those in situations of scarcity? The commons are inherently open, and in this trend towards nodal cooperation and higher resilience, the scale at which decisions about shared elements are made is an acutely relevant issue.

*I think this is the right approach: a Spanish Electrical Grid ( . . . ). And then there should be a series of distribution grids, which I would place in the hands of the municipalities, or I would at least enable actions to be taken at a municipal level. Because this means that municipalities can choose their own power generation formula; and also because renewable energy is a local resource. ( . . . ) The local and municipal dimension should be a key element of the energy design [ASO\_E2].*

*At the same time, I think there should be some general guidelines that are nationwide. I believe that energy is too large and important issue to be dealt with independently by each different municipality. But I also believe that municipalities should have more room to take the initiative, they should have more 'power' [IMU\_E1].*

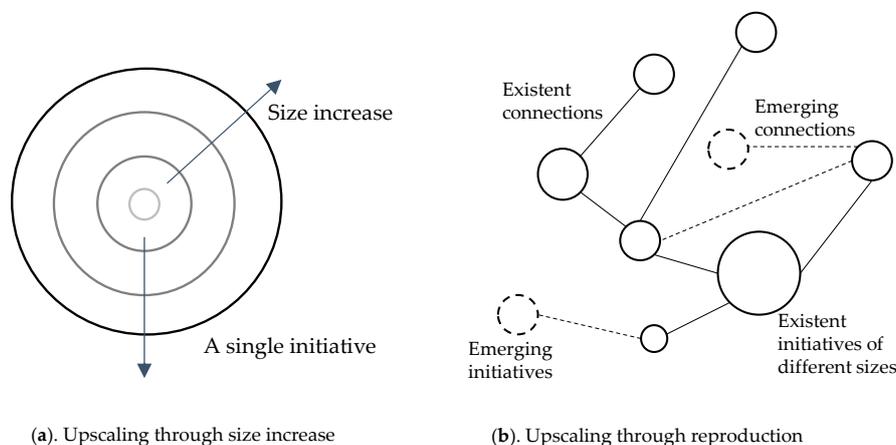
It is questions and answers such as these that demonstrate the multi-scale nature of the governance of goods, and the need for different communities to reach agreements and share resources. There is an unavoidable sophistication of scale that further increases when each initiative has significantly different resources, sizes, capacities and areas of action. While all are rooted in the local reality, there is no single scale that is valid for all initiatives. In the effort to develop an alternative energy model, attempts at ensuring confluence and mutual recognition between the initiatives should be aware of the range of different sizes operating at a local level.

In fact, it is not just about ensuring universal access to socially and environmentally-fair renewable energy. The aim is to move towards a recovery by citizens of the resilient government of the energy, which ultimately requires better distribution and control over the power currently in the hands of the electricity oligopoly in Spain [64].

*The thing is that, ultimately, we are talking about energy production resources, control over which implies power. The real question is how this power is controlled [INA\_E7].*

In this twofold approach, in which we are striving to build an environmentally-sustainable model at a global level, while at the same time promoting the democratisation of energy, seen as a social good, initiatives need to think about how they respond to the aforementioned planetary-scale issues. It is not just a case of guaranteeing access to ‘green’ energy. Power over a social good such as energy must be distributed among all citizens.

An important question is whether this distribution of power over the good and over the resources for its production is feasible during both upscaling through size increase (Figure 2a: when an initiative in itself grows) and upscaling through reproduction (Figure 2b: when initiatives, each with its own size, act as a network). From a different perspective, it is worth asking whether it is necessary to sacrifice a certain degree of distributive power in order to respond to those global-scale issues.



**Figure 2.** Two forms of scalability.

Accordingly, this paper presents the thoughts and comments of interviewed initiatives on (1) their capacity to grow without losing their hallmark democratic and participatory nature (upscaling through size increase); and (2) their capacity to replicate locally, an option which respects their diversity and does not prevent other communities/societies from generating their own common practices (upscaling through reproduction). It is important to remember here that while the commons are not universal, they are universalist. In other words, if the case were to arise, they should permit the global proliferation of heterogeneous and diverse initiatives.

#### 4.2. Power Distribution and Citizen Participation as Key Elements

One of the main arguments used to advocate the upscaling by growing in size of community-based initiatives, rather than their dispersion, is that there is already a high concentration of economic and political power in the hands of those who dominate the prevailing energy model in Spain [64].

*We should not lose sight of the risk of excessive dispersion. In other words, while it is easier to control municipal powers, we also need public powers (i.e., powers ultimately controlled by citizens) which have the size and critical mass required to stand up to big capital [INA\_E7].*

Moving beyond the general recognition of the need of locally-coordinated and organised actions, some initiatives argue that it is necessary to acquire a certain size in order to propose a viable alternative to the current model.

Given the number of energy consumers, if we compare even the largest initiative (CER\_E2) with any of the electric utilities that make up the oligopoly, it quickly becomes clear that we are looking at a microscopic alternative. There is a vast gap between Iberdrola's 16.97 million electricity customers [65] (p. 6) and the 66,480 consumer members of *Som Energía*. However, *Som Energía* is similar in size to some of the largest cooperatives in Europe, such as *Enercoop* in France, which had 75,000 consumers in July 2020, and *Ecopower* in Belgium, which had 58,000. Instead, *Som Energía* is also 5.5 times bigger than *Goiener*, the second largest cooperative in Spain, with 12,122 members-consumers.

