



Universidade de Aveiro
Ano 2022

**Susana
Teixeira
Soeiro**

**ENSAIOS SOBRE COMUNIDADES DE ENERGIA
RENOVÁVEIS**

ESSAYS ON RENEWABLE ENERGY COMMUNITIES



Universidade de Aveiro
Ano 2022

**Susana
Teixeira
Soeiro**

ENSAIOS SOBRE COMUNIDADES DE ENERGIA RENOVÁVEIS

ESSAYS ON RENEWABLE ENERGY COMMUNITIES

Tese apresentada à Universidade de Aveiro para cumprimento dos requisitos necessários à obtenção do grau de Doutor em Ciências Económicas e Empresariais, realizada sob a orientação científica da Doutora Marta Ferreira Dias, Professora auxiliar do Departamento de Economia, Gestão, Engenharia Industrial e Turismo da Universidade de Aveiro

“What one person cannot achieve is achieved by many” by *Friedrich Wilhelm Raiffeisen*

o júri

presidente

Prof. Doutor Delfim Fernando Marado Torres
professor catedrático, Universidade de Aveiro

Prof. Doutora Patrícia Carla Gama Pinto Pereira da Silva Vasconcelos Correia
professora associado com agregação, Universidade de Coimbra

Prof. Doutora Lúgia Maria Costa Pinto
professora associada com agregação, Universidade do Minho

Prof. Doutora Susana Maria Almeida da Silva
professora auxiliar, Universidade do Porto

Prof. Doutora Margarita Matias Robaina
professora auxiliar, Universidade de Aveiro

Prof. Doutora Marta Alexandra da Costa Ferreira Dias
professora auxiliar, Universidade de Aveiro (orientadora)

agradecimientos

To my parents, brothers, and nieces

palavras-chave

Comunidades de Energias Renováveis; União Europeia; Energia renovável; Motivações; Legislação Energética; Comunidades de energia do cidadão; Portugal; Espanha; Participação, Benefícios, Drivers, Transição energética, Cooperativas de energia renovável; Participação; Economia Social, Sustentabilidade

resumo

As tendências ambientais e económicas das últimas décadas forçaram o mundo a repensar urgentemente os mercados energéticos atuais e a oferta de energia. Assim, um estudo mais aprofundado sobre a Comunidades de Energia Renováveis (CER) é uma preocupação recente e emergente devido ao seu papel relevante em alguns mercados energéticos e, em alguns casos, pelo seu papel-chave no futuro. Esta nova geração de intervenção cidadã apresenta-se como uma forma de democratizar o sector energético em todas as suas fases, desde a produção até ao abastecimento. A energia comunitária representa uma forma jurídica de negócio presente em todo o mundo e em toda a economia, nomeadamente na agricultura, nas finanças, no consumo geral, e na produção industrial, ainda que em menor escala. De acordo com a Aliança Cooperativa (ICA), a definição é clara. Os objetivos deste modelo empresarial são o aumento da participação dos seus membros e a governação para um novo nível; posicionar a energia comunitária como construtores de sustentabilidade, construir a mensagem energética comunitária e assegurar a identidade comunitária, assegurar estruturas legais para apoiar o crescimento da comunidade e garantir capital comunitário fiável, assegurar o controlo dos membros. Argumenta-se frequentemente que as leis e regulamentos levantam várias restrições à CER. Por conseguinte, o desenvolvimento das energias renováveis deve ser apoiado por políticas públicas, em todos os países europeus.

O desenvolvimento das CER não aparenta ser o mesmo em todos os estados-membros. Além disso, o seu desenvolvimento parece mesmo ser diferente, e dependendo do país europeu. Nos países do sul da Europa, que não têm uma tradição de disseminação de energia verde, mostram um desenvolvimento inferior de CER. Então através de um questionário dirigido aos participantes nas CER e um questionário dirigido à população em geral, pretende-se estudar e compreender melhor quais são as iniciativas energéticas dos cidadãos, as suas principais características, benefícios, barreiras e as motivações dos indivíduos que nelas participam.

A participação dos cidadãos é um ponto crucial para o desenvolvimento das comunidades. A principal motivação para a participação parece ser a preocupação com os impactos ambientais e climáticos. Observamos também que, nestas comunidades, a confiança é apontada como importante para o desenvolvimento de qualquer projeto RE. Quanto aos benefícios, os resultados conduzem a importantes perceções: em primeiro lugar, é mencionado, pelos participantes no survey, que os benefícios ambientais superam os financeiros ao criar e desenvolver CER's. Em segundo lugar, é importante destacar que os benefícios e impactos que as CER trazem para as regiões onde são criadas são percecionados como essenciais. Sobre as barreiras, as políticas ambientais e os custos são das barreiras que mais são apontadas à adoção e ao desenvolvimento das CER. Finalmente, mostrou-se a existência de uma disparidade entre os países do sul da Europa e os do norte da Europa, justificando-se essa diferença por fatores económicos, ambientais e pelo quadro legislativo. Em suma, as CER mostram-se importantes para a transição energética, devendo ser apoiada pelos governos europeus e pelas políticas nacionais e europeias.

keywords

Renewable Energy Community; European Union; Renewable Energy; Motivations; Energy Legislation; Citizen Energy Communities; Portugal; Spain; Participation, Benefits, Drivers, Energy transition, Renewable energy cooperatives; Participation; Social Economy, Sustainability

abstract

Environmental and economic trends of the last decades have forced the world to urgently rethink current energy markets and energy supply. Thus, a deeper study on Renewable Energy Communities (REC) is a recent and emerging concern due to their relevant role in some energy markets and, in some cases, their key role in the future. This new generation of citizen intervention presents itself to democratize the energy sector in all its phases, from production to supply. Community energy represents a legal form of business present throughout the world and throughout the economy, namely in agriculture, finance, general consumption, and industrial production, albeit on a smaller scale. According to the Cooperative Alliance (ICA), the definition is clear. The objectives of this business model are to increase member participation and governance to a new level; position community energy as sustainability builders, build the community energy message and ensure community identity, ensure legal structures to support community growth and secure reliable community capital, ensure member control. It is often argued that laws and regulations raise various restrictions on REC. Therefore, renewable energy development should be supported by public policy, in all European countries.

The development of REC's does not appear to be the same in all member states. Moreover, its development even seems to be different, and depending on the European country. In Southern European countries, which do not have a tradition of green energy dissemination, show a lower development of REC's. So, through a questionnaire addressed to participants in REC's and a questionnaire addressed to the general population, it is intended to study and better understand what citizens' energy initiatives are, their main characteristics, benefits, barriers, and the motivations of individuals who participate in them.

Citizen participation is a crucial point for the development of communities. The main motivation for participation seems to be concern about environmental and climate impacts. We also observe that, in these communities, trust is pointed out as important for the development of any RE project.

As for the benefits, the results lead to significant insights: firstly, it is mentioned by the survey participants that the environmental benefits outweigh the financial ones when creating and developing REC's. Secondly, it is significant to highlight that the benefits and impacts that RECs bring to the regions where they are created are perceived as essential. On the barriers, environmental policies and costs are among the barriers that are most pointed out to the adoption and development of REC's. Finally, it has been shown that there is a disparity between the countries of Southern Europe and those of Northern Europe, this difference being justified by economic and environmental factors and the legislative framework. In short, REC's are significant for the energy transition and should be supported by European governments and by national and European policies.

Index

1	Introduction.....	1
1.1	Aim and Objectives of the study	3
1.2	Published articles	4
2	Background	9
2.1	Emergence of Energy Cooperatives	9
2.2	The Cooperative in European Union Law	16
2.3	Social Innovation in energy sector	21
2.4	Renewable Energy Community.....	26
2.5	Participation and Motivations for integrating a REC	34
2.6	Benefits and Drivers	40
2.7	Barriers to the development of REC's.....	43
2.7.1	Strategies adopted by REC to address the barriers	48
2.8	The disparities between the REC of the EU.....	49
2.8.1	Four European countries and the promotion of RE projects.	51
3	Is public policy helping or not?.....	57
3.1	Introduction	57
3.2	Analysis of relevant EU legislation	57
3.2.1	Last decade	57
3.2.2	Post-2020	59
3.3	Acknowledging community energy.....	62
3.4	Final legislation	66
4	Methodology	71
5	Results.....	73
5.1	Statistical results	73
5.1.1	Stage One.....	73
5.1.2	Stage Two	78
5.2	Participation and Motivation.....	82
5.2.1	Stage One.....	82
5.2.2	Stage Two	87
5.3	Benefits and Drivers	90
5.3.1	Stage one.....	90
5.3.2	Stage two	93
5.4	Barriers to renewable energy development.....	96
5.4.1	Stage One.....	97
5.4.2	Stage Two	103

5.5	The disparities between the REC of the EU.....	106
5.5.1	Analysing Portugal and Spain.....	106
5.5.2	Comparison between Portugal, Spain, Germany, and Denmark.....	110
6	Conclusions	120
Annex I. The Evolution of Global Cooperative Principles by Waring and Lange (Waring and Lange, 2019).....		
		i
Annex II. Key literature on social dimension of REC		
		ii
Annex III. Type of barrier		
		iii
Annex IV. An overview of renewable energy sources (RES) and technologies		
		iv
Annex V. REC provides non-monetary added value to the community, from the point of view of those who do not participate in an REC.		
		v
Annex VI. Share of renewable energy in total final energy consumption for Germany, Portugal, Denmark, Spain, and the European Union, 1998 to 2016,.....		
		vi
Annex VII. Chronology of crises over the last 15 years		
		vii
Annex VIII. Renewable Energy Cooperative/Community Survey		
		viii
Annex IX. Renewable Energy Community Survey		
		xxiv

List of Figures

Figure 1.2.1. Frequency of Keyword (Community Energy) co-occurrence in papers per year (1990-2020) (Software VOSviewer), the database used Scopus	9
Figure 2.1.1. Seven Cooperative principles (ICA, 2019).....	11
Figure 2.1.2. The Evolution of Cooperative Principles	11
Figure 2.1.3. Reasons behind the restoration of energy Cooperatives, based on ILO (ILO, 2013).....	13
Figure 2.1.4. Cooperatives of RES pros in relation to traditional energy providers, based on ILO (ILO, 2013).....	14
Figure 2.1.5. The two parts of the RES market, based on ILO (ILO, 2013).....	14
Figure 2.2.1 - The three ways to promote cooperatives of RES.....	17
Figure 2.2.2 - Framework proposed by Cooperatives Europe (Cooperative Europe, 2017)	19
Figure 2.3.1 Social relations, based on Mischkowski and Wittmayer (Mischkowski and Wittmayer, 2020).....	24
Figure 2.3.2. Energy activities, based on Mischkowski and Wittmayer (Mischkowski and Wittmayer, 2020)	25
Figure 2.3.3. Categorization of social innovations in energy, based on Mischkowski and Wittmayer (Mischkowski and Wittmayer, 2020)	25
Figure 2.6.1. Benefits categories, based on Brummer, (2018)	42
Figure 2.7.1 – Reasons that prevent the REC development, based on Huybrechts and Mertens, (2014).....	43
Figure 2.7.2 – Barriers that REC face, based on Huybrechts and Mertens, (2014)	44
Figure 2.7.3 – Generic barriers that REC have to face, based on Soeiro and Dias, (2019)	48
Figure 2.7.4. Strategies Adopted by REC, based on Soeiro and Dias, (2019).....	49
Figure 2.8.1. Challenges facing by REC, based on (Koirala et al., 2016; Rae and Bradley, 2012).	50
Figure 3.2.1. Five dimensions of the Energy Union, based on Parliament and Council of the European Union, p. (2018, p. 13).....	60
Figure 3.2.2. Key targets for 2030, based on (2030 climate & energy framework, 2020)	60
Figure 3.2.3. Benefits created by the 2030 legislative framework.	62
Figure 3.3.1. Article 2, based on European Commission IME, (2016)	63
Figure 3.3.2. Article 16, based on European Commission IME, (2016)	63
Figure 3.3.3. Article 22: Definition for “Renewable Energy Community”, based on European Commission, (2017)	64
Figure 3.3.4. Definition proposed by the Council and Parliament, based on European Council, p. (2018, p. 55).....	65
Figure 3.3.5. Definition of Active Customer, based on European Commission IME, p. (2016, p. 52)	66
Figure 3.4.1. Pathway of RED.....	66
Figure 3.4.2. Definition of “Renewable Energy Community”, based on Article 2 Parliament and Council of the European Union, p. (2018, p. 103)	67
Figure 3.4.3. Pathway of IEM for electricity	68
Figure 3.4.4. Definition of “Citizen Energy Community”, based on European Commission, p. (2019, p. 140)	69
Figure 5.2.1. Contributions to the community	86

List of Graph

Graph 2.1. Share of RES in the EU (2004-2018), based on Eurostat (Eurostat, [s.d.]..	15
Graph 2.2. Share of RES-E in the EU (2004-2018), based on Eurostat (Eurostat, [s.d.]	15
Graph 5.1. Agree to participate in the survey.....	73
Graph 5.2. Gender.....	73
Graph 5.3. Age Group.....	74
Graph 5.4. Role in the REC.....	74
Graph 5.5. Do you know what REC are?.....	75
Graph 5.6. Do you want to belong to an REC?	75
Graph 5.7. Country	75
Graph 5.8. Year of Foundation	76
Graph 5.9. How many members does the REC have?	77
Graph 5.10. Geographic scope of REC members.....	77
Graph 5.11. one member one vote principle	77
Graph 5.12. Technologies	78
Graph 5.13. Categories.....	78
Graph 5.14. Gender.....	79
Graph 5.15. Age Group.....	79
Graph 5.16. Role in the REC.....	80
Graph 5.17. How do you classify your knowledge about REC?.....	80
Graph 5.18. Do you want to belong to a REC?	80
Graph 5.19. Country	81
Graph 5.20. Motivation of members to join the REC, from the point of view of those participating in an REC.	84
Graph 5.21. Answers to “Please state whether you agree or disagree with the following statements”, from the point of view of those participating in an REC.	85
Graph 5.22. REC provides non-monetary added value to the community, from the point of view of those participating in an REC.	86
Graph 5.23. Motivates to join an REC, from the point of view of those who do not participate in REC.....	88
Graph 5.24. Answers to “Please state whether you agree or disagree with the following statements”, from the point of view of those who do not participate in an REC.	89
Graph 5.25. Benefits of an REC, from the point of view of those participating in an REC.....	91
Graph 5.26. Drivers for development of an REC, from the point of view of those participating in an REC.....	92
Graph 5.27. Benefits attributed to an REC, from the point of view of those who do not participate in an REC.	94
Graph 5.28. Drivers attributed to an REC, from the point of view of those who do not participate in an REC.	95
Graph 5.29. Main barriers to the development of an REC, from the point of view of those participating in an REC.....	98
Graph 5.30. Do the support policies in your country provide equivalent conditions for all actors in the renewable energy sector?, from the point of view of those participating in an REC.	99
Graph 5.31. Challenges of an REC, from the point of view of those participating in an REC.....	101

Graph 5.32. Impact of the following cost items on an REC, from the point of view of those participating in an REC.....	102
Graph 5.33. Barriers attributed to an REC, from the point of view of those who do not participate in an REC.	104
Graph 5.34. Challenges attributed to an REC, from the point of view of those who do not participate in an REC.	105
Graph 5.35. Most important motivation for participating in an REC in Portugal and Spain, from the point of view of those participating in an REC.	107
Graph 5.36. Most important benefits for participating in an REC in Portugal and Spain, from the point of view of those participating in an REC.	108
Graph 5.37. Most important barriers for participating in an REC in Portugal and Spain, from the point of view of those participating in an REC.	109
Graph 5.38. “Is there a difference between REC in northern Europe and southern Europe?	110
Graph 5.39. “What factors contribute most to this difference?	110
Graph 5.40. Share of energy from renewable sources in % of gross final energy consumption, based on Eurostat (Eurostat, [s.d.])	113
Graph 5.41. Share of renewable energy in electricity generation, based on Eurostat (Eurostat, [s.d.])	113
Graph 5.42. Share of energy from renewable sources and 2020 target, based on Eurostat (Eurostat, [s.d.])	114
Graph 5.43. Approximate number of REC, based on (Heras-Saizarbitoria et al., 2018; Morris, 2019; Primeira comunidade de energia nasce em Miranda do Douro. , 2021; Soeiro and Ferreira Dias, 2020; Wierling et al., 2018).....	115
Graph 5.44. Greenhouse gas emissions compared to 1990 levels, based on Eurostat (Eurostat, [s.d.])	116
Graph 5.45. GDP per capita (value in \$), based on (The World Bank Data Bank , [s.d.])	117

List of Tables

Table 2.1. Typologies of REC, based on Rijpens, Riutort and Huybrechts, (2013); Yildiz et al., (2015); Enercoop, (2016)	28
Table 2.2. Typology of REC Business Models, based on Rijpens, Riutort and Huybrechts, (2013) and Capellán-Pérez, Campos-Celador and Terés-Zubiaga, (2018)	29
Table 2.3. Legal forms for REC, based on Interreg Europe, pp. (2019, pp. 6-7).....	31
Table 2.4 . Factors that influence participation, based on Kalkbrenner and Roosen, (2016)	36
Table 2.5. Added Value, based on Coenen et al., (2017).....	38
Table 2.6. Motivations with adopting microgeneration, based on table of (Balcombe, Rigby and Azapagic, 2013, p. 658)	39
Table 2.7. Factors that affect or determine the motivation to participate in REC, based on Bamberg, Rees and Seebauer, (2015; 2016; 2022; 2016; 2014; 2015).....	40
Table 2.8. Barriers with adopting microgeneration, based on a table of (Balcombe, Rigby and Azapagic, 2013, p. 658)	47
Table 5.1. Participation and Motivation.....	82
Table 5.2. Benefits and Drivers	90
Table 5.3. Barriers, Challenges and Costs	96
Table 5.4. Comparative analysis between two REC's from Southern Europe and two from Northern Europe, based on (Coopérnico, 2019; Heras-Saizarbitoria et al., 2018; Morris, 2019; Simcock, Willis and Capener, 2016)	112

Glossary of abbreviations

CEC - Citizen Energy Community

CER – Comunidades de Energia Renovável

EC – European Commission

EDP – Energias de Portugal

EU – European Union

GHG - Greenhouse gas

IEM – Internal Energy Market

RE – Renewable Energy

REC – Renewable Energy Community

RED – Renewable Energy Directive

RES – Renewable Energy Source

RES co-ops – Renewable Energy Cooperative

RES-I – Renewable Energy Source for Electricity

SI – Social Innovation

US – United States

JEL Codes: Q4; Q42; Q48

1 Introduction

Climate change is a “*perverse problem*” (Rittel and Webber, 1973). (Marshall, 2015) states that “*It is incomplete, contradictory, complex and constantly changing. There is no one point at which one has enough information to make decisions.*” Unfortunately, there is no single solution, nor a single policy response, that will work by itself. So, as (Verweij and Thompson, 2006) say, “*complex solutions*” will be needed for a “*complex world*”. The energy transition is not a linear transition, and as states about transitions that “*two steps forward may be followed by one step back (or steps in a different direction if actors change their beliefs and goals or if there is growing contestation of particular pathways)*” (Geels et al., 2016, p. 900). This process is particularly complex, as it includes different types of actors with different interests and goals. Agreeing, in the short term, on the goals to be defined is made very difficult by the actors' values, such as sustainability, energy security, among others. Socio-technical changes and uncertainties make the energy transition complex, as Valkenburg and Cotella, p. (2016, p. 3) says “*we do not know how the future system will behave, since we cannot be entirely sure what system we will build for the future*”. Moreover, the fact that citizens do not understand what is needed to ensure that, at the flick of a switch the lights go on, i.e., citizens think that energy is “*seemingly pure, invisible, clean, and cheap*”, because they do not observe the impact it has on natural resources, the environment and the market (Sovacool, 2009, p. 367). The greatest challenge for consumers, users and stakeholders is, therefore, to be involved in the development of the systems and their practices, and thus to play a key role in the energy transition with producers and promoters.

The energy sector was created as a centralized, hierarchical system to be managed by central governments and large national companies (monopolies or oligopolies) (Domanico, 2007), something that may be observed a little around the world. Ordinary citizens have been largely banned from managing and participating in the energy sector (Bauwens, Gotchev and Holstenkamp, 2016). However, recent developments indicate that this may be changing and citizens may and will play a very important role in the energy sector in the coming years (Corsini et al., 2019).

Bearing in mind that the objectives of the Paris climate agreement still seem difficult to achieve (Larkin et al., 2018), and since the efforts to increase the proportion of renewable energy (RE) in Europe, were only partially successful, new forms of energy

transition need to be considered. RE technologies and energy efficiency seem to be the most applied solutions to achieve energy sustainability, to reduce global warming and Greenhouse gas (GHG) emissions. Consequently, considering this need and the increased interest of citizens on participating in energy democracy (Szulecki, 2018), it is an evident excuse, motivation and an excellent opportunity for communities to create a new place on energy markets. It is several times stressed that communities are very prone for the implementation of technologies with low carbon values and for the application of several measures of energy efficiency (Parra et al., 2017).