A sustainable and distributed energy system requires a long transition where centralized generation would exist together with an expansion of the distributed generations. The energy generating capacity of the existing Spanish cooperatives is not capable of responding to the existing demand. Accordingly, the transition towards sustainable models not only requires the transformation of the generation processes but also systemic changes lead to planned reductions in the energy demand.

In this context, renewable energy cooperatives particularly acknowledge that scale is an issue requiring constant reassessment (CER\_E1, CER\_E2, CER\_E3, CER\_E4). A variety of different approaches have been adopted. Some initiatives have chosen to operate at a nationwide level, since this is the scale at which there is a common legal-administrative framework (CER\_E2). Others believe that operating at this scale would prevent them from maintaining necessary levels of participation and democracy (CER\_E1).

In fact, the stances adopted by the cooperatives are very different, and even give rise, on occasions, to confrontations between different models. Some of the factors mentioned above, such as loss of democracy, proximity to citizens or disconnection from the material limits of the territory, are the key concerns fuelling these debates.

*Som Energía operates throughout the Iberian market, which is its market in accordance with current regulations. But we [Goiener] don't operate throughout the entire market. We operate in what is more or less the Basque region. Why? Because we have a lot of experience working in the cooperative sphere and we know that in a cooperative, if you don't go to the assemblies, make an effort to get to know people and be in the thick of things, then the initiative is no longer a real cooperative. [CER\_E1].*

All the initiatives acknowledge the fact that participation and engagement levels change, both quantitatively and qualitatively, as the initiative itself grows. However, both smaller and comparatively larger initiatives point out that not all members are equally eager to participate and play an active role in the community. No one can become one hundred percent involved in all community initiatives, and we all have to divide our time among different daily activities. In light of this, it is important to offer different ways of forming part of the initiative, that is to say, different levels of belonging and involvement.

Furthermore, some initiatives believe that what is lost during upscaling in size can be compensated by the incorporation of information and communication technologies and decentralised organisational structures (CER\_E2). They therefore grow in terms of members, while at the same time becoming more decentralised than initially envisaged.

*In 2013, a restructuration attempt was made [in Som Energia] by generating territorial sections. Some sections comprise entire regions, while others encompass a single province or Autonomous Community, depending on member preferences. The idea is for these territorial sections to be more representative. ( . . . ) The aim is to give local groups and territorial sections more autonomy or some kind of legal status to enable them to foster the development of generation projects in their local areas, or to respond to different local situations or circumstances. [CER\_E2].*

At *Som Energia*, the level of decentralisation and autonomy reached in relation to the decision-making power of the different local groups seem so high that the words ‘marvellous anarchy which somehow works’ (CER\_E2) were used in the interview to describe its everyday functioning. However, despite the different approaches, no Renewable Energy Cooperative believes that an increase in size is an aim in itself: ‘the goal is not to grow per se’ (CER\_E2).

If we broaden our analysis to include the other initiatives that make up the common instituting praxis, thinking about scalability becomes even more complex. Due to specificities such as their close ties with the local area, self-managed living communities and eco-villages are fully aware that they cannot grow beyond 500–600 members (INA\_E1). Inversely, as aforementioned, they are also particularly aware of the effects generated by extremely small scales (INA\_E1, INA\_E2, INA\_E3, INA\_E5, INA\_E6). In their particular circumstances, forging networked connections with other communities in the same region is a key area of action in these cases. Their upper and lower limits push them to establish collaborations that could lead to a greater systemic resilience.

#### 4.3. Reclaiming the Human Scale

Moving beyond the considerations outlined above, upscaling through an increase in size also poses a number of other problems that are far from easy to resolve. Without overlooking the drawbacks inherent to the microscale, the idea of remaining close to citizens and their needs adds a qualitative dimension to the debate.

*The larger an institution is and the more it is separated from citizens, the more inefficient it becomes. If it were really an institution of the common good, if it really pursued the common good, then it would probably work; but in practice this doesn't happen. ( . . . ) I don't really see how you can solve a global problem if not at a local level. [You have to act] within the framework of local nodes that function as a network. It's a bit like what Plataforma por un Nuevo Modelo Energético [Platform for a New Energy Model] does [IMU\_E2].*

It would therefore be desirable to add another layer to the debate on scale, in order to include concepts such as the ‘human scale’. As well as being the idea commonly referred to by initiatives when asked about their size (ESO\_E1, INA\_E1, INA\_E3), the concept also reveals a relational dimension to scale. So why do Spanish community-based energy initiatives demand a human scale? Why has ‘humanisation’ in the exchange of goods become something to which the praxis aspires?

*At a philosophical level, we believe that multinational corporations are a huge mistake, because they end up having so much power they can destroy democracy and influence sitting governments. That's at a political level, of course. At a social level, large corporations lose sight of the human scale. They also lose individual participation. That's why I find small, connected, local organisations so interesting. Because this is the century of connection. We see ourselves as connected, but not because there is a large corporation where a management team makes decisions, but rather because there are many small organisations which are changing things [ESO\_E1].*

In addition to recognising the value of smallness, the human scale highlights the importance of placing people at the centre of all the initiatives’ actions. Democratic deepening is necessary [65]. From a relational perspective, the human scale highlights the need to replace the purely market rationale with a logic based on solidarity and social and environmental justice.

[It is important] to reproduce initiatives; because otherwise we are just replicating the patterns of the current system. Moreover, by generating these networks of collaboration, we are also generating resilience and interconnection, learning different lessons and empowering more people [INA\_E2].

Ensuring ‘the transformation of the person-object into the person-subject is ( . . . ) a question of scale; because in enormous systems which are hierarchically organised in a top-down manner, individual protagonism is impossible’ [66] (p. 30). In addition to the environmental benefits it offers (IMU\_E2, ASO\_E1), a decentralised energy model connected to different local realities is better able to understand and respond to people’s changing circumstances and seems to have the potential of being more resilient (IMU\_E1, IMU\_E2).

( . . . ) what we advocate is a distributed model. It just seems the logical answer. In a world in which energy needs are growing, the traditional model of sending energy from A to B does not seem to be the best option. ( . . . ) We believe that a distributed mode would make much more sense. I mean, who knows better than the community or municipality itself what its energy needs are? [ASO\_E1].

#### 4.4. Scaling Up from a Constellation of Local Sustainable Initiatives

Regardless of their size, the initiatives all share a common discourse. Among other things, they all agree that (1) projects should be constructed in a bottom-up manner; (2) decentralised structures capable of responding to local diversity are always necessary, regardless of the geographical scope of operations; (3) it is important to relocate and socialise energy production and consumption resources; (4) it is good that there is an increasing number of initiatives which share the common goal of transforming the current energy model; and (5) all are eager to cooperate and collaborate.

*It’s important to understand the situation we’re in. What is the framework in which we are forced to act? We want to operate in an electricity market of which 80% is in the hands of the oligopoly. If we want to carve ourselves out a niche, we have to be a lot bigger than we are now ( . . . ). So, it’s great that new initiatives are cropping up, but we have to act together, because otherwise, they will be able to wipe us off the board with a flick of their hands [ESO\_E2].*

Networked organisation, comprising a coalition of coalitions [49] (p. 81), is the preferred alternative for most initiatives.

*Years ago we set up a network, Ecolise, which includes Transición, Permacultura, Ecoaldeas (the Basque Ecovillages chapter) and ICLEI (the network of sustainable municipalities) . . . it was established with the aim of giving us greater ‘lobbying power’, although I’m still not sure what this actually means, but it’s about having a greater influence in Europe [INA\_E1].*

*It’s a question of understanding that we are all in the same boat: that of the commons and citizen engagement and activation. We have to be united and get on with each other. We have joined other organisations too. And before all these new relationships we are now establishing, we had already begun to sign collaboration agreements with SEO/BirdLife, for example, a conservation organisation, and with Amigos de la Tierra, which focuses on the environment [ESO\_E1].*

These statements help us understand scalability in terms of reproduction, i.e., the existence of a horizontal network of initiatives; all independent but all pulling in the same direction (ASO\_E1). Together are able to generate an alternative and resilient energy model that is aware of the material boundaries of each region.

( . . . ) I think it’s a mixture of local communities, which may be small, but are immersed in a much broader transitional environment. Community must once again be understood as the space in which people are truly coming together around a specific region. Not just around a specific vision. The term ‘we’, as we use it at least, has much more to do with the extended definition of community. It’s the relationship we have with the region, with the land [INA\_E1].

Acceptance of these boundaries, which are vital for avoiding environmental debt and, therefore, for enabling the development of energy commons in other areas of the planet, turn cooperation for upscaling local practices through reproduction into an absolute must. In this matter, despite self-managed communities are aware of their environmental impact, a major effort in its assessing is needed (INA\_E1, INA\_E2, INA\_E3, INA\_E5, INA\_E6). Approaches like geometric modeling to measure individual and collective CO<sub>2</sub> emission could help in this regard [67].

Likewise, the promotion of cooperation is not limited to a mere discursive declaration of intent. Rather, the initiatives have well-defined, jointly-implemented projects. Among many others, *Ecooo* and *Amigos de la Tierra* collaborate in projects designed to open up solar farms to citizen participation (ASO\_E1); *Arterra* works with *Som Energia* in its move towards solar self-generation, taking the first steps towards this goal by selecting the initiative as its supplier (INA\_E1); *Goienier* supported its fellow Renewable Energy Cooperatives *Solabria* and *Megara* during their initial establishment and operational start up, even signing collaboration agreements (CER\_E3, CER\_4); *Astra* has a photovoltaic self-consumption facility which is protected against possible changes in legislation thanks to their collaboration with *Som Energia* (INA\_E6); and *Ecooo*, *Rubí Brilla* and the Madrid City Council jointly established *Proyecto 50/50*, which aims to foster a more efficient and sustainable use of energy in schools (IMU\_E2). There are many examples of collaboration between different initiatives.