The current energy transformation requires that communities also become energy producers (Der Schoor, Van et al., 2016). Thus, there is a wide range of energy projects led by citizens operating worldwide, with European countries at the forefront of this emerging trend (Heras-Saizarbitoria et al., 2018). The European Commission says:

“the participation of local citizens and local authorities in renewable energy projects through renewable energy communities has resulted in substantial added value in terms of local acceptance of renewable energy and access to additional private capital which results in local investment, more choice for consumers and greater participation by citizens in the energy transition” (European Commission, 2018, p. 92).

Consumers have been relegated, for several years, concerning the decisions on when, where or how renewable energy projects are built (Catney et al., 2014). Nowadays, they are being placed at the centre of the power systems. In the most recent energy package ((EU, 2019)) – Clean Energy for all Europeans – we note that the European Union seeks to put citizens at the heart of European energy policy, enabling them to become “*fully active actors*” in the energy transition (EU, 2019). This implies that citizens are increasingly involved not only in the production, distribution, storage, and end use of RE, but also in participation, supply and ownership in energy markets and services. This change may be achieved through the creation and development of Renewable Energy Community (REC). For its part, the EU has entrusted its expectations to the continued development and diffusion of community approaches to sustainable energy production and consumption (Soeiro and Dias, 2019).

Renewable Energy Community are defined as citizen groups, public authorities and community organizations that participate in the energy transition, through investments, production, sale, distribution, and consumption of RE. The benefits of REC's go beyond climate change, and include positive regional, economic and

environmental impacts, which drive up the public acceptance (Cohen et al., 2016). The concept of social innovation (SI) seems to be relevant in this context. These long-term structural changes in the energy market, may have considerable impacts on the quality of life, on economic organizations and on the activities and practices of individuals (Gadenne et al., 2011; Mulugetta, Jackson and Horst, vander, 2010). Citizen involvement in REC has several potential benefits (Kim, 2017). REC may reflect local interests and priorities, sustain the economic profits of the local energy economy to some extent (Feldhoff, 2016; Magnani and Osti, 2016), to establish an “*important sense of being something*” (Burchell, Rettie and Roberts, 2016, p. 23), to increase cohesion among the community (Hargreaves et al., 2013; Rogers et al., 2012), and finally to help creating awareness and transparency on energy matters (Bauwens, 2016; Rogers et al., 2012).

Citizen participation in the energy sector may be also tool for civic growth and political change (Hoffman and High-Pippert, 2010; Seyfang and Haxeltine, 2012). This opportunity gives citizens the ability to help creating and implementing more efficient solutions to social and environmental problems. Thus, citizens may not only participate on the choice of its energy supplier, but also to become a “*prosumer*¹”, simultaneously through energy generation and consumption (Der Schoor, Van and Scholtens, 2015).

1.1 Aim and Objectives of the study

The aim of the research is to understand the phenomenon, implications and stakeholders in the energy communities is how they impact the energy transition. The present study has the following specific objectives:

- To understand the participation and motivation aspects that lead citizens to create or develop a REC.
- To understand the benefits and drivers that a REC can bring to the community where it is located.
- To understand the barriers that affect the creation and/or development of a REC.

¹ Prosumers drive the adoption of RES, where energy is both produced and consumed locally – reducing greenhouse gas emissions and ensuring local value creation.

- To examine why there are disparities between European countries, when it comes to the creation of REC's.
- To understand how the new European energy legislation will assist countries in the development of new REC's.

1.2 Published articles

✱ **Energy Cooperatives in Southern European Countries: Are They Relevant for Sustainability Targets?**

The transition to low-carbon energy is a reality in Europe and most countries are on track to achieve their 2020 targets. However, there is a debate about the role of each stakeholder in this process and which of the parties most contribute. Our research focus is the role of energy cooperatives as contributors to sustainability targets, namely to energy transition, based on a database of cooperatives in southern European countries. The aim is also to compare the results with prior results on the literature. Our paper aims at answering the following questions: Are energy cooperatives important actors in the energy transition for southern European countries? Is this role different from the role of energy cooperatives in northern countries? The answer to these questions may be a starting point for discussion of different regulations and different behaviours of energy cooperatives throughout Europe and draw attention to the best way of supporting energy cooperatives. Differently, from the northern countries, the appearance of RE co-ops in Southern countries might be due to the dissatisfaction of citizens and consumer with the energy model, characterized by the dominance of the electric companies on the energy market for electric power.

Citation: SOEIRO, Susana; FERREIRA DIAS, Marta - Energy cooperatives in southern European countries: Are they relevant for sustainability targets? **Energy Reports**. 2019).
<https://www.scopus.com/record/display.uri?eid=2-s2.0-85072271584&origin=inward&txGid=471692be066e86cc731d282e107208a7>

✱ **Renewable energy cooperatives: a systematic review**

The environmental and economic trends of recent decades have forced the world to urgently rethink current energy systems. Thus, further study on renewable energy cooperatives is necessary because of the relevant role they already play in some energy markets, but essentially because of the key role they can play in the future. However,

academic research on energy cooperatives is widely dispersed and limited, particularly for southern European countries, i.e., countries that have no tradition on disseminating green energy. This paper presents a systematic review of the literature about these organizations that promote community-based renewable energy initiatives, based on primary and secondary sources, their main characteristics, motivations, and performance in several European countries. This is an important state of the art and a starting point for discussion for further research and on the implications for stakeholders and policymakers. Citation: SOEIRO, Susana; FERREIRA DIAS, Marta - Renewable energy cooperatives: a systematic review. In **2019 16th International Conference on the European Energy Market (EEM)**.

<https://www.scopus.com/record/display.uri?eid=2-s2.0-85076750947&origin=inward&txGid=698dd287c05a6e12d18ef7d39d1d96e7>

✱ **Community renewable energy: Benefits and drivers**

The energy transition alone causes a physical and social transition in places and communities. Although Community Energy (CE) emerged as a grassroots innovation, which is of interest to citizens and policy makers, the benefits, drivers, and barriers need to be extensively studied. In this article we analyse, through a survey, the benefits and drivers that affect the creation and development of the CE. The results lead to two important insights: firstly, environmental benefits outweigh financial ones when creating and developing CE's. Secondly, it is important to mention the benefits that the CE bring to the regions where they are created. Third, when developing an CE, we must consider must be taken of the impacts it will have on the environment and the community where it will be installed.

Citation: SOEIRO, Susana; FERREIRA DIAS, Marta - Community renewable energy: Benefits and drivers. **Energy Reports**. 6:2020) 134-140.

<https://www.sciencedirect.com/science/article/pii/S2352484720315122?via%3Dihub>

✱ **Motivations for Integrating a Renewable Energy Community: Evidence for Spain and Portugal**

We analyse community energy in Portugal and Spain. These communities are an alternative route to the dominance of the large energy companies on European market. This analysis is important because the literature emphasizes the weaknesses that the CE

have in southern Europe countries comparing to northern Europe ones, as there are no explanations for the delay in development in these countries. Using a survey, we explain the motivations that support the participation of its members in the CE. This paper analyses knowledge of stakeholders and its influence on the participation motives to better understand CE in Spain and Portugal.

Citation: SOEIRO, Susana; FERREIRA DIAS, Marta - Motivations for Integrating a Renewable Energy Community: Evidence for Spain and Portugal. In **2020 17th International Conference on the European Energy Market (EEM)**. Stockholm, Sweden: [s.n.]

<https://ieeexplore.ieee.org/document/9221887>

✧ **Renewable energy community and the European energy market: main motivations**

With the implementation of the EU's key climate and energy policy objectives, there is a transition to a new energy system where renewable energy sources are pushed and where new technologies need to be developed and adopted. The energy transition may result in deeper participation of individual consumers or citizens in community-based initiatives. Those communities operate collectively in the energy market producing RE or in local networks, based on local collaborations. The development of energy communities is not the same in all member state. Moreover, it is noted that their development is different depending on the European country. The aim of this paper is to collect data, using a survey, to study and to better understand what the citizen energy initiatives are, their main features and the motivations of individuals to participate on it. The citizen's participation is a crucial point for the development of this type of communities. The main motivation for participation in these communities seems to be concerns about environmental and climate impacts. We also note that in these communities the trust is very important for the development of any RE project.

Citation: SOEIRO, Susana; FERREIRA DIAS, Marta - Renewable energy community and the European energy market: main motivations. **Heliyon**. 6:7 (2020) e04511.

[https://www.cell.com/heliyon/fulltext/S2405-8440\(20\)31355-4?_returnURL=https%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS2405844020313554%3Fshowall%3Dtrue](https://www.cell.com/heliyon/fulltext/S2405-8440(20)31355-4?_returnURL=https%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS2405844020313554%3Fshowall%3Dtrue)

✧ **Renewable Energy Community Across Europe: Is Public Policy Helping**

The environmental and economic trends of recent decades have forced the world to urgently rethink current energy markets and energy offer. Thus, further study on Community Energy (CE) is a recent concern due to their relevant role in some energy markets and in some cases for their key role in the future. This new generation of citizen intervention is a way of democratizing the energy sector on all stages, from production to supply. Community energy represents a legal form of business that exists worldwide, namely in the agricultural, financial, general consumption, and in industrial production, nonetheless on a smaller scale. Thus, according to the Co-operative Alliance (ICA), the definition is clear. Thus, the aims of this business model are increasing participation within membership and governance to a new level; positioning community energy as constructors of sustainability, building the community energy message and ensuring community identity, ensuring legal structures to support community growth, and guaranteeing reliable community capital, ensuring control of members. It is often argued that laws and regulations raise various restrictions on CE. Therefore, the development of renewable energy is supported through public policy in most European countries. To reach the aims of EU 2030 climate and energy framework and considering the new legislative framework the new EU energy directive is undergoing a process where CE's seem to have a saying at this point in history. All over Europe nowadays the REC projects are based on regulated market prices and public support programs. Therefore, the policy and legislative framework of REC seems to be very relevant for the incentives to the creation and expansion of REC. From literature review it may be concluded that in countries where the regulation of public support schemes is inconsistent, the development of a sound financing plan and a business model for REC seems to be more difficult. Thus, the role of public authorities in promoting and supporting the development of renewable energy is a key aspect for the creation/ growth of REC, as well as other forms of energy community. Consequently, national regulations, as transpositions of European directives, may be different according to the country and may be a good starting point for studying this phenomenon and its expansion in Europe. Furthermore, in most cases the legal barriers encountered are mentioned as one of the main obstacles to CE creation and these vary from country to country. This chapter presents a comprehensive study of European-level policies and legislation at national level that transposes or complements EU legislation to gain a broader perspective on the multiple regulations of European countries concerning REC with the aim of studying different law motivations for different evolutions across Europe.

Citation: S. SOEIRO and M. FERREIRA DIAS, “Renewable Energy Community Across Europe: Is Public Policy Helping or Not?,” in **European Political, Economic and Security Issues**, New York: Nova Science Publishers, Ed. 2020, pp. 1–182.

After a brief introduction on the topic of this study, chapter 1 discusses the research objectives and subsequent study questions. Chapter 2 focuses on the theoretical background, stating the underlying beliefs about cooperatives and energy communities. Social innovation and European trade union law are also addressed. Chapter 3 focuses exclusively on the European Union law for energy communities. Chapter 4 gives an overview of the methods chosen, while chapter 5 presents the results of the two stages of the online survey. Chapter 6 presents the main conclusions and addresses the main limitations of the study.

that there is not much delay in these common expectations and foundations, which exist beyond individual interests, to evolve into a cooperative movement that encompasses virtually all sectors of our society (Mori, 2014).

Cooperativism, still in the 18th century, sought to constitute a political and economic alternative to capitalism, suppressing the boss and the intermediary, and granting the worker the appropriation of labour instruments and participation in the results of his own work.

During the first half of the 19th century, in countries such as the United States of America, Canada and England, organizations emerged in cooperatives. In 1844, the Rochdale Society of Equitable Pioneers was founded, bringing together 28 weavers, from Lancashire in England, to try to counter the poverty brought about by the Industrial Revolution. This was the first successful modern cooperative enterprise, succeeding in balancing external market competition with internal values (Zamagni and Zamagni, 2010). According to Holyoake , p. (1893, p. 12), the statutes state that "*the objective and plans of this Society are to form arrangements for the pecuniary benefit and the improvement of the social and domestic condition of its members ...*", thus establishing an exception in organizational framework in relation to the claim of organizational identity.

Throughout Europe, in the nineteenth century, various types of economic cooperatives emerged, including the **labour cooperative** in France (1831), **the credit union or mutual bank** in Germany (1852), and **the cooperative of Farmers** in Denmark (1882) (Zamagni and Zamagni, 2010). Each of these cooperatives intended to provide different services in the economy, based on their connection with the principles collectively established by the Rochdale Pioneers, to unite them throughout the continent and the Atlantic.

Thus, to support this wave of international innovation and unite members with similar ideas, the International Cooperative Alliance (ICA) was founded in 1895. ICA adopts the seven principles originally written by the Rochdale Society, thus giving support to the Society as the founder of the modern cooperative movement.

The Alliance in 1995, adopted the revised Statement on the Co-operative Identity, which contains the definition of cooperative, cooperative values and the seven fundamental principles of cooperatives (Figure 2.1.1). Cooperatives should hold the following values: self-help; self-responsibility, democracy, equality, equity, and solidarity. Thus, according to the revised Statement, the definition of cooperative is: "*The*

co-operative is an autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly owned and democratically-controlled enterprise." (ICA, 2017). This definition is accepted today by everyone in the cooperative movement of the world.

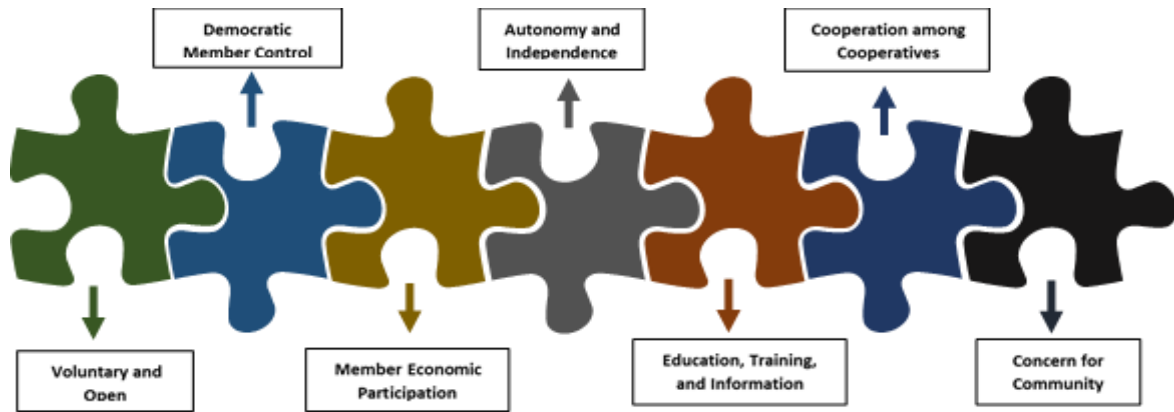


Figure 2.1.1. Seven Cooperative principles (ICA, 2019)

Over the course of 150 years, the seven fundamental principles of cooperatives have remained essentially unchanged (Annex I) and Figure 2.1.2. Although the values shared by the cooperatives are the same, there is a significant variation of cooperatives regarding the type of organization (consumer, producer, worker), sector of activity (e.g., agriculture, credit, technology production, retail, social welfare provision, housing, renewable energy and political orientation (i.e., the degree of participation in the values and actions of the capitalist economy and/or reformist commitment) (Cooperatives: Characteristics, activities, status, challenges, [s.d.]).

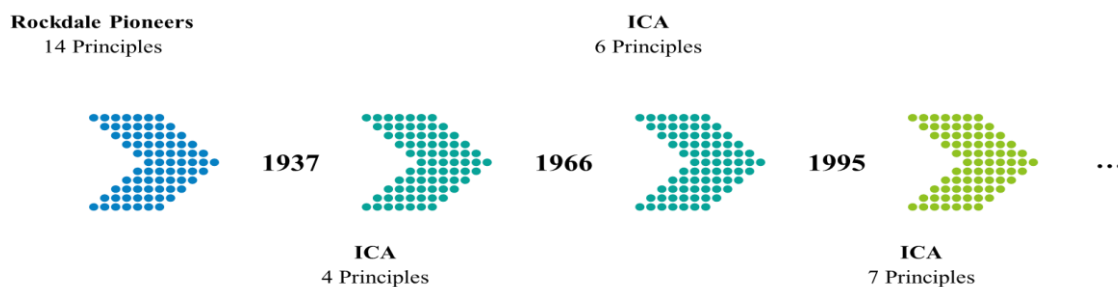


Figure 2.1.2. The Evolution of Cooperative Principles

If we observe in economic terms, cooperatives are a different business organization because they present a different ownership model. That is, the cooperatives

are owned by their beneficiaries instead of their investors (as is the case of capitalist corporations), and so are joint beneficiaries and members of the cooperative and the property rights have a special configuration. Since cooperatives are democratic and participative organizations, the gains obtained are divided equally among members, according to the volume of transactions they have made with the company. As well as the voting rights are shared among the partners according to the relative quantity of transactions, or merely on a "*one member, one vote*" basis (Zeuli, Cropp and Schaars, 2004).

Nowadays, a new type of Cooperatives is emerging. This new, extremely complex, and diverse model of cooperative organization is termed "*social enterprises*", emerging when certain distinct types of stakeholders have a strong appeal to become owners, while sharing interests and mutual visions. Among their interests are sustainable development, social inclusion and poverty reduction, and, as is our research topic, the access to energy as a critical issue for development processes, including for eradicating poverty and helping to provide basic human needs (ILO, 2013).

Vieta and Lionais, (2015) say that "*Rooted in the unique principles and values that distinguish them from other business types, cooperatives, in a nutshell, embody what has been called*" the cooperative advantage". This competitive advantage is achieved through a "*win-win*" relationship with the key stakeholder group. Such a win-win relationship ensures that there is loyalty among members of the cooperative and attracts more members over time (Huybrechts and Mertens, 2014). Despite several good examples of cooperatives, seen in various business areas and regions, we must ask *why these models of organizations are no longer widespread?* This question will try to be answered later in this research work, on the chapter about "*Barriers to renewable energy development*".

The environmental and economic trends of recent decades have forced the world to urgently rethink current energy systems. Thus, due to growing concerns about ecological sustainability, market volatility, rising energy prices and security of energy supply, the world has, in recent years, attempted to rebuild the energy system into a system of more sustainable energy, both in supply and in production. These new energy models give rise to "*new*" types of socioeconomic organizations, such as the resurgence of energy cooperatives and other forms of local property or community-based property technology RE (Figure 2.1.3).

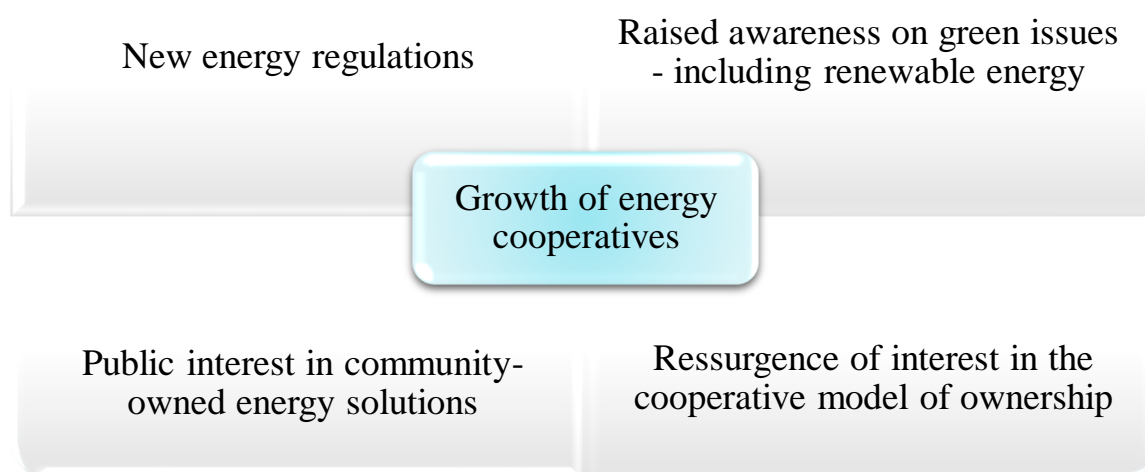


Figure 2.1.3. Reasons behind the restoration of energy Cooperatives, based on ILO (ILO, 2013)

With awareness of climate change and the introduction of renewable energy sources (RES) policies, this new generation of energy cooperatives, commonly known as RES Cooperatives, are democratizing the energy sector through production, sale, consumption, and energy supplied.

In Figure 2.1.4, we may find several reasons why cooperatives of RES consist of an alternative solution for large traditional energy suppliers. One of the issues of particular importance for cooperatives of RES is the provision of energy at a reasonable price. With this type of business, consumers may reduce environmental impact (relying on green energy sources), strengthening the market with cleaner energy and renewable energy generation facilities. As a member of a cooperative of RES, the citizen will actively participate in local or national debates on energy policies, and thus see the implications of the efforts for a better future environment. On the other hand, cooperatives of RES will also promote local development, creating green jobs or providing additional services such as microfinance, better infrastructure or technical training and assistance in innovative and productive end-uses (ILO, 2013).

In turn, these companies will differentiate themselves from other market players because major electricity companies have no incentive to reduce their customers' consumption as this will induce costs and reduce turnover. Thus, cooperatives of RES are more legitimate in promoting consumption reduction, since this is in the interests of consumers who control it (Huybrechts and Mertens, 2014).

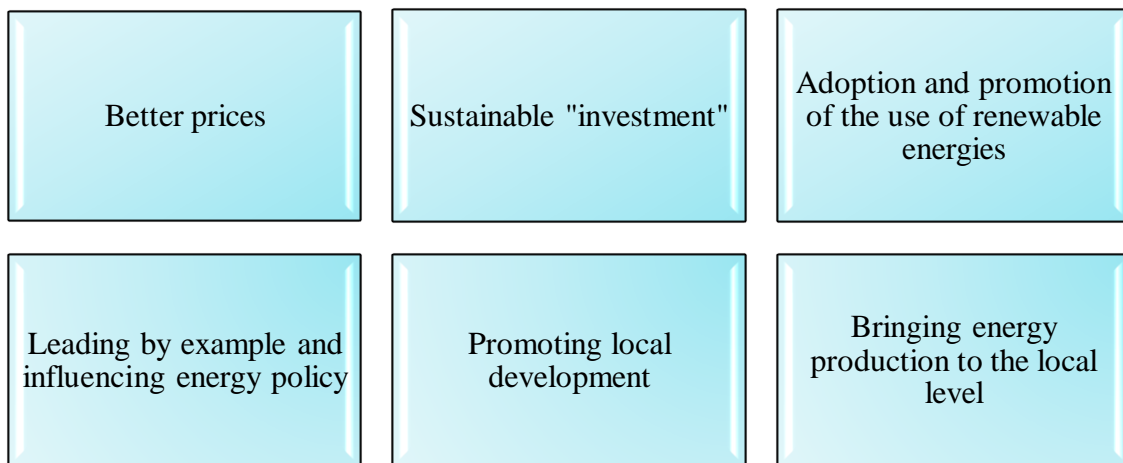


Figure 2.1.4. Cooperatives of RES pros in relation to traditional energy providers, based on ILO (ILO, 2013)

Since the peak of alternative energies in the 1970s, large companies have practically controlled the RES market in all countries (in Portugal we have the case of Energias de Portugal (EDP)). However, with the recent European liberalization of the electricity market, an increasing number of cooperatives of RES are emerging in Europe, supported by growing consumer dissatisfaction and the desire to have a say on the costs and origin of energy. As pioneer cooperatives, we have EWS in Germany and Ecopower in Belgium (Huybrechts and Mertens, 2014).

Although cooperatives of RES provide numerous advantages in terms of, both economic efficiency and citizen involvement, the fact is that these cooperatives still represent a small part of the European RES market. Basically, the European RES market may be divided into two parts (Figure 2.1.5).

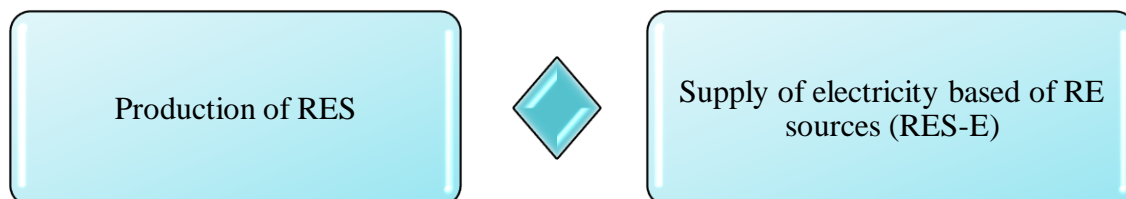
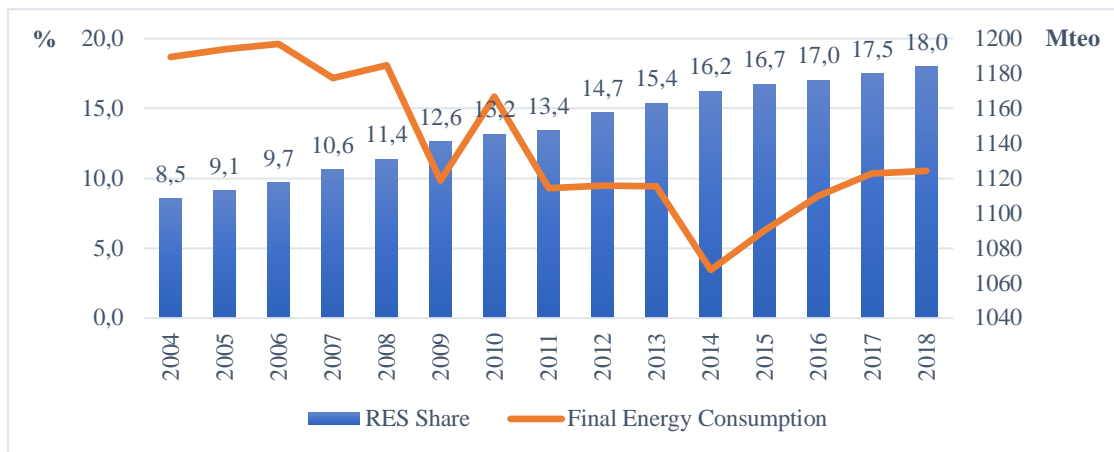


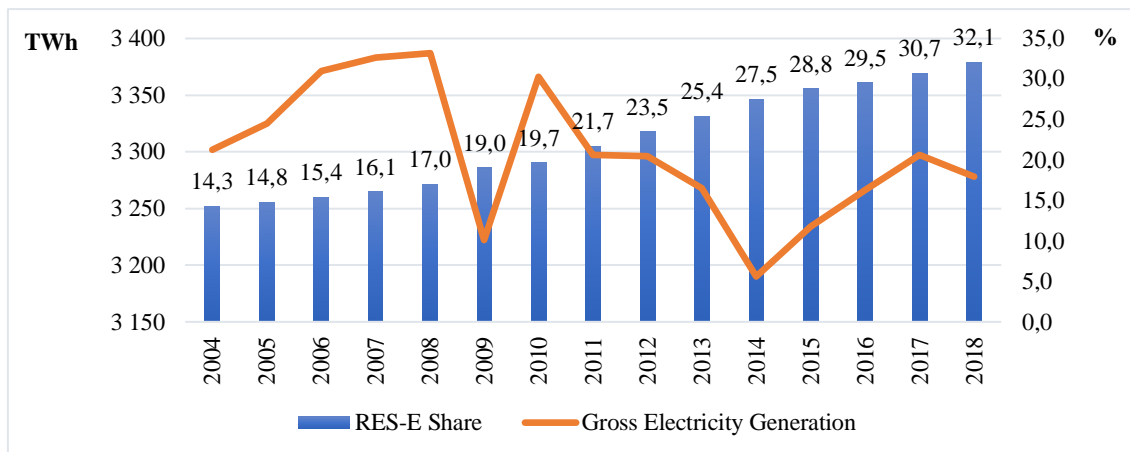
Figure 2.1.5. The two parts of the RES market, based on ILO (ILO, 2013)

According to the Eurostat energy reports (European Commission, 2019) (Graph 2.1), the production based on of RES (biomass, hydropower, geothermal energy, wind and solar energy) in the total energy production in the EU has evolved from 8.5% to 18.0%, between 2004 and 2018, and from 14.3% to 32.1% if we only consider electricity (Graph 2.2).



Graph 2.1. Share of RES in the EU (2004-2018), based on Eurostat (Eurostat, [s.d.])

A related market is the supply of energy produced, particularly in the form of electricity. This type of market, it is even more complicated to get to the cooperatives of RES because it was very newly opened and is still controlled by a small number of powerful energy companies. On the other hand, the electricity grid of each country is often owned by the oldest electricity provider on the market. However, a number of cooperatives of RES have begun to provide RES-based electricity to increase their share and control a significant part of the supply chain (Huybrechts and Mertens, 2014).



Graph 2.2. Share of RES-E in the EU (2004-2018), based on Eurostat (Eurostat, [s.d.])

Considering that the increased concerns about ecological sustainability and the adoption and promotion of the use of "green power" have led to an expansion in the share of RES in total energy production in the EU. If we look at the graph above (Graph 2.2) we see a decreasing in energy consumption in 2009, which may be related to a strong

policy of measures to improve energy efficiency. The increase in 2010 was due to a combination of severe climatic conditions, which strongly stimulated demand in the residential sector, and also economic recovery (Bertoldi, Hirl and Labanca, 2012).

At the same time, EU members have set energy efficiency targets for buildings and have taken steps to increase the rate of deep reforms to effectively reduce energy demand and create new jobs (Graph 2.1 and Graph 2.2).

Regardless of the advantages of the cooperative of RES model in response to consumer concerns, as noted above, there is no single business model. That is, each country has its own peculiarities and, even if there are some general principles, certainly no standards may be found between countries. Then, it may be said that the development of the cooperative model may depend on the context in which the cooperative will be installed (Huybrechts and Mertens, 2014).

2.2 The Cooperative in European Union Law

Since sustainable development and energy are likely to be included as two of the main objectives of the European development agenda, the role of cooperatives is becoming more important and more intense in the future of the energy market. With the anticipated growth in the popularity of cooperatives of RES, one predicted consequence seems to be the need for an appropriate legislative framework, including environment support measures. These measures are in line with **ILO Recommendation No. 193 on the Promotion of Cooperatives 2002**, which notes (ILO, 2013):

“Cooperatives should be treated in accordance with national law and practice and on terms less favourable than those accorded to other forms of enterprise and social organization. Governments should introduce support measures, where appropriate, for the activities of cooperatives that meet specific social and public policy outcomes, such as employment promotion or the development of activities benefiting disadvantaged groups or regions. Such measures could include as many as possible, tax benefits, loans, grants, access to public works programs, and special procurement provisions”.

Thus, we can mention that a regulatory environment is essential to promote cooperatives and, in this case, cooperatives of RES. We may divide the promotion of cooperatives of RES into three parts (Figure 2.2.1).



Figure 2.2.1 - The three ways to promote cooperatives of RES.

Since 2003, when the European Commission adopted the Regulation on the Statute for a European Cooperative Society, which sets out the rules for cooperatives willing to extend their action beyond national borders, much has been done. However, much remains to be done in this field, namely the creation of a standard law that protects and regulates cooperatives of RES (EU Legislation, 2003).

With the economic crisis of 2009, there has been a drop in the level of consumer confidence and business, so the attention of the public is increasingly focused on the social and ethical performance of companies. Thus, after years of debate, the European Commission published in 2011, the long-awaited communication: "*A renewed EU strategy 2011-2014 for Corporate Social Responsibility*" (European Commission, 2013). With this communication, the EU officially recognized cooperatives as one of several ways of doing business.

Not long after, the role of cooperatives was again highlighted when social entrepreneurship was selected as one of the twelve measures announced in UE to achieve Internal Energy Market, as well as the introduction of a short-term action plan to support the development of social enterprise (European Commission, 2011; Social Business Initiative, 2011).

As cooperatives are active companies and may become very competitive, the UN has proclaimed the year 2012 as **The International Year of Cooperatives**, linking various efforts, to define the cooperative movement in political agenda. Among the topics discussed, we highlight the three most important (ICA, 2012):

- ∴ *Co-operative answers to the current economic crisis*
- ∴ *Co-operative Development Support: dialogue between Cooperative experts and EU policy makers.*

∴ Towards a new European Co-operative Society regulation: in the overview of national cooperative legislations in Europe and the potential for revision of the Statute for European Cooperative Society (SCE) Regulation.

An important conference was organized to discuss the EU 2020 strategies. Basically, EU 2020 strategy aims at a *"sustainable economy, putting people and responsibility first with a sustained fight against exclusion and a transition to a green economy"* (Cooperative Europe, 2017). As cooperatives already act on these principles, they may bring specific responses and innovative solutions that may contribute to the EU 2020 strategy.

Since cooperatives and the cooperative movement should be consulted and included in the drafting of new energy policies or in the implementation of existing projects, **Cooperatives Europe** (Cooperative Europe, 2017) was created as part of a UE cooperative of RES project to cooperative business model at European level. The main working objectives of this group are (Cooperative Europe, 2017):

- ∴ Promote Cooperatives in the European Energy debate and support a decentralized energy strategy in the EU.*
- ∴ Strengthen visibility at EU level the credible actor in the energy and environment domain and develop a European cooperative energy advocacy strategy.*
- ∴ Seek of foster cooperation through joint actions and targeted cooperative networks.*

In 2013, REC announced a proposal, to integrate sustainability into corporate strategies and activities. This is what cooperatives have been doing for years, through informing members, citizens, and consumers of the impacts of their activities.

In that same year, the European Commission and Rescoop.EU (REScoop, 2019), that is a project that seeks to identify all RE projects in Europe and to promote cooperatives of RES as the next step in the energy transition, promoted an event where they addressed issues about how to overcome the main challenges for the introduction of RE, the way cooperative may help to achieve EU energy transition, local and regional RE partnerships, the effects of EU policy on local/regional initiatives and the discoveries of EU liberalization approaches (Cooperative Europe, 2017).

It is important to note that *The European Parliament and Council* adopted a report on the *"real recognition"* of the European Parliament and the European Parliament about

the contribution of the cooperative model during the economic and social crisis, and a motion for resolution on the **Entrepreneurship 2020 Action Plan** (European Commission, 2011). This motion complies with the plurality of business forms, a principle recognized in the funding treaties of the EU, but which was barely mentioned in the European Commission texts (Social Business Initiative, 2011).

Despite the announcement of the European Commission in 2014 on the creation of a group of experts to develop clear recommendations on cooperative training and education, cooperative financing and business development support services, EU 2030 was also launched for climate policy and energy, which still does not support local efforts for decentralized energy production.

In response to this document, European Commission proposes three binding and ambitious objectives at EU level (European Commission, 2013):

- ∴ Energy efficiency.*
- ∴ RE share.*
- ∴ Reduction for greenhouse gas emissions.*

The European Commission believes that these objectives should be divided by the members of the European Union, thus ensuring an equal approach between EU members. As national objectives lead to policy decisions, show signs of investment and clarity on the paths which should be taken as national industries (Figure 2.2.2). Only then will it be possible to have a stable long-term framework that promotes investments in the energy transition, namely in cooperatives of RES, to achieve energy independency in Europe and to support itself as a leader in a competitive and green economy.

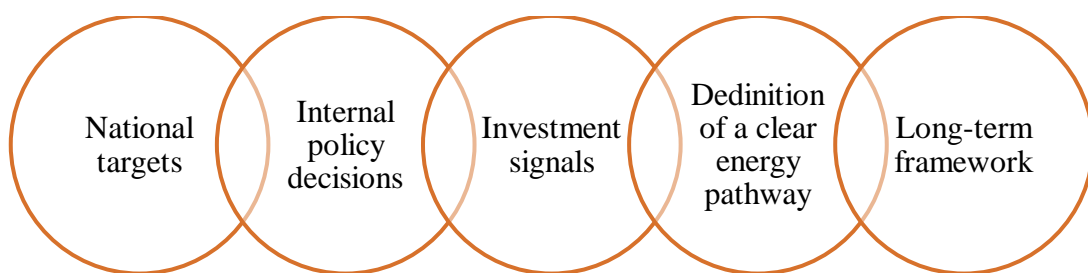


Figure 2.2.2 - Framework proposed by Cooperatives Europe (Cooperative Europe, 2017)

Ideally, a market system could only work when all actors (small, medium, and big companies) are included and treated equally. However, new guidelines continue to neglect the impact that cooperatives of RES have on the energy transition, and on the organization of energy demand, set up the internal energy market and strengthen

indigenous energy sources. It would be expected that these new guidelines will affect with existing national and European laws, in particular **Directive 2009/28/EC** (European Commission, 2009) on renewable energies, since it considers the local and regional interests of RES generators.

Europe may need a new energy vision, based on increasing energy autonomy through RES, a diversity of energy agents through integration of cooperatives and citizens with a desire to intervene and to change. In parallel with the promotion made by international organizations, efforts must also be made in the development either by each member and by the cooperative movement that operates from each member.

In general, we may say that government promotion measures may be divided in direct promotion measures, by the energy cooperatives, and more general RES measures, which may indirectly encourage and support the establishment of cooperatives of RES. However, it is of the utmost importance that these promotion measures should provide conditions for each potential cooperative member, the power to create a new cooperative, whose autonomy and democratic nature, values and principles must be consider (ILO, 2013). RES cooperatives to reach their full potential in sustainable energy production, providing access to and distributing clean energy at affordable prices and in creating green jobs, allowing citizens to decide on energy production and distribution.(ILO, 2013).

When creating a network of RES cooperatives, both at national and regional level, a way must be found to achieve individual success. This is extremely important, not only for capacity development and knowledge transfer, but also for the development of a political and legislative dialogue, for public awareness campaigns, considering the protection of the interests of each cooperative of RES and their members. Financing, provided by the cooperative movement, is a great help for energy initiatives:

Many savings and credit cooperatives in OECD provide specific loans to improve energy efficiency or small and medium-sized enterprises involved in the energy sector, including cooperatives, or to enable access to energy. (...) This is an important role, as energy generation or distribution can require considerable amounts of investment, and access to finance is often a major challenge for energy cooperatives (ILO, 2013).

On a final note, the term Cooperatives of RES has so far been used to define a voluntary association of people who come together to produce electricity from renewable sources. However, when conducting our research, we found that the term does not cover all existing RES projects. Thus, from this point on, the term Renewable Energy Community (REC) will be used, which seems more comprehensive and is very often used

in the literature. In this case, we agree with the new Renewable Energy Directive (RED), which uses the term Renewable Energy Community.

2.3 Social Innovation in energy sector

The field of social innovation (SI) has received a growing academic and political interest during the last decade (Adams and Hess, 2010), driven by trends such as the involvement of citizens and organizations in innovation and the needs of developing economies, where innovation is not based on the latest technology, but on solving social problems. However, the term SI has a long history, dating back to the 19th century (Have, Van der and Rubalcaba, 2016), with a multiplicity of meanings, orientations and uses. What all the meanings share is the focus on "*social*" as an objective of innovation (Avelino et al., 2019). Polman et al., (2017, p. 4) defines SI as "*the reconfiguring of social practices, in response to societal challenges, which seeks to enhance outcomes on societal wellbeing and necessarily includes the engagement of civil society actors*". SI is considered an instrument of social change and has the potential to create solutions that contribute to facing very complex social challenges, such as climate change, population aging, inequality growth, globalization and digitalization (Mulgan et al., 2007; Murray et al., 2010).

The literature on the social dimension of renewable energy is large and growing (Annex II), focusing mainly on research in the United Kingdom. However this fact has been changing (Bauwens and Defourny, 2017; Becker and Kunze, 2014; Devine-Wright, 2007; Magnani and Osti, 2016; Pepermans and Loots, 2013; Szulecki, 2018). The basic innovation literature (Hargreaves et al., 2013) and research on transition initiatives (Frantzeskaki et al., 2016; Gorissen et al., 2018), use the term "*social innovation*" mainly to denote innovations that are not just technological (Dóci, Vasileiadou and Petersen, 2015; Seyfang and Smith, 2007), but have not defined or conceptualized what social innovations in energy are. This has its roots in the social acceptance of large energy projects, such as wind farms. In Europe, during the 1990s, wind farms were widely implemented, where there was generally no significant participation or consultation by citizens, which led, in several cases, to refusal by the local population (Aitken, 2010; Devine-Wright, 2005; Wolsink, 1994). But, public acceptance increases if energy projects bring benefits to the community as a whole (Rogers et al., 2008; Warren and McFadyen,

2010). The term social innovation was used by Maruyama, Nishikido and Iida, (2007), in a study on community participation in wind energy projects in Japan, referring to the new theory on social dynamics, which alters the risk-benefit distribution in some way, but also the role that the actors have before new technology. This study stresses that this type of investment, even if it is not for local development, may serve as drivers for bringing people together around a common objective, such as environmental protection.

Walker et al., (2007) states that the emergence of a “*community-based localism*” in renewable energies in the UK, in the early and mid-2000s, is a positive development. It also states that vague definitions of community do not necessarily imply “*participation, empowerment or wider civic outcome*” (Hoffman and High-Pippert, 2005; Walker et al., 2007, p. 77). In a very current REC study, Horst, van der, (2008) refers to “*social enterprise in renewable energy*”. The author affirms that the appearance of this phenomenon in the United Kingdom, is due to the slow progress of the private sector in the development of RE, but also to the support to the rural communities at risk of fuel poverty through the remote locations, namely in Scotland. Some authors argue that Scotland presents itself as a significant focal point of REC innovation, where it also emerges as a tool for rural development (Slee and Harnmeijer, 2017; Veelen, van, 2017).