Interconnection is not only an end in itself, it is also a stark reality. As members of the *Red Ibérica de Ecoladeas* (RIE) and the *Global Ecovillage Network* (GEN), along with other local smaller-scale initiatives (INA\_E1, INA\_E2, INA\_E3, INA\_E4), self-managed communities once again demonstrate the importance of networked cooperation both for their own survival and in terms of enabling them to respond to everyday needs.

*Being realistic about things, although we have a solar park and a fairly good food supply, what we really use is huge. It's so big, actually, that you simply cannot link the entire issue of sovereignty or food self-sufficiency to self-management, because you'd wear yourself out. It's important to understand it as a world of exchanges, a world of interdependencies. More in terms of bioregions. It's large regions that have to start to adopt this as their identity; they need to be aware of their potential to be not so much self-sufficient, as at least more resilient in terms of their needs. That's really the heart of it. Regions need to be more resilient, to produce what they need [INA\_E1].*

This ties in with the proposal represented by the common instituting praxis. Institutions are necessarily transformed or generated on the basis of praxis, collective action and cooperation. Networks are created on the basis of joint action and mutual trust and knowledge.

*[Networks] yes, but based on joint work. I think that we sometimes try too hard to influence people's principles, which is a very sensitive area that can often elicit a very strong negative reaction. Don't you dare change how I see the world. Don't even try it. Why do you think your vision is better than mine? This really motivates me. I love exploring this in order to try to find a way forward. I believe there has to be one, even though we haven't found it yet. But it's there, it exists. I get a real kick out of these challenges [INA\_E1].*

The direct relationship established by *Arterra Bizimodu* between joint action and trust-building among heterogeneous groups is particularly eloquent. Praxis impacts the values of different communities. When complexity and sophistication are understood in this way, it is clear that attempts to generate collaborative dynamics will not always be successful (INA\_E3).

*The Spanish word for trust is *confianza*, which can be divided into two sub-terms: *con-fianza* (con meaning with and *fianza* meaning deposit, as in the deposit you put down to secure a reservation, for example). You have to put something of value on the table. In this case, this is *fianza*. If you contribute something of value, people are more likely to trust you. If nothing of value is at stake, no one trusts you. And in villages, and sometimes in larger cities also, what we contribute is often just words.*

*It's like there's an excess of words, because it's the easy option. But words have to be shored up by actions; you have to propose actions and share them with those who are different from you [INA\_E1].*

Almost all the initiatives interviewed have region or valley-based regeneration projects in collaboration with other organisations from the same territory. In fact, energy commons not only aim to cooperate just with initiatives which are similar to itself in nature. It also makes an effort to identify elements of other apparently distant initiatives which may serve as a common starting point for joint action.

*I'm not going to change the inhabitants of Artieda; we aren't going to change them. But we can develop proposals in which we can all work together. And it is important for these proposals to make sense for both our aspirations and dreams and for the reality we all share. ( . . . ) How can we get people interested without changing them and without them feeling we are threatening their templates, their very beliefs or the way they view the world? How can we generate complicity around common needs, so we can gradually change the direction in which we are headed? I think this is what is lacking in social movements. How can we communicate with those who are not involved in these movements so that we can generate these alliances? [INA\_E1].*

In some cases, collaboration and efforts to bring about change at a larger scale are so intense that they represent a qualitative leap forward in initiatives' institutionalisation. One clear example of this is the setting up in 2017 of *Unión Renovables*, a union of renewable energy consumer and user cooperatives encompassing 19 cooperatives selling electricity at a municipal/regional level to over 85,000 members [ESO\_E2]. The union is also part of the European Federation of Renewable Energy Cooperatives, *Rescoop* [CER\_E1]. Other example is *Plataforma por un Nuevo Modelo Energético* (Platform for a New Energy Model), which encompasses 473 Spanish member organisations and, in its own words, is 'one of the best-qualified voices in our society for demanding a radically different energy model based on renewable sources, savings, efficiency and energy democratisation' [68].

#### 4.5. Scalability through the Catalysis of the Public

In the scaling of common initiatives by way of expansion or reproduction, public institutions in their multi-scale approach can become catalysts. The United Nations recognised this ability in the implementation of its Sustainability Development Goals [69], provided that public institutions are aligned and coordinated in their multi-scale approach [70,71]. The alignment of the public at its various scales, coupled with the recognition and support of a community-based reality could become one of the core elements of scalability.

The Spanish energy commons revealed to be highly willing to engage in these type of collaboration with public institutions. In contrast to conceptions of commons which are entirely contradictory to state planning and bureaucratic rationality [62] (p. 11), the praxis contains dynamics filled with both temporary and long-lasting collaborations with the public institutions.

These initiatives believe that in addition to interactions that take place between the individuals of a society with the Public Administrations, communities must take on a specific role in these relations (INA\_E6, INA\_E7). An intermediate scale that can give a voice to forms of collective organisation. In fact, some interviewed town halls accessed commons rationales and even opened spaces for shared practices so that initiatives have the power to decide what solutions were going to be implemented (IMU\_E1). *Rubí Brilla* is an example of this; a municipal administration project for an energy model transition which its ultimate purpose is to contribute to the collective and citizen emancipation in this area.

*The idea consists of, in an association of neighbours from each of the three districts, using a space with the highest degree of activity at the neighbourhood level and setting up a district energy centre. This space would be used to decide on energy refurbishment and energy poverty relief actions by the*

neighbours themselves and who would benefit from the energy refurbishment and energy poverty relief funds [IMU\_E2].

We can conclude that there exists a public-municipal space willing to catalyse commons (Figure 3) [72]. Furthermore, initiatives between the public and the commons become an example for other municipalities who also decide to adopt this type of dynamic (IMU\_E2). It is worth noting here that one of the individuals responsible for the *Rubi Brilla* is also involved in *Ecooo* in order to replicate this practice in a greater number of municipalities [ESO\_E1, IMU\_E2].

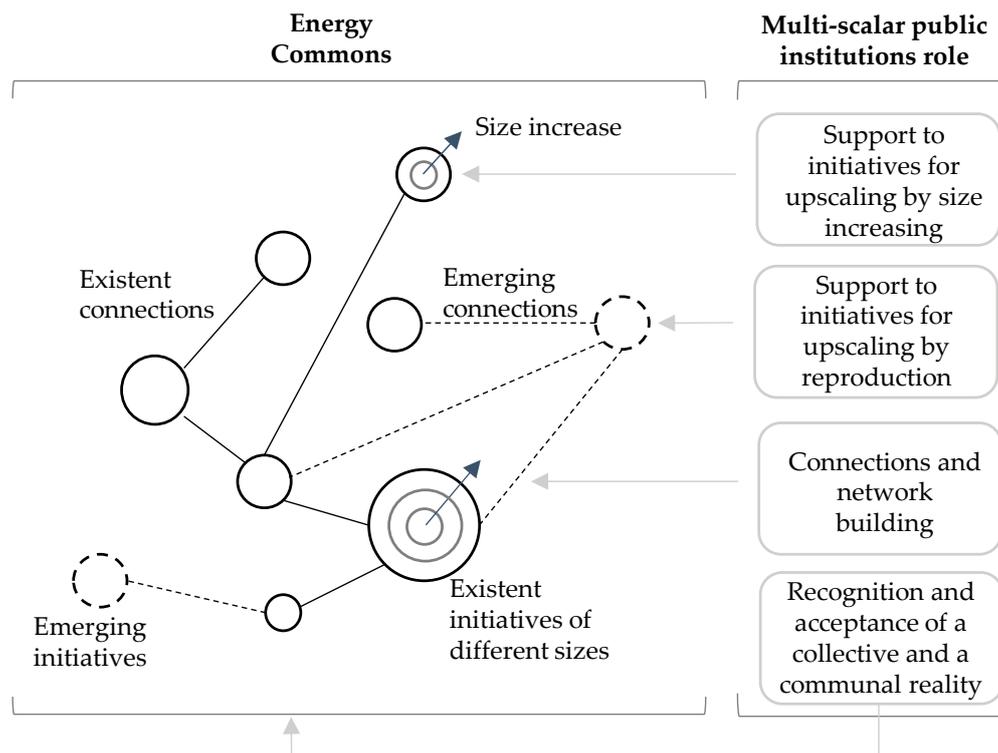


Figure 3. Public institutions role fostering Energy Commons.

By defending distributed generation systems, adopting municipal bylaws, including social clauses (ASO\_E1) and promoting non-profit renewable energy generation (IMU\_E1), public institutions demonstrate a certain level of adaptation to social demands (INA\_E2). The creation of a municipal electricity operator (IMU\_E1), or the elimination of intermediaries for the acquisition of renewable energy from the wholesale market, are some of the first steps several local administrations are taking.

However, this opportunity which seems to be taking shape in Spain has not come without criticism from part of the constellation that makes up the energy commons; are examples of it, (1) the well-known ‘revolving doors’ between the leaders of political parties and energy utility board of directors, (CER\_E1); (2) the power of lobbying and political power of large electricity utilities at the European level (INA\_E7, ASO\_E1, CER\_E2); (3) the persecution during the last financial crisis of self-consumption and renewable energies (ASO\_E3, ESO\_E1); (4) the use of public funds to benefit the private sector in the mid/long term [(ASO\_E1); and (5) financial speculation (ESO\_E1, ASO\_E1). We cannot forget that scalar relationships are always power relationships [73].

Collaboration and criticism between the energy commons and the public institutions coexist. Immersed in this complex reality, currently Spain seems to be equipped with the necessary conditions and elements for public institutions to catalyse the scalability of local, community-based practices. The European Union’s willingness and commitment to an energy transition through the implementation of its four priorities in the next four years [74]; the creation of the Ministry of Ecological Transition

and Demographic Challenge by the Government of Spain in 2020 [75]; and the existence of municipal governments willing to foster democratic, community-based governance, favours scalability either through expansion or reproduction [72]. Collaboration and cooperation between the commons and public institutions are paramount in responding to issues caused by the globalised energy model.