There is a series of scientific evidence on the huge growth of the REC in the UK, which details individual REC projects (Hargreaves et al., 2013; Seyfang, Park and Smith, 2013; Seyfang et al., 2014, 2014). These REC initiatives are extremely diverse popular movements, not being easily reduced to a single model entity or process and are not susceptible to unique political solutions (Rae and Bradley, 2012; Seyfang, Park and Smith, 2013). This diversity of REC’s has given rise to debates in academic literature (for example, (Veelen, van, 2017)), about the importance of research on dominant changes (Geels, 2002), such as multi-level perspectives (for example, (Kemp, Schot and Hoogma, 1998)). However, this type of approach has led to several criticisms, since it tends to treat REC as a uniform phenomenon (Geels, 2011; Seyfang et al., 2014). Another gap that must be consider is the traditional and salient application in technology of the term “*innovation*” (MacCallum, 2009), which contradicts the emphasis on human activity and the social capital on which the SI concept is based.

Bauwens and Defourny, (2017) address, in a study on renewable energy cooperatives in Belgium, the role of social capital in renewable energy cooperatives. They consider that there are three different forms of social capital: “*social identification with*

the cooperative, generalized interpersonal trust and network structure” (Bauwens and Defourny, 2017, p. 3). The results of this study also show that:

“That the type and level of social capital differ indeed depending on whether the cooperative is oriented toward mutual or public benefit. On average, an orientation toward public/mutual benefit is associated with higher/lower social identification and stronger/weaker social bonds between members. This relationship is mediated by spatial factors and the structure of social interactions within organizations” (Bauwens and Defourny, 2017, p. 3).

However, by increasing the size, impact, and financial stability of REC's, it can result in the dilution of the share capital.

Hiteva and Sovacool, (2017) study energy service companies, from an energy justice perspective. These authors define *“energy justice” as a global energy system that fairly disseminates both the benefits and costs of energy services, responsive to ever-shifting future imbalances and one that contributes to more representative and impartial energy decision-making*” (Hiteva and Sovacool, 2017, p. 8). They conclude that a company already established in the energy market, which tries to incorporate the principles of energy justice in its business model, will be less successful in achieving its objectives than a company which is created with the principles of energy justice in mind. In turn, Kunze and Becker Kunze and Becker, p. (2014, p. 8) in a study for a set of European REC initiatives, apply the term *“energy democracy”*. Energy democracy is aligned with climate justice, and *“means that everybody is ensured access to sufficient energy”* (Kunze and Becker, 2014, p. 8), it must be produced without causing damage for the environment or the climate, the means of production must be democratized and reflect the energy consumption by the population. Szulecki, (2018, p. 35) analysed that, *“while energy democracy, as a policy goal and a certain ideal type of socio-technical arrangement, is a quasi-utopian idealization, energy democratization – the political process altering the industry and influencing socio-political institutions – is already taking place”*. The three elements used that become the *“energy democracy from conceptual to analytical/decision-making tool – democratic popular sovereignty; participatory governance; and civic ownership”* (Szulecki, 2018, pp. 35-36) – are the most recurrent themes in the study of REC, and are also essential to the concept of SI (Sovacool and Dworkin, 2015).

The **SONNET** project (The SONNET project, 2019) prepared a recent study, where they address SI in energy. In this study, Mischkowski and Wittmayer, (2020) report that:

“Looking at changes in social relations that manifest through activities related to energy generation, transmission, distribution and/or consumption. These changes have both a material and social side: they address changing patterns – by, for example, using new technology – as well as the simultaneous changes in behaviour of those people using this technology”(Mischkowski and Wittmayer, 2020).

It was also presented a definition for *Social Innovation in Energy*: “*is a combination of ideas, objects and/or actions that change social relations and involve new ways of doing, thinking and/or organising energy*” (Mischkowski and Wittmayer, 2020, pp. 4 - 6). They also identified, studied and gathered 500 examples of SI in 8 European countries, where they were categorized into 18 types, which were grouped considering several items (Figure 2.3.1 and Figure 2.3.2)

➤ social relations (*Cooperation; Exchange; Competition; Conflict*)

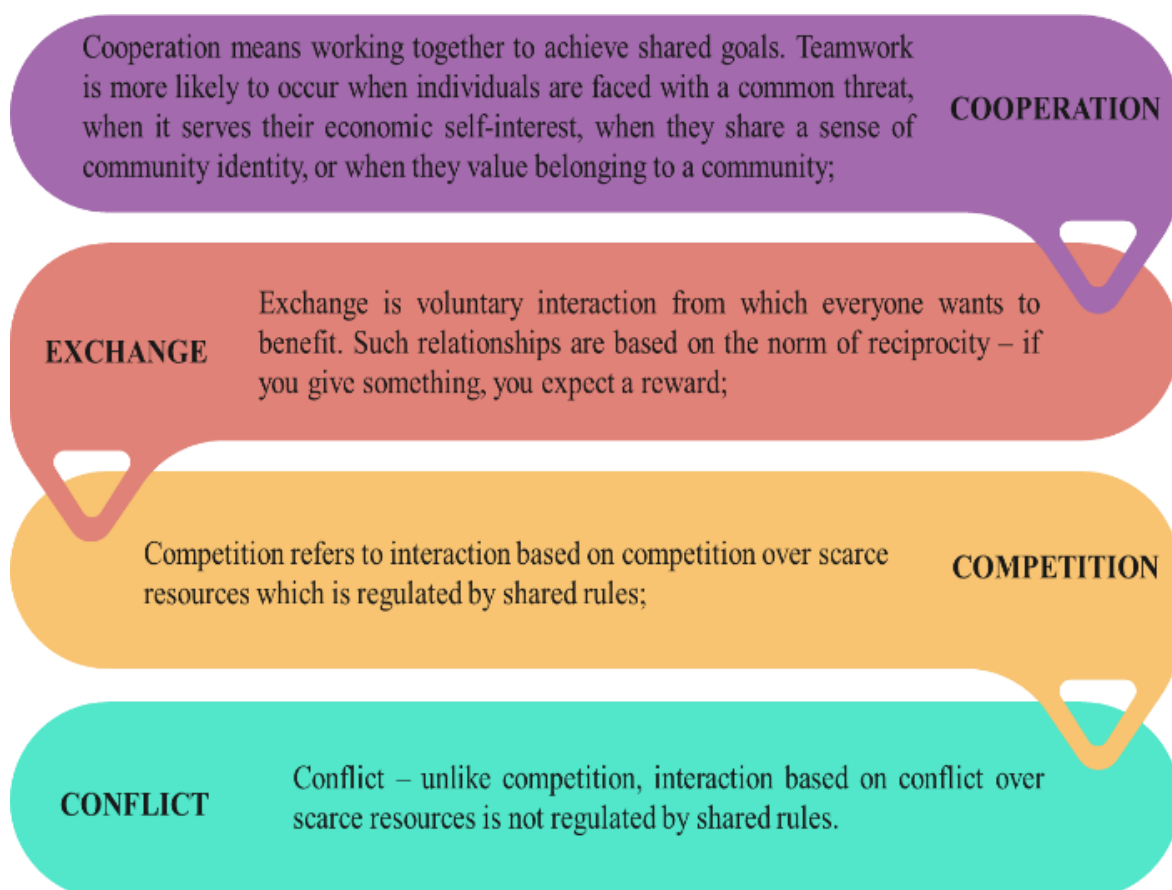


Figure 2.3.1 Social relations, based on Mischkowski and Wittmayer (Mischkowski and Wittmayer, 2020)

- types of energy activities (*Doing; Thinking; Organising*) where they get involved.

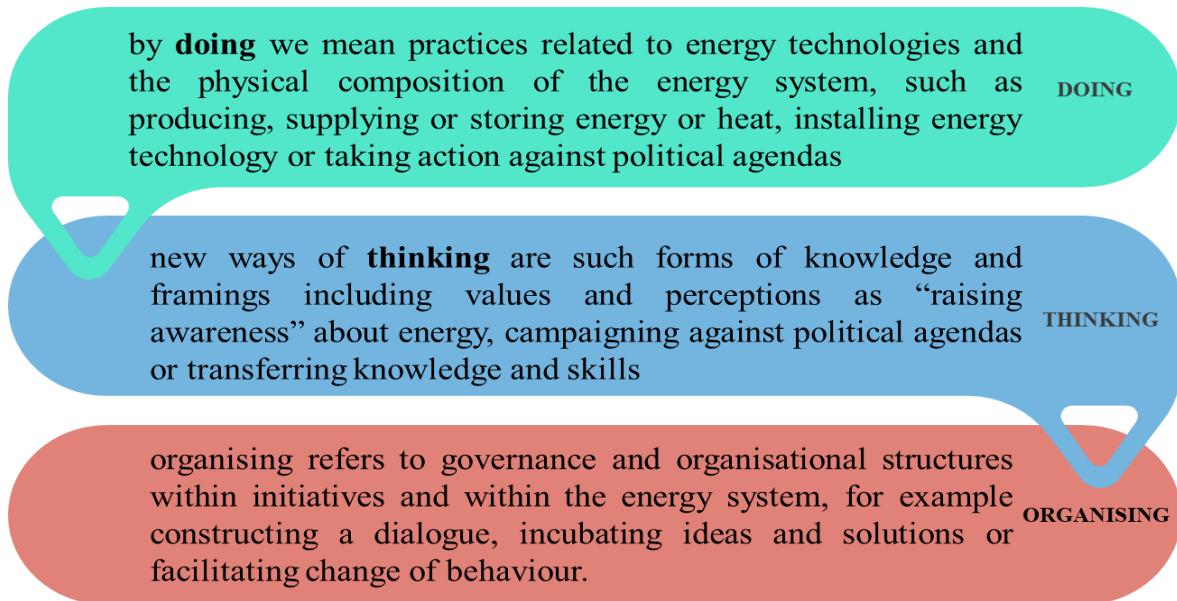


Figure 2.3.2. Energy activities, based on Mischkowski and Wittmayer (Mischkowski and Wittmayer, 2020)

Through this type of classification, other social innovations in energy can be understood and supported (Figure 2.3.3).

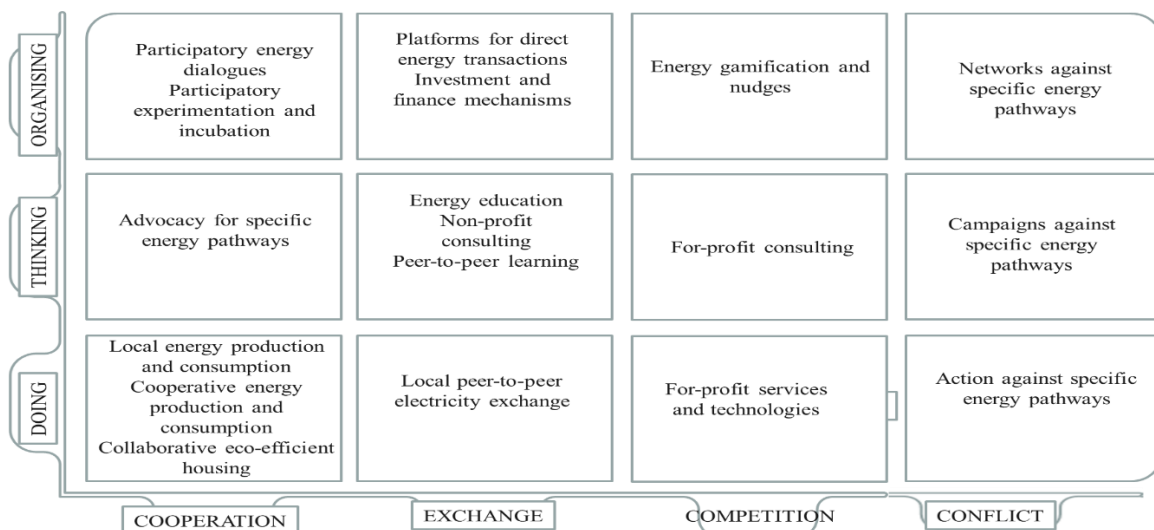


Figure 2.3.3. Categorization of social innovations in energy, based on Mischkowski and Wittmayer (Mischkowski and Wittmayer, 2020)

So, we may say that SI in energy is highly diverse, assume different arrangements and use different means to change the way energy is produced and consumed.

It appears that community involvement is what connects the REC to the SI, that is, innovating on energy issues to highlight the participation of the community. Therefore, it can be said that REC is a form of SI, since it is essential for reducing GHG emissions or even increasing the production of RE (Harnmeijer, Harnmeijer and Loyd, 2012), two main societal challenges of our times.

2.4 Renewable Energy Community

The arguments for a REC are not exactly new, since they go back to the literature on '*soft energy paths*' (Lovins, 1977), small-scale development (Schumacher, 2011), and appropriate technology (Dunn, 1979), from the 1970s onwards. This form of social innovation on energy sector has undergone a significant reappearance, due to energy crisis, the desire to find an alternative to nuclear energy and the path to decarbonisation. These new REC's have been emerging in various parts of Europe (Heras-Saizarbitoria et al., 2018; Huybrechts and Mertens, 2014; Seyfang, Park and Smith, 2012; Willis and Willis, 2012), in Japan (Horiuchi, 2018; Maruyama, Nishikido and Iida, 2007), and in the USA (Hoffman and High-Pippert, 2005; Hoffman et al., 2013), in different governance contexts.

Community involvement in the energy market may take several forms (ILO, 2013), and the concept of REC may be subject to several meanings in the scientific and academic literature. In a broader sense, Walker and Devine-Wright, (2008), in his seminal paper notes that '*what community renewables does and should mean was a recurrent theme of discussion and analysis – and one that continually proved difficult to pin down*'. Several authors point REC term as "*vague*" (Becker and Kunze, 2014; Hoffman et al., 2013), "*elastic*" (Hoffman et al., 2013) and sometimes "*problematic*" (Seyfang et al., 2014). But others seek to emphasize the innovative nature of REC, those driven by civil society activists, and social and/or environmental needs, rather than a search for profit maximization. Then, the most commonly used REC definition belongs to the seminal work of Seyfang, Park and Smith, (2013), which states that: '*projects where communities (of place or interest) exhibit a high degree of ownership and control of the energy project,*

as well as benefiting collectively from the outcomes (either energy-saving or revenue-generation)'.

In general, REC are built on the idea of achieving aims through a joint effort, since they qualify the individual actors for the realization of projects that otherwise would not be able to execute (Debor, 2014). Magnani and Osti, (2016) point out that the constitution of a REC is a way of reducing the costs of technology, but also maximizing the economic output resulting from the sale of electricity to the grid. Moreover, to reduce the cost of electricity to the population, and invest part of the existing profit in local development projects. The authors also point out that, in addition to geographic and sociocultural characteristics, the project leader has capacity to mobilize social, technical, and economic resources and this capacity is of fundamental importance. That is, the so-called ecopreneurs, with the most varied formations, provide innovations of consumption and energy production (Beveridge and Guy, 2005). Beggio and Kusch, (2015) report that the different REC present quite common aspects and are in accordance with the seven fundamental principles of the cooperatives of the ICA guidelines (ICA, 2019).

Although the values shared by the cooperatives are the same, there is a significant variation regarding the type of organization (consumer, producer, worker), sector of activity (e.g. agriculture, credit, renewable energy, among others) and political orientation (i.e. the degree of participation in the values and actions of a capitalist economy) (Nelson et al., 2016). Although, they are related in definition, and they have a common perspective.

REC are citizens' groups, with no specific legal form, whose long-term goal is the energy transition through involvement in active citizenship and a sustainable future of energy and environment (Beggio and Kusch, 2015). Thus, new alternatives emerge not only from large companies that control the energy market, but also from collective solutions, bottom-up options for local community needs and global environmental issues (Tarhan, 2015). As mentioned, there is no single common definition of REC, and, in the literature, different typologies may be found (Table 2.1).

Typology

Energy Sources	REC that foster the Biomass energy production REC that foster the Wind energy production REC that foster the Solar energy production REC that foster the Geothermal energy production REC that foster Natural/Biogas energy production REC that foster the Tidal energy production Hybrid REC that foster a mix of any of the previous RE's
-----------------------	---

Table 2.1. Typologies of REC, based on Rijpens, Riutort and Huybrechts, (2013); Yildiz et al., (2015); Enercoop, (2016)

Therefore, the REC has become a *'pluralistic sector, encompassing multiple technologies, social institutions, business models, actors and goals'* (Seyfang et al., 2014). As we can see in Rijpens, Riutort and Huybrechts, (2013), which identifies six categories of business models for the REC (Table 2.2). Each form depends on the national policy frameworks and on the different traditions of energy market structures and collective organization of the country.

#1: Local group of citizens

It is often created around a specific project of local renewable energy, therefore, often with no prospect of growth. Through voluntary work, these operate locally. It is commonly referred to as a RES project and has a more limited transformation potential (**Romero-Rubio and Andrés Díaz, de, 2015**). But they have the capacity to increase and trigger quite substantial changes (**Dóci and Vasileiadou, 2015**) (e.g., a group of citizens who decide to renovate a watermill in their village, to produce electricity).

#2: Regional-national REC

Created by a group of citizens, who have the internal or external motivation, it presents a bottom-up development for several renewable energy projects. Through volunteer work by members, but also with employees, they operate on a regional or national level. They operate in generation and retailing, and the financing comes from the members, but may also be purchased from outside investors. This type of REC (#2) may

help for the development of REC (#1) and is more outward-oriented (e.g., photovoltaic projects and wind projects at the level of a country).

#3: Fully integrated REC

These types of REC hold and operate in the entire energy market: production, supply, distribution when possible as well as other services. So, the main goal is functioning independently on the different dimension of energy provision. These have a long history, since they often evolved from REC (#1) and (#2), because there are currently limitations to integration in the energy supply chain, as the RES market is dominated by large companies (Schreuer and Weismeier-Sammer, 2010) (e.g. old Italian REC or EWS).

#4: Network of REC

This type of REC, as the name implies, is an integration/structuring of several REC. Then, with an organizational and operational structure, it is disseminated through various sites, maintaining links to improve the operation and balance the economy, time, and resources, through learning processes and generic rules (e.g., Energy4All in the UK, which is formed by 20 REC). So, we can say that this type of REC, is based on horizontal integration.

#5: Multi-stakeholder governance model

This type of REC is not only composed by members but also includes agents from the energy market (consumers, producers, workers, etc.), creating a confusion in the context of governance (multi-stakeholder governance model). It can exist on several levels, from local to regional (e.g., Enercoop in France, formed by 10 regionals REC that are integrated at the national level.) Therefore, we may say that this type of REC, is based on vertical integration.

#6: Non-energy-focused organization

They are organizations that do not operate within RES nevertheless resolve to create a RES project that will complement the main activity. These organizations generate an energy project so they can resemble REC (#1), only with very different motivations and sources.

Table 2.2. Typology of REC Business Models, based on Rijpens, Riutort and Huybrechts, (2013) and Capellán-Pérez, Campos-Celador and Terés-Zubiaga, (2018)

Willis and Willis (Willis and Willis, 2012) report that REC are quite different, but operate in a similar way (p.6):

- *A core group establishes the feasibility of a project, often helped by grant funding and advice from other co-ops or not-for-profit agencies.*
- *The group formally establishes and publishes a share prospectus, explaining the business plan, intended return on investment and plans for community benefit. The scheme is marketed, often locally. All investors become members of the co-operative.*
- *For larger schemes, income from individual investors is supplemented by a bank loan or co-operation with a commercial developer.*
- *When the funds are raised, the scheme is constructed. Members receive a return, which depends on profitability, and the amount spent on community benefit or ploughed into future schemes. Members themselves decide how profits are allocated.*

It should also be considered that REC's may have different legal forms and the details and requirements for their legal form differ from country to country. The Table 2.3 presents several legal forms that can be found in Europe.

<i>Legal form</i>	<i>Characteristics</i>
Co-operative	Co-operative societies are intended to primarily benefit their members. Membership is voluntary and open to anyone willing to accept responsibilities and risks. Members benefit from generated energy and have a say in governance and profit allocation with one vote per member. They may provide training and other benefits to members, as required to maintain the co-operative.
Partnership	Individuals may decide to work together to establish a legal partnership with the aim of providing energy to a community. Unlike a co-operative, voting power will be determined by the stake that everyone put into the company. As well as providing a community benefit, partnerships can generate a profit.
Trust and foundations	Trusts and foundations are established as charitable organisations, with the aim of delivering a social benefit rather than profit. These forms enable whole communities to benefit, even when individuals cannot afford to participate.

Public utility company	Public utility companies are run by municipalities, who invest in and manage the utility on behalf of taxpayers and citizens. These forms are less common than the above forms but are particularly suited for rural or isolated areas.
Public-private partnership	Local authorities can decide to enter into agreements with citizen groups and businesses to ensure energy provision and other benefits for a community.

Table 2.3. Legal forms for REC, based on Interreg Europe, pp. (2019, pp. 6-7)

Willis and Willis, (2012) further notes that the process may seem simple, but each step taken in this process is a considerable challenge to a group that are mainly composed by volunteers.

Academic research on REC is widely dispersed and limited, particularly for southern European countries, that is, countries that have no tradition of disseminating green energy (Heras-Saizarbitoria et al., 2018), but they are on an emergent phase. The literature focuses mainly on the dissemination of REC in countries with a long tradition of RE.

REC attach particular importance to reasonably priced energy supplies and consumers may reduce their environmental impact, through production with green energy sources and thereby strengthen the market with cleaner energy. As a member of REC, citizens may actively participate in energy policy debates and may, more clearly or quickly, notice the implications of their actions for a better environmental and energy future. On the other hand, REC may promote local development, create green jobs and offer additional services such as microfinance, among others (ILO, 2013).

REC may have more influence in supporting the necessary reduction of consumption, as this is in the interests of consumers/members (Schreuer and Weismeier-Sammer, 2010). The reality is that the European RES market is still mainly controlled by large companies (Schreuer and Weismeier-Sammer, 2010) and the REC still represent a small part of that market, despite their known many advantages associated with, both economic efficiency and citizens' involvement and participation.

Basically, the European RES market may be divided into two parts: the production of RE and the supply of electricity based on renewable energy sources (RES-E). A market related to the production market is the supply of energy produced, particularly in the form of electricity. This type of market still presents some obstacles to the entry of REC as it

is a market recently liberalized and controlled by a small number of (large sized) energy companies (Zademach and Hillebrand, 2013). Several cooperatives have begun to provide RES-based electricity in order, at first stake, to try to control a part of the supply chain and finally to increase their share in this market, and then focus on the benefits for the community where they are located.

The REC presents several important economic impacts. One of the most important impacts is their contribution to energy democracy and "*energy citizenship*". While the first concept refers primarily to joint decision-making on energy policies (Kunze and Becker, 2014), the second concept refers more broadly to "*consciousness among citizens and communities of energy issues*", in turn, allows individuals to "*contribute more broadly to the energy transition*" (Roberts, Bodman and Rybski, 2014, p. 4). Thus, citizens and energy communities become active consumers or "*prosumers*", and they will also gradually begin to participate in distribution networks, power supply and energy service companies (Roberts, Bodman and Rybski, 2014). The democratization of the energy system may lead to greater acceptance of RE projects (Huybrechts and Mertens, 2014), lower energy prices, especially for low income consumers (Kunze and Becker, 2014). It is quite important for REC, and named several times in their status, the supply of energy at lower prices and to reduce the energy poverty. For example, Ecopower was recognized as having the fairest billing structure of all suppliers in the Flemish Region. Also in the UK, some cooperatives are known for providing free or low-cost electricity subsidies to members in order to fight fuel poverty in Brixton (Community Power, 2016).

Another impact of REC is its contribution to the local economy, i.e. may create jobs directly in the local market and REC and community projects are likely to hire local firms or use local banks and reinvest community profits (Community Power, 2016). Thus, REC may seek to maximize local value, contributing to the social and economic well-being of local communities (Creupelandt and Vansintjan, [s.d.]). Specifically, cooperatives may create a "*circular*" economy at the local level, where RE profits are invested to promote other energy goals, as well as building reforms and energy savings (Creupelandt and Vansintjan, [s.d.]).

Finally, REC may contribute to the achievement of climate, energy, and environmental targets. In turn, they can bring EU national and regional policies closer together, thus improving local responsiveness to energy transitions projects (Community Power, 2016). But they also aim to contribute to the achievement of EU climate policy targets by helping to set up RE capacity, save energy and improve energy efficiency.

While REC have expanded strongly in countries such as Denmark (Lipp, Lapierre-Fortin and McMurtry, 2012), Germany (Schreuer, 2012) and to a lesser extent, the UK (Seyfang, Park and Smith, 2012), it can be seen that the evolution of REC is much slower in other countries, particularly in southern Europe (Heras-Saizarbitoria et al., 2018). Portugal is an example of this difference, as to date there are few REC's.

Wierling et al., (2018) in an analysis of the role of REC in the transition of energy in European countries, show that publications focus on single countries or case studies, and mostly in countries with many cooperatives, leaving unanalysed why there is a disparity between European countries. In the case of single country analysis, there is a lack of literature for southern European countries. This may be due to the lack tradition of disseminating green energy (Heras-Saizarbitoria et al., 2018) or/and the lack of REC in these countries. Capellán-Pérez, Campos-Celador and Terés-Zubiaga, (2018) refer, for example, for Portugal, that even being a country with a very high percentage of wind energy, there does not seem to be space for local and democratic energy projects in the country.

Despite the complexity, size, strategies and success, there is common ground for REC in Europe. A very common point in these studies is that they mention the importance of the actions of communities or cooperatives for the transition to more sustainable energy systems.

Huybrechts and Mertens, (2014) note that access to energy provided by cooperatives or civil society in general in Europe is especially hard to find, since the market is still owned by large electric companies, allowing a reduced access to the energy grids by the cooperatives and since the number of REC offer this service is very small. These considerations apply, in large extent, to the southern Europe countries. Thus, it seems that the evolution and spread of the consumption and production of RE depends on solving this barrier.

The effective operation of REC involves a flexible and favourable legislative framework, policy environment and enabling conditions, including support measures (ILO, 2013). Heras-Saizarbitoria et al., (2018) note that these points are the major obstacles for the growth of REC, namely in the southern countries.

2.5 Participation and Motivations for integrating a REC

Renewable energy community is characterized as having a high degree of community involvement in terms of ownership, management and benefits of energy projects (Walker and Devine-Wright, 2008). Adding to this, the REC involves energy production, collective acquisition, distribution or conservation initiatives (Boon and Dieperink, 2014; Seyfang, Park and Smith, 2013). Energy communities may differ in governance and participation structure, ownership, technology and local consumption (Hoffman and High-Pippert, 2010).

There are currently various types of community energy, such as groups of local individuals investing in RE, wind farms or cooperatives (Bauwens, Gotchev and Holstenkamp, 2016; Hoffman and High-Pippert, 2010; Romero-Rubio and Andrés Díaz, de, 2015). REC's, which are a specific form of energy communities, are characterized by the involvement of local communities, which may assume investor or contributor roles (Hoffman and High-Pippert, 2010; Huijben and Verbong, 2013). The REC's follow the cooperative principles adopted by the International Cooperative Alliance (ICA, 2019) and cooperatives have a limited return on subscribed capital, suggesting that profit maximization is not the main focus.

REC's, like other types of energy community, are increasingly crucial stakeholders in the energy transition (Soeiro and Dias, 2019; Soeiro and Ferreira Dias, 2020; Yalçın-Riollet, Garabua-Moussaoui and Szuba, 2014). Boon and Dieperink, (2014) report that local involvement, participation, and co-ownership are very important factors in supporting energy communities. Indeed, citizen participation in decision-making and RE projects may, in fact, increase levels of acceptance of RE sources (Bauwens, 2015; Maruyama, Nishikido and Iida, 2007; Rogers et al., 2012), may promote “*energy responsibility*” (Frantzeskaki, Avelino and Loorbach, 2013, p. 102) and energy transition (Walker et al., 2010), support and sensitize the local economy (Romero-Rubio and Andrés Díaz, de, 2015) and “*create the space for developing and testing models of social innovations*” (Mulugetta, Jackson and Horst, vander, 2010, p. 7545).

Mumford and Gray, (2010) note that there is a “lack of public confidence in large energy companies for the introduction of alternative sources and that the decentralized installation of RE has more supporters if it is done by local citizens and trusted

organizations. As an example, Fraune, p. (2015, p. 57) states that the German case is “a reference point in revealing the impact of the larger social, cultural and political context on citizens’ capabilities to participate and thus to benefit from citizen participation schemes in RES-E”. It seems important to understand the motivations that lead citizens to invest in RE projects at the local level so that the conclusions may help decision-makers to create effective measures to support for REC.

As mentioned earlier, REC’s depend on the participation and involvement of citizens, as volunteers, participants or investors (Seyfang and Smith, 2007; Wirth, 2014). Different types of initiatives and degrees of participation may be found within the CE (Hoffman and High-Pippert, 2010; Walker and Devine-Wright, 2008). Several studies have explored the factors influencing citizen participation in RE projects (Bamberg, Rees and Seebauer, 2015; Dóci and Vasileiadou, 2015; Kalkbrenner and Roosen, 2016) but there is still a lack of significant and systematic research about why different members participate in these energy initiatives, namely in several countries and comparing them to understand if there are differences.

Table 2.4 summarize the factors influencing participation identified in the literature. The motivations may be economic, environmental, social, political and technological, and there is also concern about the fundamentals of energy policies, such as decentralization of energy systems and energy self-sufficiency (Bauwens, 2016; Hicks and Ison, 2018; Seyfang, Park and Smith, 2013). The factors with positive effect are environmental awareness and the intention of energy independence (Boon and Dieperink, 2014). In general, the involvement of citizens may present some negatives such as risks, costs and outcomes for citizens and society.

Trust

Some studies focus on the concept of energy confidence (**Greenberg, 2014; Sovacool, 2014**). **Walker et al., (2010)** state that “*trust is both a necessary characteristic and a potential outcome of cooperative behaviour*” that is, trust is critical to the progress of the REC. Decentralized energy projects require a lot of confidence (**Wiersma and Devine-Wright, 2014**). However, **Walker et al., (2010)** and **Yildiz et al., (2015)** are the only ones to analyse trust within the context of energy communities.

Social Norms

In general, cooperation is influenced by social norms (**García-Valiñas, Macintyre and Torgler, 2012**). When presented with a social dilemma, social norms have a positive effect on cooperative behaviour (**Biel and Thøgersen, 2007**). The impact of social norms on REC and their influence on social and environmental behaviours have been analysed (**Gadenne et al., 2011; Mulugetta, Jackson and Horst, vander, 2010, 2010**).

Community Identity

Citizens are likely to cooperate in energy communities if there is a social connection between them with their community or with a specific institution (**Hoffman and High-Pippert, 2010**), as this connection and identification with the community reinforce collaboration and action of citizens (**Bomberg and McEwen, 2012**). Identification with the energy community supports mobilization (**Bomberg and McEwen, 2012**) and shifts citizens' interests to be self-directed towards the energy community (**Vugt, Van, 2001**). RE projects can facilitate solidarity with the community, but on the other hand, solidarity can also come from RE projects (**Bomberg and McEwen, 2012; Horst, van der, 2008**). The success of RE projects may be due to the concept of making a community a “*better place*” (**Hoffman and High-Pippert, 2010**). This fact was analysed by Haggett and Aitken (**Haggett and Aitken, 2015**), who found that community identity is very important and can promote community-based action.

Environmental Concern

Several studies have examined the determinants of environmental attitudes or concerns, and how they influence decision making (**Chen, 2014; Gadenne et al., 2011**). Among the motivations for participating in a REC are environmental reasons (**Bomberg and McEwen, 2012; Der Schoor, Van and Scholtens, 2015**). Boon and Dieperink (**Boon and Dieperink, 2014**) show in their study that environmental awareness has a positive effect on supporting REC.

Table 2.4 . Factors that influence participation, based on Kalkbrenner and Roosen, (2016)

There are two fundamental aspects impacting on the willing to participate in a REC: on the one hand, development in different places at different time with different actors and therefore different contexts; on the other hand, participation on different RE projects have different motivations.

The motivations for participating in REC is several and quite different. REC exploit environmental and social problems while generating economic benefits, for RE members as well as for the community (Lipp and McMurtry, 2015). Heras-Saizarbitoria, (2014) states that since REC are integrated into local development, they tend to create similar expectations, instigate a long-term vision, to provide a more sustainable basis.

REC are quite resilient during times of economic turmoil compared to traditional business models, which makes them more sustainable in the long term (Birchall and Ketilson, 2009; Birchall, 2013; ILO, 2013; Nowak, Rychwalska and Szamrej, 2014) and provide a space for communities to reclaim "*private goods*" with private control for the benefit of all (Cheney et al., 2014; Peuter, De and Dyer-Witthoford, 2010; Vieta and Lionais, 2015). The longevity of many REC testifies their flexibility and adjustment to the new realities of the market and the environment (Harnmeijer et al., 2012). However, the properties of community projects help overcome the public obstacles that REC face. Thus, community energy projects may be generated as profit-driven and non-profit-making social projects (Becker, Kunze and Vancea, 2017).

It seems to be a logical fact that the emergence of REC may be partly explained by consumer dissatisfaction with large business, putting power in the hands of citizens and controlling the source of energy (Huybrechts and Mertens de Wilmars, 2011; Lipp and McMurtry, 2015; Vansintjan, 2015). REC also seek to reduce the price of electricity for all consumers. Coenen et al., (2017) mentions and determines the added value of the REC to stimulate energy saving (Table 2.5).

Factor	Added Value
Scale level of activities	REC operate close to citizens, increase their efficiency, and inspire energy savings.
Capacity and critical mass	REC contribute to energy savings as they have a certain critical mass to acquire the necessary expertise and motivate and assist citizens who are less motivated than those who are devoted to pursuing sustainability goals.
Social network argument	REC are in an excellent position to share and link their activities, including their energy-saving actions, with other local actors (schools, sports clubs, local business firms and housing associations).

Awareness raising and education	REC are in a good position to make their consumers more aware of energy use. They can also educate the larger community on the importance of energy efficiency by organizing.
Social norms	REC to promote energy saving goals and average group energy-saving behaviour (i.e., as a reference point for behaviour).
Trust	REC are in a good position to generate trust towards citizens for them to take measures themselves and invest in energy efficiency or RE technology appliances.
Common's argument	REC see the energy produced by them as a common good.

Table 2.5. Added Value, based on Coenen et al., (2017)

Understanding the motivations that lead citizens to join an REC may help policy makers to develop support mechanisms to help communities to participate in the energy transition. Several studies have addressed the more deliberate and inclusive importance of consumers in this transition process (Bauwens, 2013; Rogers et al., 2008; Walker, 2008). It seems that the motivations for participating in an REC are diverse. In addition to the factors related to the community for collective action, they are also influenced by factors that affect the propensity of citizens to join a RE project (Kalkbrenner and Roosen, 2016; Kostakis and Sardianou, 2012; Mortensen, Heiselberg and Knudstrup, 2016).

Economic incentives, environmental concerns and resilience seem to be very important factors. Demographic and socio-economic factors (income, age, job, owning a home, family situation) should also be consider to explain the motivation to participate in an REC (Bamberg, Rees and Seebauer, 2015; Kalkbrenner and Roosen, 2016). Financial incentives (energy prices, tax deductions, among others) also impact motivations, as noted by (Kostakis and Sardianou, 2012) for the propensity to adopt microgeneration in UK households. Kalkbrenner and Roosen, (2016) analysed the renewable energy projects located in Germany, and found that socio-institutional and environmental factors (social norm, reliability and environmental concerns) also affect the motivation to participate. Balcombe, Rigby and Azapagic, (2013) analysed and categorized the different types of motivations and barriers (Table 2.6):

Financial
<ul style="list-style-type: none"> ✓ Save or earn money from lower fuel bills and government incentives. ✓ Increase the value of my home.
Environmental
<ul style="list-style-type: none"> ✓ Help improve the environment.
Security of supply
<ul style="list-style-type: none"> ✓ Protect against future higher energy costs. ✓ Make the household more self-sufficient/less dependent on utility companies. ✓ Protect the household against power cuts.
Uncertainty and trust
<ul style="list-style-type: none"> ✓ Use an innovative/high-tech system.
Inconvenience
<ul style="list-style-type: none"> ✓ None identified.
Impact on residence
<ul style="list-style-type: none"> ✓ Improve the feeling or atmosphere within my home. ✓ Show my environmental commitment to others.

Table 2.6. Motivations with adopting microgeneration, based on table of (Balcombe, Rigby and Azapagic, 2013, p. 658)

We may assume that the factors presented in Table 2.7 may also play a role in motivations to participate in an REC. It may vary the degree of influence and, we must consider other ones that are new.

Demograph factors

- The position in life that citizens find themselves in influences the motivation to participate, such as gender, age, education and income level

Environmental Factors

- Pro-environmental factors have an impact on the motivation of citizens to participate, such as ownership of distributed energy resources, environmental concern, resilience and the reduction of CO2 emissions

Socia-institutional Factors

- Factors such as a sense of community and trust can also influence motivation to participate

Socioeconomic Factors

- Socioeconomic factors can play an important role in motivating you to participate, such as ownership and energy bills

Table 2.7. Factors that affect or determine the motivation to participate in REC, based on Bamberg, Rees and Seebauer, (2015; 2016; 2022; 2016; 2014; 2015)

Other factors that may also influence participation are the identification with the community in which the REC is integrated and the environmental concerns, which seems to be an extremely important factor. Therefore, an important step is to understand which factors affect or determine the motivation in European countries, particular in Southern European countries.

2.6 Benefits and Drivers

First, it is important to differentiate between **drivers and benefits** of REC. Drivers are the driving forces behind REC projects, while the benefits are what a community or the wider energy systems experience as a positive result of REC projects.

In the last decades, there has been an interest in studying the benefits of REC in the literature, namely in wind farm projects, since it has the potential to increase local acceptance, to alleviate conflicts over projects and also to add development regional opportunities (Aitken, 2010; Cowell, Bristow and Munday, 2011; Lipp and McMurtry, 2015; Walker, Wiersma and Bailey, 2014; Wolsink, 2007). There are several studies that analyse the implicit opportunities for community-based energy generation, mainly

focusing on environmental, social or economic benefits (Cass, Walker and Devine-Wright, 2010; Walker, Wiersma and Bailey, 2014). In a recent study, Brummer, (2018) analysed the REC literature for three countries (UK, Germany and USA), where he found that there are seven categories of benefits, as illustrated in Figure 2.6.1.

The negative impacts of REC's have been largely neglected, with the exception of certain studies that show negative environmental impacts, complications in the project's development phase and social conflicts (Aitken, 2010; Baxter, Morzaria and Hirsch, 2013; Rogers et al., 2008). Some studies also report that there are some expected or potential benefits in the community and others that are not experienced (Walker, Wiersma and Bailey, 2014). However, these perceptions of RE's may change in the process of planning and developing the project (Aitken, 2010; Devine-Wright, 2011; Wolsink, 2007). These changes may be due to the differences between the expected results and those experienced in RE projects. Therefore it is very important to consider how the benefits to the community are represented and understood (Walker, Wiersma and Bailey, 2014) by their members and if there are unfavourable impacts and how they are perceived in any energy project.

With regard to drivers, it is not only the climate change and the energy insecurity that may be perceived as the main factors that lead to the development of REC (Walker et al., 2007), known drivers may span the entire spectrum of sustainability. Projects may be developed as a way to obtain economic compensation by increasing job opportunities (Walker et al., 2007) or a reduction in the price of energy (Walker, 2008). They may also be motivated by the view that the local generation of RE coexists directly with preservation of natural resources (Rogers et al., 2008). Finally, the social benefits of REC and its ability to promote changes in behaviour, establishing trust and social cohesion (Devine-Wright, 2007), also may lead to their development.



Figure 2.6.1. Benefits categories, based on Brummer, (2018)

2.7 Barriers to the development of REC's

Investing in a REC also carries risks, and while research has been conducted clearly showing the opportunities and successes of REC initiatives, we may also see several barriers (Tarhan, 2015) that must be known in order to create solutions to surpass them (Figure 2.7.1).



Figure 2.7.1 – Reasons that prevent the REC development, based on Huybrechts and Mertens, (2014)

Since the REC does not have a **particular organizational model**, that is, each country has its own particularities, and even if there are some general principles, there are certainly no usual standards across countries. Thus, an organizational model for a REC depends on the context in which it will be installed. **Economic barriers** also impact REC development. These are often reinforced with “*entry barriers*” that make it impossible for REC's to take advantage of their skills to survive and thrive. Finally, REC development can be hampered by the way they are perceived and understood by a number of stakeholders - this refers to **legitimacy issues** (Huybrechts and Mertens, 2014).

The REC faces major obstacles in obtaining enough investment funds, namely in capital-intensive markets such as RES industries. Often, non-investor-owned firms are unappealing to investors who want to maximize return on investment. Indeed, REC members may deny entry by foreign investors as they seek to protect common ideas from traditional profit-making behaviours. Thus, for these two reasons, cooperative capital is limited to the amount generally collected by members. This often leads to undercapitalization, preventing the company from entering a market that requires an extensive capital base.