## 5. Discussion

A resilient energy system requires the existence of an interconnected ecosystem of local commons that, beyond their divergences, are capable of recognising each other. A *living machine* [16] with the potential to create an available, accessible, affordable and acceptable sustainable energy system [17]. However, resilience is not enough. In a world where uncertainty and impacts are global, resilient systems should be able to scale. This is the point on which the central conclusions of the article are based (Table 2): scalability by extension and by reproduction of the energy commons in Spain.

**Table 2.** Summary of scalability strengths and weaknesses.

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• Instead of competing, Spanish energy commons are eager to cooperate and collaborate.</li> <li>• Through decentralisation and networked action, Spanish energy commons are able to scale from the local level.</li> <li>• Initiatives acknowledge that environmentally sustainable management is not enough; democratic recovery of its governance is necessary.</li> <li>• Implementation and use of ICTs for the governance of the initiatives allow increasing their size while participation level is not reduced as much as expected.</li> <li>• Spanish energy commons employ the human scale notion, the relational dimension of the scale that (re)places people at the heart of initiatives.</li> </ul>	<ul style="list-style-type: none"> <li>• It is not easy for these initiatives to identify which is the most appropriate scale to develop their activity and projects. Initiatives clearly recognise that increasing their size could dilute member's participation and bonding.</li> <li>• The existence of initiatives of different sizes and with different needs hinders collaboration.</li> <li>• Although they are aware that their daily activity has global repercussions, it is not easy for them to have an accurate and updated information of their social and environmental impact.</li> <li>• Initiatives must also pay attention to its lower limits to ensure certain degree of efficiency, diversity and universalization capacity.</li> </ul>

In the light of the empirical research done, it seems that there are the necessary conditions to progressively move forward a scalable resilient system. In fact, Spanish energy commons are able to scale from the local level to the European level based on the logic of 'coalitions of coalitions' proposed by N. Klein. Although it is not simple for these initiatives to identify which is the most appropriate scale, there seems to be a preference in the field of energy for decentralisation and the coordinated, networked action of local practices. The initiatives clearly recognise that increasing their size dilutes fundamental aspects of the commons, such as the degree of member participation and subsequently, the level of democracy. They also stress that when considering scale, it is important to pay attention to its lower limits. A community which is too small could be hampered by a loss of efficiency, a decrease of diversity among community members, or by the detriment of its universalisation capability.

The scale of common instituting praxis is conditioned by several factors. The type of good (material or immaterial), the different activities that make up its governance (generation, distribution, consumption, etc.), the specificities of the place in which the initiative emerges (such as the existence of a cooperative tradition or other aspects of the local social and cultural capital), existing technologies and particular characteristics of the problem or need requiring a response or solution, all evidently influence the scale that can be acquired, while forfeiting the democratic and participatory quality as little as possible. We can therefore conclude that there is no single scale that is valid for all initiatives that make up the common instituting praxis. In an effort to develop an alternative energy model, attempts at ensuring confluence and mutual recognition among initiatives, commons should be sensitive to the range of sizes operating at a local level.

Beyond the vague parameterisation of initiatives as ‘big’ or ‘small’, which will always be relative based on what it is being compared to, proposals such as ‘human scale’ [65] add a new dimension to the debate regarding the ideal size of common instituting praxis. Notions that the energy commons themselves employ and that evince the relational dimension of the scale which offer an alternative to a fundamentally market logic. The human scale (re)places people at the heart of initiatives, whereby democratic deepening is a key cornerstone of sustainable communities.

All the initiatives acknowledge that participation and engagement levels are not quantitatively and qualitatively the same as initiatives grow. However, both smaller and comparatively larger initiatives report that not all members are equally eager to participate and play an active role in the community. It would be interesting to see if future research can determine what is the extent of lost participation as a result of an increase in size and what, upon the involvement of individuals interested in a sounder social and ecological consumption, but not quite in a proactive attitude in the progression of the initiative (Table 3).

**Table 3.** Summary of the gaps, opportunities and recommendations.

Gaps	Opportunities
<ul style="list-style-type: none"> <li>• Initiatives report that not all members are equally eager to participate and play an active role in the community.</li> <li>• The impact of this divergent participation interest in the democratic character of the initiative has not been assessed.</li> <li>• Energy commons in Spain don’t have a cooperation map that would provide a more precise picture of the scaling opportunities.</li> </ul>	<ul style="list-style-type: none"> <li>• In the energy field there seems to be a preference for decentralisation and the coordinated, networked action of local initiatives.</li> <li>• Current conditions in European and Spanish public institutions could be valuable in catalyzing the escalation of local collective initiatives.</li> <li>• Commons paradigm can serve as a nexus between initiatives of different characteristics and scope.</li> </ul>
▼	▼
Recommendations	
<ul style="list-style-type: none"> <li>• Commons and public institutions should be sensitive to the range of sizes operating at a local level.</li> <li>• It is convenient to develop future researches to determine the extent of lost participation as a result of an increase in size.</li> <li>• Public decentralised structures capable of understanding local individual and collective diversity should exist.</li> <li>• In order to foster a democratic government of energy, production and consumption should be relocated and socialized.</li> <li>• Transition towards sustainable models not only requires the transformation of the generation processes but also systemic changes lead to planned reductions in the energy demand.</li> <li>• To create social awareness about the existence of an alternative, current initiatives that are actually of transforming the energy model should be shown and spread.</li> <li>• A cooperation map of the common praxis and the characterisation of these relationships would contribute to identifying and examining the core elements of a potentially transformative scalability.</li> </ul>	