Some solutions may be found. On the one hand, by bringing together many members, it will provide enough capital (for example as crowdfunding). On the other hand, they may eventually go public for foreign investors. However, in this case, external

shareholders expect returns on investment and decision-making power, the REC may change and resemble a for-profit company (Huybrechts and Mertens, 2014). Figure 2.7.2 illustrates the barriers that most influence the entry and development of a REC

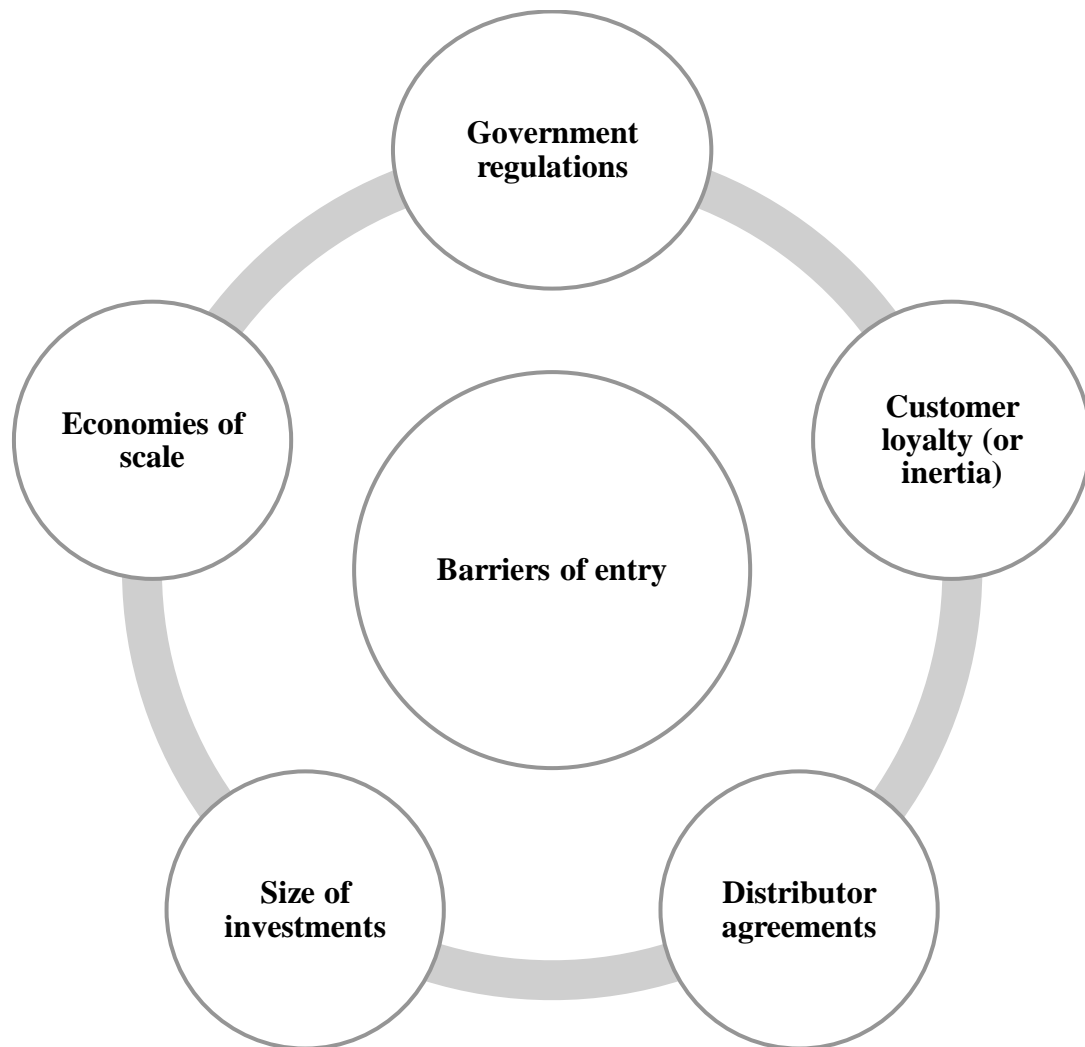


Figure 2.7.2 – Barriers that REC face, based on Huybrechts and Mertens, (2014)

So, if the REC does not have access to the market, due to monopoly power, the existence of economies of scale or even adverse legislation, and the efficiency of the REC may not be converted into market share (Huybrechts and Mertens, 2014). The REC still enjoys little legitimacy because people, stakeholders, decision-makers do not have information about the business model. Thus, in order to develop and survive, REC's must gain cognitive legitimacy (Huybrechts and Mertens, 2014).

The literature on barriers to REC development and growth is diverse and transversal to all countries. Mignon and Rüdinger, (2016) argue that, although the positive

aspects of REC may hardly be questioned, there are major differences between countries in setting up cooperative projects. Challenges facing the REC include financial and technical complexity and the need for skilled and knowledgeable people (Vansintjan, 2015; Willis and Willis, 2012). Mignon and Rüdinger, (2016) note that REC's are particularly affected by the lack of financial infrastructure, lack of knowledge, lack of professionalism, lack of legitimacy, lack of access to sites, unstable policy contexts, lack of experience, lack of access to capital, lack of networks, and a complicated institutional context that hinders their development, among others (Huybrechts and Mertens, 2014; Tarhan, 2015; Vansintjan, 2015; Walker, 2008; Walker et al., 2010; Willis and Willis, 2012; Yalçin-Riollet, Garabua-Moussaoui and Szuba, 2014). As REC stakeholders have heterogeneous interests, trust and conflict resolution aspects become crucial success factors (Yildiz et al., 2015).

One of the most frequently mentioned barriers in the literature is that technology is complex, as there is a lack of technological knowledge and experience, and even a lack of equipment (Balcombe, Rigby and Azapagic, 2013; Bomberg and McEwen, 2012; Cagno et al., 2013; Engelken et al., 2016; Foxon et al., 2005; Karytsas and Chorapanitis, 2017; Kaufmann and Tödtling, 2002; Pihkala, Ylinenpaa and Vesalainen, 2002; Tiwari and Buse, 2007). Limited access to capital is another barrier that has been widely reported in the literature, both in the early stages and during the development of REC (Cagno et al., 2013; Engelken et al., 2016; Huybrechts and Mertens, 2014; Karytsas and Chorapanitis, 2017; Kaufmann and Tödtling, 2002; Kowalska-Pyzalska, 2018; Ménard, 2004; Pihkala, Ylinenpaa and Vesalainen, 2002; Tiwari and Buse, 2007; Yildiz, 2014). For example, the high costs of RES power plants may be a major obstacle to the creation of new RES projects. We must consider two distinct community groups, the ones that refer to people who share a common interest but are not geographically close (communities of interest), and, in turn, locality communities refer to a specific area that may be improved in a number of ways (Walker, 2008). In the case of the REC, as they require capital intensive investments, it can be a challenge for collective ownership (Hansmann, 2000).

Access to venues for new infrastructure may be a barrier to the REC, as in combination with the amounts needed for project development it clearly benefits big players and can lead to the creation of an oligopoly (Balcombe, Rigby and Azapagic, 2013; Brummer, 2018; Huybrechts and Mertens, 2014; Kowalska-Pyzalska, 2018). This was clearly confirmed for all European countries, both for the production and distribution

of RE. Another barrier is the distribution of RES-E, as in some countries distribution may be difficult for the REC, and private consumers and even municipalities remain quite passive when dealing with such organizations (Balcombe, Rigby and Azapagic, 2013; Brummer, 2018; Kowalska-Pyzalska, 2018). In such cases, this allows companies to analyse information advantages over the profitability of RES projects, to the detriment of consumers and municipalities, who generally accept what large companies offer without realizing that they could reach a much more favourable agreement. In fact, there are several reasons why consumers and municipalities support the emergence of REC to lower the level of consumer dissatisfaction, thus reducing energy costs. Closely related to the previous barrier is the lack of transparent information as it does not allow citizens and public authorities to compare between different offers. Often, RES projects are too small to fall under the public procurement regime. On the other hand, as municipalities are involved in “*inter-municipal partnerships*” for energy management and other varied issues, decisions are made according to the management mechanisms of these partnerships (Balcombe, Rigby and Azapagic, 2013; Brummer, 2018; Huybrechts and Mertens, 2014; Kowalska-Pyzalska, 2018). Behind the aforementioned entry barriers, the lack of support for this model also appeared to result from a lack of awareness of RES as public goods with high potential for involvement and return to the community. The benefits and challenges associated with REC demonstrate that the application of this type of organizational model is highly context-dependent (Huybrechts and Mertens, 2014).

In a relatively recent article on the adoption of microgeneration², (Balcombe, Rigby and Azapagic, 2013, p. 658) analysed and categorized the results of 18 articles on different types of barriers, classifying the barriers as *financial, environmental, security of supply, uncertainty and trust, inconvenience and impact on residence*. These are summarized in Table 2.8 and are discussed, according to the order of importance in the adoption decision.

Financial
<ul style="list-style-type: none"> ✓ Costs too much to buy/install. ✓ Cannot earn enough/save enough money. ✓ Lose money if I moved home. ✓ High maintenance costs.
Environmental

² Microgeneration is defined as the small-scale production of heat and/or electricity from a low carbon source (Solar, wind, and others).

✓ Environmental benefits too small.
Security of supply
✓ Would not make me much more self-sufficient/ independent.
Uncertainty and trust
✓ Home/location not suitable.
✓ System performance or reliability not good enough.
✓ Energy not available when I need it.
✓ Hard to find trustworthy information/advice.
✓ Hard to find any information/advice.
✓ Hard to find trustworthy builders to install.
Inconvenience
✓ Hassle of installation.
✓ Disruption or hassle of operation.
✓ Potential requirement for planning permission.
Impact on residence
✓ Take up too much space.
✓ The installation might damage my home.
✓ Would not look good.
✓ Neighbour disapproval/annoyance.

Table 2.8. Barriers with adopting microgeneration, based on a table of (Balcombe, Rigby and Azapagic, 2013, p. 658)

In a review of the incentives and barriers to successful adoption of innovative energy services in the energy market, Kowalska-Pyzalska, p. (2018, p. 3577) characterized the barriers as *economic, organizational, technological and behavioural*. Brummer , p. (2018, p. 192) in an analysis of the benefits and barriers to REC in Germany, the UK and the USA, has formed six categories of barriers (Annex III):

- ☑ *Organizational issues/Legal framework/Planning requirements.*
- ☑ *Discrimination against big companies, incumbents.*
- ☑ *Lack of institutional and political support.*
- ☑ *Skepticism about CE/NIMBY opposition.*
- ☑ *Lack of resources/expertise/resilience.*
- ☑ *Saturation effect.*

These categories were formed through the method of Weber, (1997). Despite these difference in the categorization of barriers that exist in the literature, it appears that

the barriers are transversal to the adoption of REC. Figure 2.7.3 presents the barriers that most influence REC development.

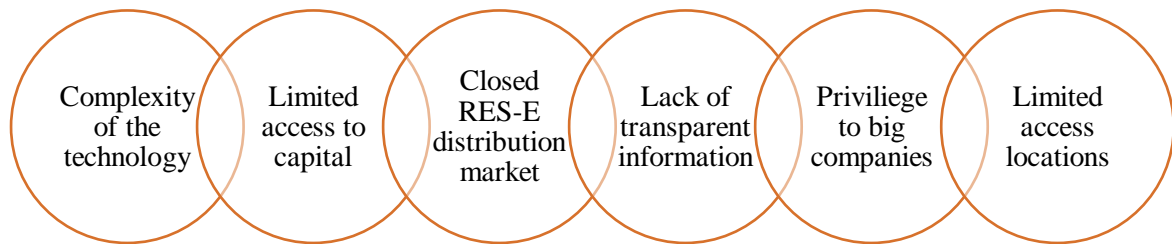


Figure 2.7.3 – Generic barriers that REC have to face, based on Soeiro and Dias, (2019)

2.7.1 Strategies adopted by REC to address the barriers

According to several studies, there are four strategies used by REC to choose their model (Huybrechts and Mertens, 2014). Regarding the first two strategies (Figure 2.7.4), the statements throwing down large corporations and promoting the economic assets of REC are surprisingly small and far from political debates. In fact, these companies focus mainly on promoting their normative legitimacy (better environmental and democratic solutions) rather than pragmatic legitimation (advantages over different stakeholder groups). Fundamentally, the most important process in REC is a search for cognitive legitimacy (Huybrechts and Mertens, 2014), that is, by defining its internal networking and determining partnerships with other partners, such as government or local governments. In this way, REC seek to make the cooperative model known and recognized at different levels. For instance, Ecopower uses an individual commitment of politicians and other resource-rich stakeholders to cooperative members to increase the recognition of the model (Ecopower, [s.d.]). REC also enjoy the role they play as allies of environmental NGOs and at the same time try to build a reputation as a reliable economic partner (Huybrechts and Mertens, 2014).

After all, the diffusion of the model, do not depend on the REC themselves, it will be dependent on the high capabilities of bringing together different stakeholders in the project. As power relations with conventional firms appear to be unfavourable to REC, a more diligent strategy of selective alliances with some of these companies may be essential to obtain a significant share of the market. Likewise, the success of the dissemination of REC will be a key element in assessing the extent to which the cooperative model is

actually innovating to meet new social and environmental challenges (Huybrechts and Mertens, 2014).

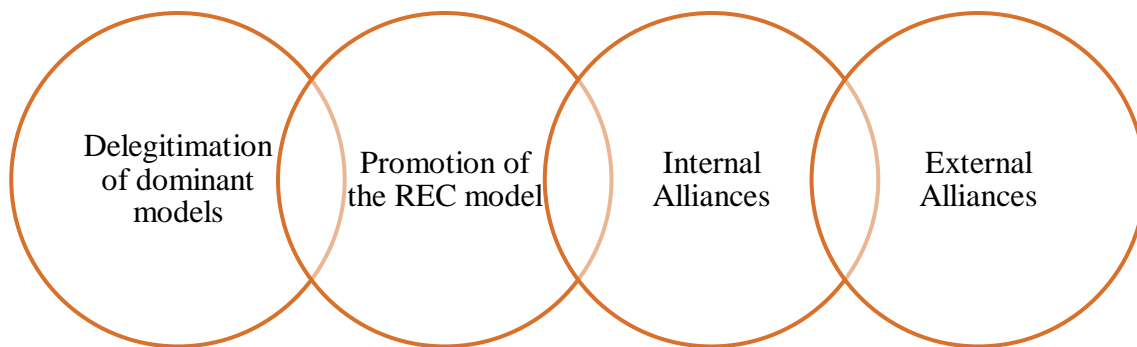


Figure 2.7.4. Strategies Adopted by REC, based on Soeiro and Dias, (2019)

In short, in the RES context, community appear as a solution to the problem of the energy market, providing social and environmental assurances in a context of asymmetric information and seem more committed to encouraging the reduction of energy consumption (Huybrechts and Mertens, 2014).

2.8 The disparities between the REC of the EU

In the European Union, there is a great diversity in the dissemination of REC. Several countries have many REC, more specifically northern European countries. On the opposite side, there are countries that have limited amounts of REC, Southern European countries (Heras-Saizarbitoria et al., 2018). Bauwens, Gotchev and Holstenkamp, (2016) identify several important factors which are intended to clarify the disparities between EU countries, such a formal institutional rule, the support mechanisms for RE and spatial planning, attitudes toward the cooperative model and the cultures of local energy activism.

In countries with traditions, that is, pioneers in terms of RE dissemination, REC are the mainstays for the energy transition (Yildiz et al., 2014). Among these countries are Germany, Denmark, and the Netherlands. Although it is not found in the literature on how to quantify the importance of this tradition (Yildiz et al., 2015).

In Germany, REC are important for renewable and decentralized energy structures (Schreuer, 2012), owing to strong growth over the last 10 years, greater democratic awareness (Debor, 2014) and citizen participation in a variety of local and regional RE.

In the Netherlands, REC play a very important role as well. Several initiatives have been created by citizens and/or social groups in recent years in order to produce and consume RES energy, most of which are related to the emergence of RE local or regional co-ops (Hufen and Koppenjan, 2015; Oteman, Wiering and Helderman, 2014). Thus, due to advocacy and lobbying actions and due to resistance during times of economic turmoil, REC are a very important incentive for RES energy (Schreuer, 2012).

Regarding the less disseminated countries in the REC, it presents a very different picture. Lipp and McMurtry, (2015), states that in the southern European countries, the development of REC is much slower. Thus, this being little explored in the literature, future research on REC activities and other community actors, may find explanations for these differences among EU members.

It is crucial to mention what challenges an REC in Southern European countries may face when implementing the project. These key points can be found in the table below (Koirala et al., 2016; Rae and Bradley, 2012).

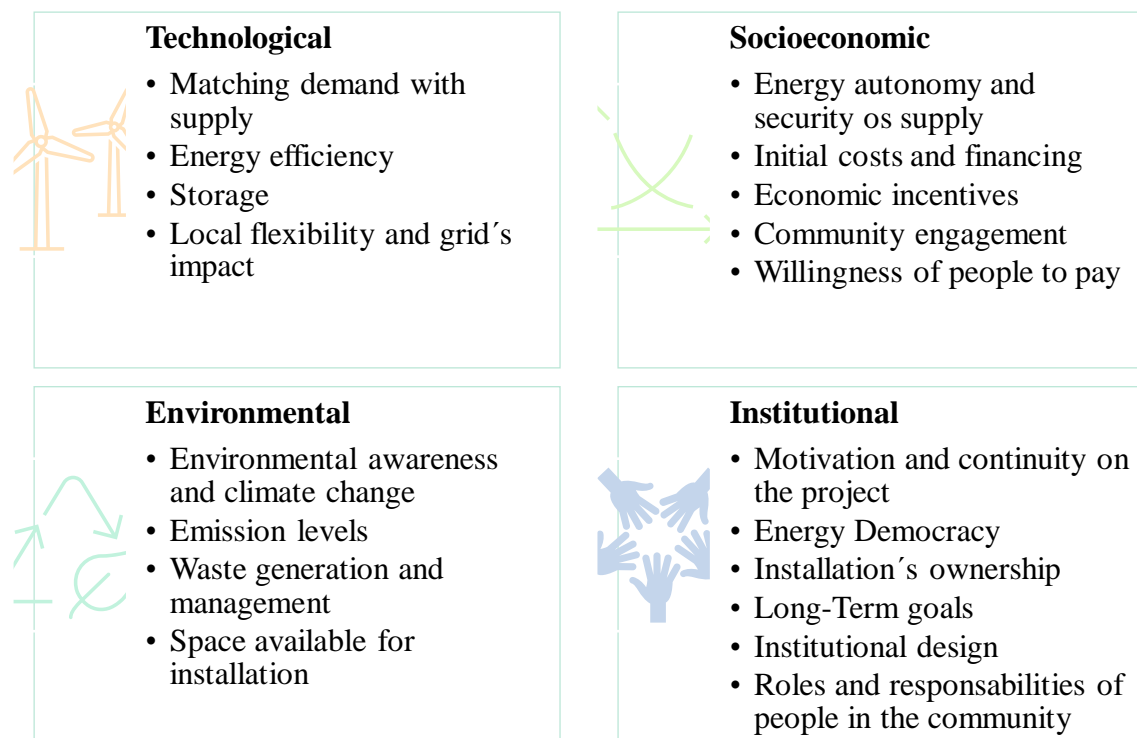


Figure 2.8.1. Challenges facing by REC, based on (Koirala et al., 2016; Rae and Bradley, 2012).

Understanding what the disparities are can be a starting point for discussion of different regulations and different behaviours of REC throughout Europe and to draw attention to the best way of supporting REC.

2.8.1 Four European countries and the promotion of RE projects.

This section discusses the REC's in four European countries, to understand their evolution and growth. The countries were chosen for their geographical position, and for their ability to involve citizens in these types of communities. In other words, Portugal and Spain are the representatives of the Southern European countries, while Germany and Denmark are Northern European countries which invest heavily in the RE sector and have a green energy tradition. As we will see, there are major differences between countries and in the measures adopted.

2.8.1.1 Portugal

In Portugal, most of the existing energy cooperatives were founded in the 1930s. These were created to supply electricity in remote areas in the north of the country and were based on medium and low voltage electrical transformation points, which were distributed to the houses. However, these have been disappearing over time in a process of commercial concentration, and today there are only about six. But in a way, these cooperatives cannot be considered as an example of modern REC, they are a sample of how to offer access and democratic power to the most remote communities. In this century, only two REC's have been created in Portugal. Coopérnico in 2013 and the one in Miranda do Douro, founded in 2020, as the first REC in Portugal under the new legal regime adapted from EU Directive 2018/2001 (REDII) (Parliament and Council of the European Union, 2018).

Coopérnico still makes a marginal contribution to the electricity market in Portugal, with only 2052 partners and 1560 supply contracts, it was created to promote a decentralized and sustainable energy model (Coopérnico, 2019). This cooperative has two business models. First, the cooperative supplies electricity to households that have contracts with it. Secondly, the development and investment in RE production facilities is presented as the driving force of the cooperative. With this type of model, several active photovoltaic plants have been installed, with approximately 1.4 kW of installed power, and with an electricity production of 1.7 GWh in 2019 (Coopérnico, 2019). As for

Cleanwatts, it intends to create more than 100 REC's in the interior of the country. This project is intended to bring clean and cheap energy to 25,000 families. This is the bridge for new REC's to emerge under the new legislation (Primeira comunidade de energia nasce em Miranda do Douro. , 2021).

Portugal is among the top 6 countries in the EU with the largest share of RE in gross final energy consumption (Annex VI). This fact is unusual when compared to the other southern European countries, since they occupy positions in the middle of the graph and the front positions are occupied by the Nordic countries. This increase in the share of RE in recent years is due to some RE policies that have been carried out in the country, such as the encouragement of up to 40% investment in RES projects; and the policy of fixing a fixed feed-in tariff guaranteed for 15 years, depending on some aspects (Haas et al., 2011).

The figure of the sustainable energy community was included in the legal regime applicable to self-consumption of REs, with the entry into force of Decree-Law No. 162/2019 of October 20. Specifically, it is established that the "Renewable Energy Communities (REC)" are:

"a legal entity established under the terms of this decree-law, with or without profit, based on an open and voluntary adherence of its members, partners or shareholders, who may be natural or legal persons, of a public or private nature, including, namely, small and medium-sized companies or local authorities, who are independent of their members or partners, but effectively controlled by them, provided that they are cumulative" (Presidência Do Conselho De Ministros, 2019).

This decree establishes that the REC is an important and complementary system to the national electricity system, allowing the objectives and goals of the country in terms of energy and climate to be met, including achieving a 47% share of RES in final energy consumption by 2030, with an increase in installed capacity up to 28.8 GW, and at least 80% of electricity production from RES. An action line was instituted in order to promote the diffusion of distributed production and self-consumption of energy and REC, in the national energy and climate plan established for the period 2021-2030 (Gabinete do Ministro do Ambiente e da Ação Climática, 2020). In this plan are measures to promote the creation and development of REC's through technical support, help with procedures, and a grant program for the coming years.

2.8.1.2 Spain

Spain is the EU country that has seen the largest increase in the use of RE in the last decade due to the enormous capacity it holds, especially in the production of photovoltaic energy. However, it is one of the European countries with the lowest concentration of REC's, this fact may be due to several reasons. We must consider the Spanish government's policies in this area and the functioning of the Spanish electricity market, but also the knowledge and acceptance that citizens have about REC's. In the country, the number of REC's operating as a cooperative is small, although some projects have emerged in recent years. As we see in Portugal, also here half of the REC's that were created were in the 20th century, to provide access to electricity in several areas of Valencia. There was also other REC scattered throughout the Spanish territory, which were based on hydroelectric production and electrical transformation. However, with the end of the Civil War, several of them disappeared.

In Spain, 60% of the installed RE power (wind, solar) is owned by the 5 largest companies in the country. This figure shows that the growth of RE has not been promoted to the citizens, which implies a low investment by them. In 2013, with the implementation of Law 24/2013 (Ley 24/2013, de 26 de diciembre, del Sector Eléctrico, [s.d.]), It was established that cooperatives and individual producers were able to trade the energy generated in the electricity market. Another measure was the fact that the consumer had to pay the corresponding taxes for the energy generated in the self-consumption installation. So, these facts plus the bureaucratic complexity, led to a rather substantial decrease in future RE installations. In turn, in 2018 this decree of law was repealed, meaning that producers were exempted from paying the taxes. Despite the short time elapsed and the fact that we are going through a worldwide pandemic, it is estimated that the power of solar energy may double and that wind energy may increase by about 20% (DBK S.A., 2019).

In Spain, unlike Portugal, there is not yet a legal framework that considers REC as a legal entity. However, in "Plan Nacional Integrado de Energía y Clima" (Gobierno de España, [s.d.]) for the period between 2021-2030, a measure is included that individualizes the inclusion of the term in the Spanish legal system for the so-called Local Energy Communities. These are defined as:

"A local energy community is one controlled by partners or members who are near the projects and its objective must be to provide environmental, economic and social partners or members or local areas where it operates. Also, in the case of renewable energy

communities, partners must be individuals, SMEs or local authorities (including municipalities)''(Gobierno de España, [s.d.]).

Methods of action are also planned to eliminate barriers to entry into the energy system, such as simplifying administrative processes, making the projects known to the communities, promoting education and training for human and technical resources, and securing financing lines and guarantees.

Som Energia, founded in 2010 in the city of Girona in Spain, can be considered a success story in the implementation of the modern REC concept. It started as a small university initiative that currently produces and markets 100% RE. Currently, it has more than 71,000 partners with more than 126,000 contracts, with a production of 18.50 GWh per year (Som Energia, 2010).

2.8.1.3 Denmark

With the oil crisis in 1979, the Danish energy landscape was changed. Until this year Denmark's energy dependence on the outside world was quite clear, from this point onwards, the situation changed drastically, with the introduction of RE, namely wind energy. This fact generated the creation of measures, on the part of the Danish government, to promote RE projects, thus changing the country's energy map. Movements against the nuclear sector were also created, which promoted the elimination of the technology in the country. These groups of people succeeded in restricting the construction of nuclear power plants, and the first communities focusing on energy change emerged (Mey and Diesendorf, 2018).

Then, in the early 1980s, the first local wind turbine cooperatives in Europe emerged. Through government-backed tax incentives aimed at producing electricity in the local community, several families came together to create these wind farms. By the mid-1990s, where huge investments were made in these new technologies, it was estimated that there were approximately 2100 wind energy co-operatives nationwide, and in the early 2000s the share in installed wind turbines in Denmark was 86% (Danish Energy Agency, 2015; Minister for Energy and Minister for Development Cooperation, 2017). At this time no other European country has achieved such high numbers. There are more than 4500 onshore wind turbines installed across the country (Danish Energy Agency, 2015). By implementing a tariff system for this type of technology, which lasted between 10 and 20 years, they achieved a high degree of growth in the wind sector. An

income tax exemption, for income from RE projects, was implemented (Haas et al., 2011).

However, around 1999, electricity reforms were made to liberalise the electricity market and caused a reduction to aid to RE's. Unfortunately, this led to an increase in electricity costs for consumers. These measures caused, between 2004 and 2008, a drastic reduction of new wind turbine installations (Minister for Energy and Minister for Development Cooperation, 2017). Once again, in 2008 the system of aid for RE, underwent a new reform, to be able to include new technologies such as photovoltaic energy, causing a new peak of growth in installations of RE projects.

It was implemented in 2012 in the Hvide Sande wind farm (Simcock, Willis and Capener, 2016), three 3 MW wind turbines on the beach, where power is generated very efficiently as in offshore wind farms. The energy produced sold to the national grid, where the profits made, after repayment of bank loans, are applied for local improvement. The project led by the charitable organisation, Hvide Sande Community Foundation, which owns 80% of the project and the remaining 20% is owned by 400 local co-operative investors³. This shareholder division prevents the purchase or accumulation of shares for individual benefits, which later do not affect the wellbeing of the community.

2.8.1.4 Germany

About 46% of the RE capacity in Germany in 2017 was owned by farmers and individuals [9]. This is due to the policies and commitment that the German government has undertaken in recent decades. The development of local communities was encouraged, and tax incentives were implemented for installing low-power projects. Two reasons can be given for this growth of REC in Germany (Morris, 2019):

- The 2016 amendment of the German law on cooperatives. Among other measures, we can highlight the extension of the payment of corresponding member fees up to 10 years, and the reduction of the number of persons for the creation of a cooperative.
- And the German System of Energy FITs (Feed-In Tariff). In this, different rates are set for the electricity introduced by power plants, which depends on the size, location, and type of energy. To benefit RE investment and to support

³ This division of ownership is required by Danish law in respect of wind farm projects.

the fulfilment of European climate change goals, small RE producers have benefited the most.

In 2005, in Jühnde⁴ (Simcock, Willis and Capener, 2016), a bioenergy plant has been implemented, making the small village the first bioenergy town in Germany. This plant works with wood chips and biogas to provide heat and power to the community. It owned by the residents (75% of the population), through a cooperative. The incentives offered to the population were extremely important to make the project viable. These range from energy policies that grant access to the energy grid to stable FITs for the next 20 years. The local council and the university of Göttingen were also involved in the project. The main goal of this cooperative to obtain heating at a low price and not to make a profit.

In summary, the four countries show large differences about the development of REC's. It then seems important to analyse various factors that may better explain this difference and whether these differences can be overcome.

⁴ A small German village with about 750 inhabitants.

3 Is public policy helping or not?

3.1 Introduction

The implementation of the main objectives of the climate and energy policy of the European Union involve a transition to a new energy system where RES should be applied, and new technologies need to be developed and adopted. Thus, decentralization of energy systems, as well as a more important role for energy producers and consumers, creates more opportunities to generate renewable energy and may include new technologies in the energy market.

This transition results in a more persistent participation by citizens, collectively producing RE, in the energy system or involved in local network management functions. These types of community initiatives, based on local collaborations, may be created by individuals, groups of individuals, families, small businesses, or local authorities that work uniquely or organized groups that can be referred to as “*local energy community*”. These communities must play a significant role in the energy transition, as they develop sustainable energy technologies and bring great benefits to local community (Soeiro and Dias, 2019).

The level of development of energy communities is not the same in all Member States, being more developed in some countries than in others. So, it is important to study the success factors and obstacles behind their development. This chapter focuses on the most significant EU legislation for energy community and other forms of local energy community. Since, we are reaching the deadline for the EU 2020 climate and energy framework, EU energy legislation is going through a review process. Thus, our research aims at analysing the current law provisions and changes for post-2020.

3.2 Analysis of relevant EU legislation

3.2.1 Last decade

The **Renewable Energy Directive** (RED, Directive 2009/28/EC) (European Commission, 2009) and the **Energy Efficiency Directive** (EED, Directive 2012/27/EU) (European Commission, 2012) are the two fundamental instruments for the application of EU policy on climate and energy for 2020. These two directives promote the global

development of RE and the investments in energy efficiency and can thus encourage the emergence of RE projects or energy community. However, they do not consider specific premises for cooperatives or energy community.

The RED admits the role of small and medium-sized enterprises (SME's) and the "*the emerging consumer market*" (European Commission, 2009, p. 22). Since that, "*in order to stimulate the contributions by individual citizens*" (European Commission, 2009, p. 21), in order to achieve the objectives set out in the Directive, it is imperative that all member states, simplify the authorization procedures for small RE installations (European Commission, 2009). The EED requires that all member states encourage simplified authorization procedures for microgeneration units for individual citizens. (European Commission, 2012).

These two directives encourage, in cooperation with local and regional authorities, the development of information, awareness, guidance and training programs for citizens on the benefits and practical aspects of RE development and use. In general, EU legislation on RE and energy efficiency grants participation and leadership roles to local and regional authorities. But unfortunately, neither directive expressly recognizes prosumer nor even energy community and does not provide a definition or guidance on what they are, which is a very considerable gap in EU legislation.

Thus, the absence of a specific energy community procedure at EU level and a common inclusion of "*small*" projects results in a very unfavourable framework for the development of energy communities. Consequently, the absence of a common understanding on the energy community subject will cause highly fragmented national regulatory structures and a lack of common understanding of the needs of the energy community (e.g., access to finance, connection to the grid). On the other hand, by oversimplifying "*small*" RE projects, it may lead energy community with installed capacity above a certain limit to be faced up with additional difficulties and lack of support (e.g., project the largest wingspan may not be eligible for feed-in tariffs).

The directives of the **Internal Energy Market** (IEM, Directive 2009/72/CE for electricity and Directive 2009/73/EC for natural gas) (European Commission, 2009, 2009) are some main key resources to carry out the policies of IEM in all EU Member States. These two measures represent common rules for the market, such as access to distribution networks or permission from energy suppliers. However, these directives do not appear to be in line with the decarbonization agenda and the specific needs and characteristics of the RES.

The IEM presents rules that may create a negative impact on new players, smaller or non-traditional in the energy system, who may be excluded from the energy market. For example, the principles of equality and non-discrimination can result in contradictory treatment and even an eventual exclusion from energy community projects. In other words, as these small players do not present equal conditions with large companies when competing in the energy market, even if the rules are the same for all those who wish to participate, they will be excluded. These guidelines do not refer to the role of consumers as prosumers, being a crucial point to change in the post-2020 context.

Comparatively, the State aid guidelines (Communication 2014/C 200/01) (European Commission, 2014) ensure fair competition within the internal market and prevents the Member States of granting economic benefits that may alter competition laws. Although certain support mechanisms for RE's may be competitive in the domestic market, the EU policymaker aims to suggest market-based approaches and an end to RE subsidies.

Although, there is the EU legislative framework to promote the development of energy community projects as part of the global energy transition, unfortunately does not clearly recognize their role and their specific needs (Roberts, Bodman and Rybski, 2014). In other words, as the energy community do not aim at making profits and may face challenges in accessing finance, the implementation of strict rules on access to the electricity grid makes it is costlier for them to sell the energy produced. Thus, the energy community must be supported and offered inventions, which may not be in line with the state aid directions.

In short, EU energy policies (RED, EED, IEM) and state aid guidelines must be consistent and targeted to the specific barriers that non-traditional market players (e.g., energy community, prosumers) may face.

3.2.2 Post-2020

With 2020 approaching, a revision of EU energy legislation is needed (European Commission, 2016). Considering the 2030 climate and energy agreements and the creation of the Energy Union (Figure 3.2.1), this new law seems to be an opportunity to define a framework and a more participative role and of the Energy Community in the energy system. This allows all EU consumers to have a safe,

sustainable, competitive, and affordable energy, which includes a proper regulatory framework, strategic investments that innovate the EU energy system and the integrated multi-level energy governance framework. By obtaining a secure, viable and accessible energy supply for all, the final aim is to add justice, inclusion, incentives to the local economy and increase in jobs with energy transition (European Commission IME, 2016; European Commission, 2017).

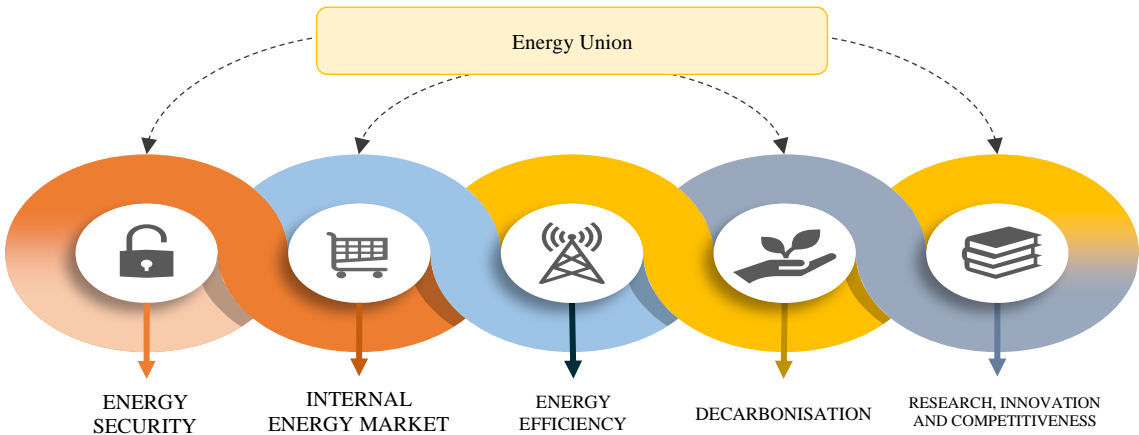


Figure 3.2.1. Five dimensions of the Energy Union, based on Parliament and Council of the European Union, p. (2018, p. 13)

Firstly, following the Energy Union, some measures supporting the role of energy community should be covered to reach the 2030 targets (Figure 3.2.2). They should also be encouraged to develop common agreements that may support energy community, thus being able to strengthen regional cooperation initiatives. Agreements will be needed to unlock EU funding, thus simplifying private investment in energy community initiatives by individual consumers, cooperatives/community or even municipalities.

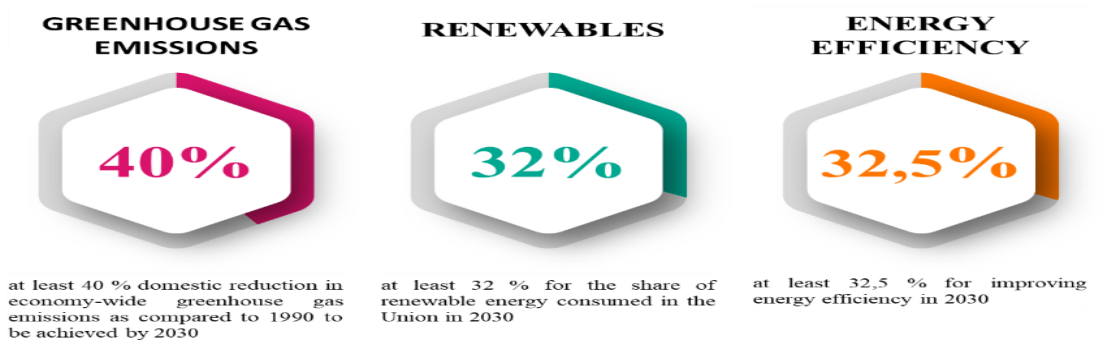


Figure 3.2.2. Key targets for 2030, based on (2030 climate & energy framework, 2020)

Secondly, the EU and Member States should address regulatory and market barriers to the EU energy sector through EU legislation, which several authors point out as the major barrier faced by energy communities (Brummer, 2018; Kowalska-Pyzalska, 2018). Although all directives affect the energy community in one way or another, the most relevant are the new RED (European Commission, 2017) and IEM for electricity (European Commission IME, 2016).

The new RED covers premises that will simplify the participation of individual consumers and the energy community in the energy system. This promotes a process of granting permission to RE projects by a designated authority ("*one-stop-shops*"), which facilitate authorization procedures for RES projects, maximum terms for the licensing process⁵, including a simple notification to the Distribution System Operators for small projects⁶. Furthermore, specific provisions are thought to speed up the licensing process for repowering existing renewable plants. That is, licensing processes are clearer, more transparent, predictable, and less time-consuming. This new RED allows consumers to produce and consume energy individually or collectively and ensuring that they are paid by the energy they supply to the grid⁷. In addition, it provides a definition for "*renewable energy community*⁸", and above all, enables energy community to participate in the energy market.

Relatively, the new EMI for electricity (European Commission IME, 2016) recognizes that energy community have an important role in the energy transition. It also provides a definition of "*local energy community*⁹" and commits each Member State to provide a framework that facilitates and ensures that local energy community have access to the energy system¹⁰.

It is significant that RED, EED and IEM for electricity focus on mitigating characteristic market barriers for non-traditional business entities, such as cooperatives or energy community, as well as municipal suppliers, so that liberalized energy markets represent further equal competition for new market entrants. By creating a political space for energy communities in the 2030 legislative framework, it will bring a few benefits for all European citizens and stakeholders (Figure 3.2.3):

⁵ Article 16, RED

⁶ Article 17, RED

⁷ Article 21, RED

⁸ Article 22, RED

⁹ Article 2, IEM

¹⁰ Article 16, IEM

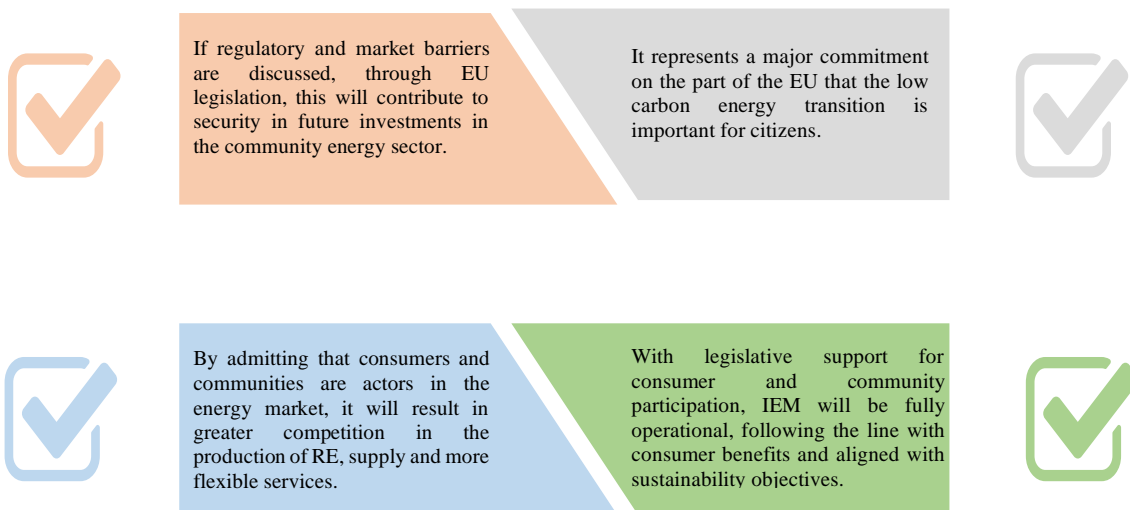


Figure 3.2.3. Benefits created by the 2030 legislative framework.

Thus, recognizing that energy community will allow citizens and community to play a more active participation but also an ownership role in the energy system. These new facts will support long-term economic development and create employment opportunities.

In the following section, the main provisions affecting the energy community will be discussed in detail, together with key points that are relevant to this context.