From a diversity standpoint, the common instituting praxis acknowledges that environmentally sustainable energy management is not enough. Democratic recovery of its governance is thus necessary. To do so, they agree that (1) projects should be built bottom-up; (2) decentralised structures capable of understanding local diversity are necessary, regardless of the geographical scope of operations; (3) it is important to relocate and socialise energy production and consumption resources; (4) it is positive to see an increasing number of initiatives which share the same common goal of transforming the current energy model; (5) all are eager to cooperate and collaborate; and (6) public institutions can play a decisive role in scaling from the local level to the global level (Table 3).

We are all in the same boat: that of the commons’, was what was stated by one of the initiatives and it seems to confirm the idea that the commons serve as a nexus between different initiatives, which are recognised as the same undertaking. In fact, we are looking at a cooperation that does not wish to be limited to those who see themselves as the same. There is an effort to cooperate with initiatives of different languages and realities. This is what the opening of the commons consists of; it is not just about cooperating with others like you but also with those who *a priori* are not involved in the cause.

The European Union's sensitivity and willingness in the implementation of four priorities by 2024; the creation of the Ministry of Ecological Transition and Demographic Challenge in Spain; and the existence of municipal governments willing to foster and finance democratic, community-based governance, provide a new dimension to the scalability of the commons through the development of strategic alliances with public institutions (Table 3).

Besides this background of opportunity, it is valuable to continue developing collaborations and connections that arise between the same common practices and between these and public institutions (Table 3). Mapping and characterizing cooperation, not only between the energy commons but also with initiatives from other fields, would contribute to keep identifying the core elements to a potentially transformative scalability.

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## Appendix A. Fact Sheet Model Used for the Preliminary Description and Analysis of the Initiatives

<b>Name of the Initiative</b>			
<b>Field</b>	<b>Just Energy, Mixed, etc.</b>	<b>Location</b>	<b>Geographical</b>
<b>Description</b>			
Main characteristics and information about the initiative: aim, duration, number of members, member profile, process to become a member, governance model, implemented technologies, etc. Link to the web page.			
<b>Main projects and activities</b>			
Main achievements related to the processes implemented and results obtained. Means in which projects and activities have been carried out (collaboratively vs on their own). If so, implemented mechanisms to reduce inequalities. Social and ecological impacts produced by their activities.			
<b>Other comments</b>			
Any other singularity of the initiative that should be specially taken into account.			
<b>Response to the applied dimensions of the commons</b>			
1.1 Cooperative governance		1.2 Network building	
2.1 Voluntary association		2.2 Self-sufficiency and autonomy	
3.1 Mechanisms to promote equality and reduce the risk of exclusion		3.2 Democratization	
3.3 Social purpose		3.4 Socioeconomic impacts	
4.1 Environmental technologies		4.2 Circular activity	
4.3 Environmental impacts			
<b>Response to the normative dimensions of the commons</b>			
<b>I. Reciprocity and co-activity</b>			
<b>II. Human autonomy</b>			
<b>III. Social justice</b>			
<b>IV. Ecological justice</b>			

## Appendix B. Summary Table and Codification of Initiatives Analysed

Self-managed initiatives	
Interview code	Initiative
INA_1	Arterra Bizimodu
INA_2	Cardedeu en Transició
INA_3	Lakabe
INA_4	Sunseed
INA_5	Transición Rompe el Círculo
INA_6	Astra
INA_7	Observatorio Crítico de la Energía
Renewable Energy Cooperatives	
CER_1	Goienar
CER_2	Som Energía
CER_3	Megara
CER_4	Solabria Enerplus
Social enterprises	
ESO_1	Ecooo
ESO_2	Eolpop
Municipal initiatives	
IMU_1	Barcelona Energia
IMU_2	Rubí Brilla
Associations and Foundations	
ASO_1	Amigos de la Tierra
ASO_2	Fundación Desarrollo Sostenible
ASO_3	Fundación Renovables

## Appendix C. Brief Descriptions of the Analysed Initiatives

*Amigos de la Tierra* is a non-profit environmental association whose mission is to foster a local and global transition towards a fair, inclusive society respectful of the environment. The association is composed of individuals who defend social and environmental justice. They firmly believe people and the planet need to be at the heart of policies. For more information, visit: <https://www.tierra.org/> (last consulted: 3 August 2020).

*Arterra Bizimodu* is a community that strives to become a reference in the research and education towards sustainable and resilient development models. For more information, visit: <https://arterrabizimodu.org/> (last consulted: 3 August 2020).

*Astra* is a self-governed space which fosters direct citizen and social fabric participation in the management of a public, community-based space. For more information, visit: <https://arterrabizimodu.org/> (last consulted: 3 August 2020).

*Barcelona Energia* is a public electricity distributor responsible for the integral management of renewable energy generation for the city of Barcelona, including self-sufficiency and the sale of surplus production. It is also involved in the refurbishment of buildings and the reduction of energy poverty. For more information, visit: <https://www.barcelonaenergia.cat/en/> (last consulted: 3 August 2020).

*Cardedeu en Transició* is based on cooperation and community and its goal is to create an active, committed network in order to achieve a resilient, quality of life as an alternative to the system. For more information, visit: <https://cardedeuentransicio.wordpress.com/> (last consulted: 3 August 2020).

*Ecooo* is a non-profit institution which uses profits towards the creation of social fabric, and outreach and awareness campaigns on the transition towards an energy model based on savings, efficiency and renewable energies. For more information, visit: <https://ecoos.es/> (last consulted: 3 August 2020).

*Ecooolocal* is a project born from the convergence of two innovative experiences in the area of citizen engagement in matters of energy. Ecooo and Rubí Brilla contributed to the creation of a roadmap for municipalities, independently of its size or geographic location, so that they harness the incredible

potential the administration has as a catalyst for an energy model change. There are 33 townships and institutions at the state level which have spearheaded the citizen energy transition through this initiative. For more information, visit: <http://ecooo.es/ecooo-local/> (last consulted: 3 August 2020).

*Eolpop* is an initiative that aims to install a wind turbine of shared ownership among citizens who voluntarily donate the money required to bring this project to life. This project was the first of its kind in Spain and represents a model of social, political and economic integration. For more information, visit: <http://www.viuredelaire.cat/en/what-is-eolpop.html> (last consulted: 3 August 2020).

*Fundación Desarrollo Sostenible* sustains that the best way to democratise the Spanish electrical system is by achieving self-sufficiency with a net balance, and subsequently fostering savings, efficiency and the participation of any citizen. It strives for a more prosperous world, with greater human development and where social equality, democratic participation and solidarity prevails among the different nations and territories. For more information, visit: <http://www.fundaciondesarrollosostenible.org/> (last consulted: 3 August 2020).

*Fundación Renovables* was founded on the principal of creating a broad social base and its primary objective is to raise public awareness about the need to implement and accelerate the energy model transition based on the guiding principles of savings, efficiency and renewable energy. For more information, visit: <https://fundacionrenovables.org/> (last consulted: 3 August 2020).

*Generation kWh* strives to foster generation projects and offers a collective alternative to the absence of incentives for renewable projects and self-sustainable production. The initial monetary investment correlates to the annual electricity consumption of the participating individual and for the following twenty-five years, these individuals have access to electricity produced at cost, which translates into electricity bill savings. For more information on this initiative and how it works, visit: <https://www.generationkwh.org/> (last consulted: 3 August 2020).

*Goener* is an energy generation and consumption cooperative which seeks to achieve energy sovereignty. For more information, visit: <https://www.goener.com/> (last consulted: 3 August 2020).

The *Instituto de Transición Rompe el Círculo* does not only strive to foster a transition like the one taking place in many places around the world, but it also wishes to do so by experimenting with non-capitalist ways of organisation of the economic, social and cultural life. For more information, visit: <https://institutodetransicion.rompeelcirculo.org/> (last consulted: 3 August 2020).

*Lakabe* is a reference in counter urbanization, rural occupancy, eco-villages, community life and green living. For more information, visit: <https://www.lakabe.org/> (consulted last: 3 August 2020).

*Megara* is a 100% renewable electricity cooperative. It views itself as green, social, local and economical. For more information, visit: <https://www.megaraenergia.com/> (last consulted: 3 August 2020).

The *Observatorio Crítico de la Energía* is a forum to discuss and analyse the unsustainability of our current energy and economic model. For more information, visit: <https://observatoriocriticodelaenergia.org/> (last consulted: 3 August 2020).

*Rubí Brilla* is one of the strategic projects spearheaded by the Townhall of Rubí whose mid-term objective is to ensure the leadership of the project is shared by the different stakeholders who make up the city and who take ownership of the project and are involved in the decision-taking process. For more information, visit: <https://www.rubi.cat/es/ayuntamiento/proyectos-estrategicos/rubibrilla> (last consulted: 3 August 2020).

*Solabria/Enerplus* is a non-profit cooperative who strives for an energy model that puts people and the planet before financial gains. For more information, visit: <http://www.solabria.es/home/> (last consulted: 3 August 2020).

*Som Energia* is a green, non-profit, energy consumption cooperative, committed to fostering the transition of the energy model to 100% renewable energies. For more information, visit: <https://www.somenergia.coop/> (last consulted: 3 August 2020).

*Sunseed Desert Technology* is a non-profit organisation which develops, demonstrates and disseminates sustainable alternatives. For more information, visit: <https://www.sunseed.org.uk/> (last consulted: 3 August 2020).

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