3.3 Acknowledging community energy

EU revised energy legislation, especially for RED and EMI, is welcome for stakeholders and is crucial for the evolution of energy communities and consumers after 2020. The new European legislation not only considers the role of citizens, consumers and energy communities but also outline specific definitions and actions to promote their role.

With the definition of “*local energy community*” in the new EMI for electricity and a more specific definition of “*renewable energy community*” in the new RED, it is insured a better common understanding of what a RE community is. Thus, we will have a level playing field for all Member States, and those who have no definition or requirements on the topic, can then adopt this general definition. In addition, with a more concrete definition of an energy community, it will prevent pseudo-local energy community or energy cooperatives from any abuse.

The new IEM for electricity has a definition for “*local energy community*” (European Commission IME, 2016, p. 52) (Figure 3.3.1), which is complemented by Article 16 (European Commission IME, 2016, pp. 68-69) (Figure 3.3.2), which provide the conditions a member state must consider when validating a Local Energy Community (Figure 3.3.1):

'local energy community' means: an association, a cooperative, a partnership, a non-profit organisation or other legal entity which is effectively controlled by local shareholders or members, generally value rather than profit-driven, involved in distributed generation and in performing activities of a distribution system operator, supplier or aggregator at local level, including across borders;

Figure 3.3.1. Article 2, based on European Commission IME, (2016)

1. Member States shall ensure that local energy communities:
 - (a) are entitled to own, establish, or lease community networks and to autonomously manage them;
 - (b) can access all organised markets either directly or through aggregators or suppliers in a non-discriminatory manner;
 - (c) benefit from a non-discriminatory treatment with regard to their activities, rights and obligations as final customers, generators, distribution system operators or aggregators;
 - (d) are subject to fair, proportionate and transparent procedures and cost reflective charges.
2. Member States shall provide an enabling regulatory framework that ensures that:
 - (a) participation in a local energy community is voluntary;
 - (b) shareholders or members of a local energy community shall not lose their rights as household customers or active customers;
 - (c) shareholders or members are allowed to leave a local energy community; in such cases Article 12 shall apply;
 - (d) Article 8 (3) applies to generating capacity installed by local energy communities as long as such capacity can be considered small decentralised or distributed generation;
 - (e) provisions of Chapter IV apply to local energy communities that perform activities of a distribution system operator;
 - (f) where relevant, a local energy community may conclude an agreement with a distribution system operator to which their network is connected on the operation of the local energy community's network;
 - (g) where relevant system users that are not shareholders or members of the local energy community connected to the distribution network operated by a local energy community shall be subject to fair and cost-reflective network charges. If such system users and local energy communities cannot reach an agreement on network charges, both parties may request the regulatory authority to determine the level of network charges in a relevant decision;
 - (h) where relevant local energy communities are subject to appropriate network charges at the connection points between the community network and the distribution network outside the energy community. Such network charges shall account separately for the electricity fed into distribution network and the electricity consumed from the distribution network outside the local energy community in line with Article 59 (8).

Figure 3.3.2. Article 16, based on European Commission IME, (2016)

So the definition of “*renewable energy community*”, outlined in the proposal for RED (European Commission, 2017, p. 89), is as follows (Figure 3.3.3):

1. Member States shall ensure that renewable energy communities are entitled to generate, consume, store and sell renewable energy, including through power purchase agreements, without being subject to disproportionate procedures and charges that are not cost-reflective. For the purposes of this Directive, a renewable energy community shall be an SME or a not-for-profit organisation, the shareholders or members of which cooperate in the generation, distribution, storage or supply of energy from renewable sources, fulfilling at least four out of the following criteria:

(a) shareholders or members are natural persons, local authorities, including municipalities, or SMEs operating in the fields of renewable energy;

(b) at least 51% of the shareholders or members with voting rights of the entity are natural persons;

(c) at least 51% of the shares or participation rights of the entity are owned by local members, i.e. representatives of local public and local private socio-economic interests or citizens having a direct interest in the community activity and its impacts;

(d) at least 51% of the seats in the board of directors or managing bodies of the entity are reserved to local members, i.e. representatives of local public and local private socio-economic interests or citizens having a direct interest in the community activity and its impacts;

(e) the community has not installed more than 18 MW of renewable capacity for electricity, heating and cooling and transport as a yearly average in the previous 5 years.

2. Without prejudice to State aid rules, when designing support schemes, Member States shall take into account the specificities of renewable energy communities.

Figure 3.3.3. Article 22: Definition for “Renewable Energy Community”, based on European Commission, (2017)

The Committee of the Regions (CoR) (European Committee of the Regions, 2017) in its opinion on the proposal for RED, consider that the definition should include, not only the “*local authorities*” but also the “*regional or local authorities*”. Moreover, the level of energy production of the RE community, cannot and should not be so restrictive as it is in the proposal, and they suggest 30 MW of renewable capacity instead of the 18 MW mentioned in the definition (European Committee of the Regions, 2017, p. 16). The justification given for these changes is due to the fact that renewable energy communities are a fundamental tool for sustainable energy production, where local authorities must play a role in achieving the objectives proposed in the directive (European Committee of the Regions, 2017, p. 16). The European Economic and Social Committee mentioned the relevance of a clear and logical definition of the energy community and prosumers in different legislative documents. Also refers to the importance of clear rules on the activities of local energy community and prosumers, and the importance of the inclusion of simplified procedures for power storage, trade, and self-consumption of energy to ensure full access to the energy market. Moreover, they stress that State aid rules must be updated accordingly (EESC, 2017).

The consistency between the definitions of the proposals may be improved, in order to ensure that the RE community is a subcategory of local energy community and showing that the local energy community may provide energy saving, energy efficiency services (REScoop.EU, 2017) and storage (REScoop.EU, 2017). The general definition needs to be clarified in order to ensure that local energy community

present equal conditions for participation in the energy system (that is, both in energy production, and in owning and operating distribution networks and/or community networks) (Energy Cities and REScoop, 2018). It should also be highlighted that local energy community aim to provide economic, social and environmental benefits, not only making profit (REScoop.EU, 2017).

The new RED presents the general principles for the promotion of a local energy community. One of them is the creation of “*one-stop-shops*”, which aims to facilitate the licensing procedures for RES projects, being a significant improvement because it will allow the reduction of the administrative burden that individual prosumers or local energy community face. In order to be most effective, this proposal should clarify and require all Member States to ensure that RE community are able to benefit from available support schemes (e.g. providing direct access to feed-in tariffs/premiums or reduced participation criteria and adding local benefit requirements to competitive bidding) (REScoop.EU, 2017).

The Council and Parliament preserves the main provisions for the promotion of local energy community, that is, the “*one-stop-shops*” and simplified notification procedures to the Distribution System Operator, providing some more details and rules for the implementation of these procedures. Their perspective also contains a revised definition on “*renewable energy community*” (European Council, 2018, p. 55) (Figure 3.3.4):

“renewable energy community” means a legal entity;
i. which, according to 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 owned and developed by that community;
ii. whose shareholders or members are natural persons, local authorities, including municipalities, or SMEs;
iii. whose primary purpose is to provide environmental, economic or social community benefits for its members or the local areas where it operates rather than financial profits.”

Figure 3.3.4. Definition proposed by the Council and Parliament, based on European Council, p. (2018, p. 55)

This definition seems much clearer regarding the role of RE community in offering wider benefits to the community, but it seems to lack clarity on the explicit recognition of the function of “*regional*” authorities and also on “*local*” ownership. Nevertheless, the provisions of Article 22 clarify the activities, in which RE community

participate, and also states that Member States must ensure that RE communities gain the right to generate, consume, store and sell RE, but also the power to participate in energy markets, among others (European Council, 2018, pp. 97-98).

Consequently, it is necessary to ensure consistency between the definitions and provisions of the new RED and the new IEM for electricity, to protect against the abuses on energy market, mainly by larger energy companies. The general definition of “*local energy community*” on the new IEM for electricity, must be clear when stating that communities of RE empower citizens for collective participation in the energy transition, differently from traditional market players (Energy Cities and REScoop, 2018, pp. 1-2).

On the other hand, the definition for “*active customer*” as is transcribed below (Figure 3.3.5) should clarify the activities in which customers can participate, namely self-consumption, storage, demand response and the energy efficiency of renewable energy sources (Energy Cities and REScoop, 2018, p. 2) (Annex IV).

‘active customer’ means:

a customer or a group of jointly acting customers who consume, store or sell electricity generated on their premises, including through aggregators, or participate in demand response or energy efficiency schemes provided that these activities do not constitute their primary commercial or professional activity.

Figure 3.3.5. Definition of Active Customer, based on European Commission IME, p. (2016, p. 52)

The European Economic and Social Committee, in its opinion on the electricity market design, argues that all consumers may “*generate, store and trade energy*”, while local energy community have the “*right to support, develop or rent community networks*” (EESC, 2017, p. 3).

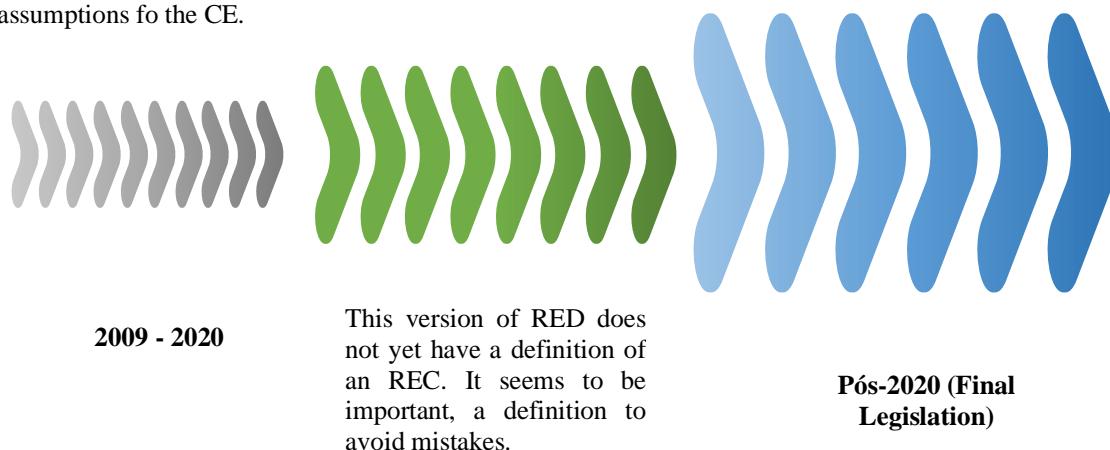
3.4 Final legislation

To place citizens at the centre of the Energy Union, a major evolution on European energy legislation would be needed, as we may conclude. Fortunately, it is common agreement that the new legislation is on the right track. Figure 3.4.1 shows the evolution that RED underwent until the document was released in 2018.

They promote the global development of RE and investments in energy efficiency, so they can stimulate new RE projects or even Renewable Energy Community. However, this does not include specific assumptions for the CE.

Revised RED

The final RED version presents a definition of the Renewable Energy Community. Where the factors that should be considered in the evaluation of an REC are pointed out.



The new RED (Parliament and Council of the European Union, 2018) mentions a definition that did not exist in the proposed revision presented. This definition is very relevant as it is essential that there is no doubt about what a Renewable Energy Community is because it will help Member States to regulate the energy market to include the participation of communities and/or citizens (Figure 3.4.2).

‘renewable energy community’ means a legal entity:

- (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;*

Figure 3.4.2. Definition of “Renewable Energy Community”, based on Article 2 Parliament and Council of the European Union, p. (2018, p. 103)

With regard to Article 22 (Parliament and Council of the European Union, 2018, pp. 121-122), there was a sufficient change, making it clearer what Member States should or should not provide to the energy communities for them to participate actively in the

energy markets. In other words, it allows families, communities, and companies to become energy producers, increasing competition and integration in the RE market, reducing dependence on energy imports and increasing energy security, creating more jobs, and attracting new investments to the economy of Europe and strengthens the sustainability of bioenergy and promotes innovative technologies.

Relatively, the new IEM for electricity (European Commission, 2019), clearly there was an extensive revision of the proposal for the final document, as we can see in Figure 3.4.3.

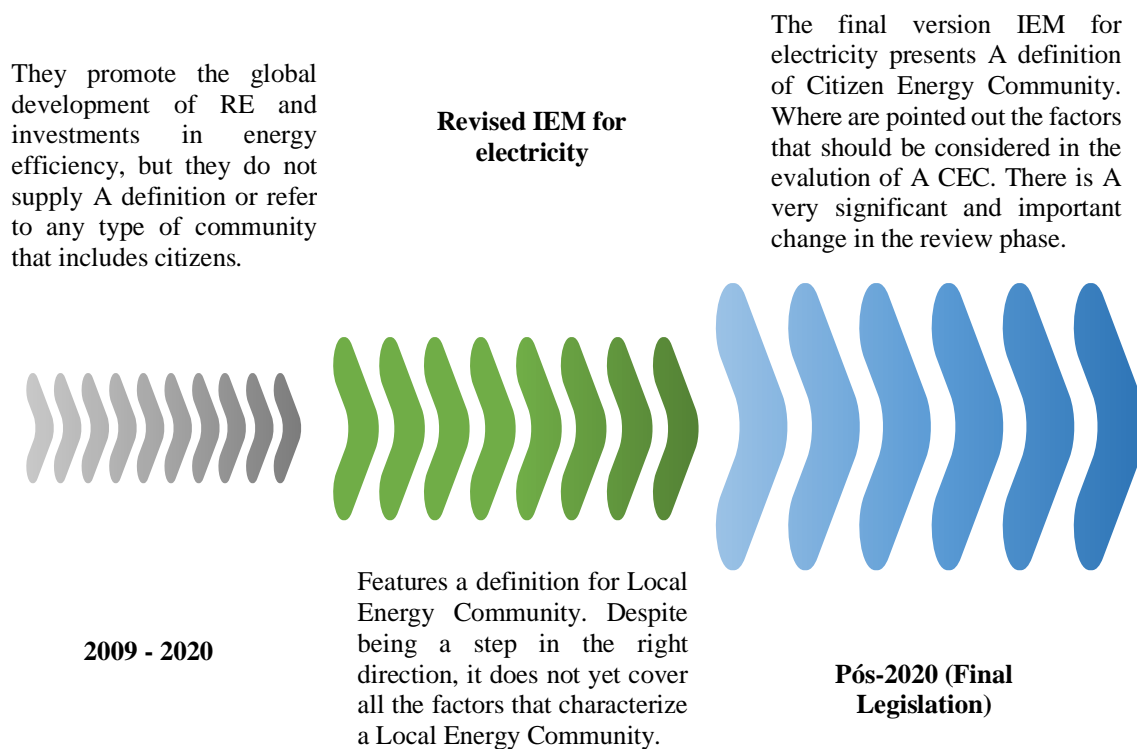


Figure 3.4.3. Pathway of IEM for electricity

The most significant change at this point was the designation of “*local energy community*” that became “*citizen energy community*” (CEC). Moreover, the evaluation of a citizen energy community became clearer and more comprehensive (Figure 3.4.4).

Citizen energy community are considered a category of cooperation by citizens or local actors that are subject to recognition and protection under EU law. That is, they are a new type of entity due to their membership structure, governance requirements and purpose. They must be able to run on the market on an equal footing, without jeopardizing competition, and the rights and duties that apply to other electricity companies.

'citizen energy community' means a legal entity that:

- (a) is based on voluntary and open participation and is effectively controlled by members or shareholders that are natural persons, local authorities, including municipalities, or small enterprises;*
- (b) has for its primary purpose to provide 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; and*
- (c) may engage in generation, including from renewable sources, distribution, supply, consumption, aggregation, energy storage, energy efficiency services or charging services for electric vehicles or provide other energy services to its members or shareholders;*

Figure 3.4.4. Definition of “Citizen Energy Community”, based on European Commission, p. (2019, p. 140)

Article 16 (European Commission, 2019, pp. 150-151), has also been revised to become broader for consumer protection, information and training in the EU's electricity sector. Consumers may then take part actively, individually or through communities, across the entire energy market, generating electricity to later consume, share, sell or provide storage services. For the first time, it seems that consumers have the right to request a smart mediator and a dynamic price contract, which will allow them to be rewarded in an era where energy is widely available and cheaper.

As mentioned above, the Energy Union aims to encourage the participation of energy consumers in the energy market, across the board, in order to (European Commission, 2019, p. 2). Thus, not only are citizens expected to be “*active customers*” (European Commission, 2019, p. 139), but also to be “*renewables self-consumers*” (Parliament and Council of the European Union, 2018, p. 103), that is, from RES they generate, store and/or sell electricity self-generated (Parliament and Council of the European Union, 2018). This is referred in the literature as “*energy prosumer*” (Ford, Whitaker and Stephenson, 2016).

The EU has also established new rules for energy efficiency (Parliament and Council of the European Union, 2018), including an ambitious target of at least 32.5% for improving energy efficiency by 2030, well above the existing 20% target in 2020. These energy efficiency targets, and labels of energy sources will, in a way, encourage the industry to invest and innovate. Thus, the revision of this directive encourages a more efficient use of energy (Parliament and Council of the European Union, 2018), leading to:

- Reduced energy consumption.
- Less reliant on energy imports.
- Incentives for producers/manufacturers.

- More investment.
- Clearer information.

So, by giving them the right to produce, store or sell their own energy, individually or collectively, the European institutions are betting on a faster adoption of RES in the energy system (European Commission Clean Energy for All Europeans, [s.d.]; Parliament and Council of the European Union, 2018). Through incentives, Member States support decentralized renewable energies, through relaxed rules or even offers incentives to self-consumption of RES, the development of cooperatives and energy communities is in great development in Europe (Energy Atlas, 2018). This pace of adoption of renewable energy across Europe, which could have been driven by the fall in prices for RES technologies, surprised policymakers and legislators (Toporek and Campos, 2019). Even with all these reviews, it appears that important dimensions of *prosumerism*¹¹, such as the development of technologies, the choice of organizational models or even innovative solutions for the financing of energy communities, are still far from ideal (Energy Atlas, 2018).

¹¹ *Prosumerism* has a collective social action, with energy justice as its framing (Fuller and McCauley, 2016), built from the bottom-up via local community action and new intermediaries working towards increased accessibility and affordability of energy (Forman, 2017; Lacey-Barnacle and Bird, 2018).

4 Methodology

To understand the impacts of different factors on REC adoption and development, a quantitative analysis was performed. The importance of a questionnaire-based survey is, knowing what to ask, as you cannot ask enlightening questions (Robson, 2002). The questionnaire may be applied in three different ways. Firstly, this methodology may be applied through a face-to-face interview, where questions must be asked in strict order. Secondly, it may be applied, by phone, following a rigorous procedure where a set of questions is applied to create standardized data. Finally, a self-report questionnaire can be applied so that participants fill in alone.

Online surveys are very similar to self-completed questionnaires or telephone surveys, differing only in the way they are conducted. Generally speaking, two means are used for this type of survey, either they are posted on a website, which must be posted so that respondents can access them, or email is used, and the respondents' private or business address is used. This type of survey is an increasingly popular method, mainly due to its advantages, which include low cost, fast data collection, ability to reach specific populations and the capacity to create smoother, more sophisticated searches for using visuals or asking sequential questions based on past answers (Robson, 2002). It also has advantages from the respondents' point of view, i.e., it is possible for respondents to answer in the most convenient way, at their own time and place. The major disadvantage that questionnaires present is the low response rate to questionnaires (Robson, 2002). This fact may present several factors, such as accessibility problems, dismissed questions, lack of customization and understanding.

A major challenge to this method is to motivate REC members to participate in the survey. Of course, the best approach was to contact as many REC's as possible to get the greatest number of answers.

It is important to note that the questionnaires must be self-explanatory because there is no direct interaction between the participant and the person applying the questionnaire (Robson, 2002). We may overcome this issue by providing an email address for any additional questions.

Surveys are used quite frequently by researchers and represent a solid empirical method (Sovacool, 2014). Moreover, this methodology was used in former studies to

analyse various aspects of energy communities (Bohnerth, 2015; Klagge and Meister, 2018; Kunze and Becker, 2014; Lipp, 2016; Schwark, 2017; Tarhan, 2016).

Thus, our methodology and the construction of the survey was based on a systematic review of existing bibliographic references on energy communities, the EU and national energy legislation, directives, and policies. For this survey-based research, several steps were considered. Two surveys were created, based on Schwark, (2017) and Bohnerth, (2015), and some additional questions were included. The option to use these surveys is because they correspond to the main lines of this study. The survey was prepared in Portuguese and English, on the eSurvey Creator online platform, to reduce barriers to participation.

The survey contained 100 questions, which ranged from drop-down choice, multiple answer choices or individuals were asked to fill a number, but also employed Likert scales related with participants' attitudes. We present a series of attitudinal dimensions, and for each of these attitudes, the participants must state whether and to what extent they agree with the statements (Brace, 2018).

More than 400 energy communities were contacted by email. During this time, emails were sent several times to remind respondents to complete the survey. The researcher's email address was provided in the survey so that further inquiries were possible. Despite this contact with the REC on several occasions, the number of responses by the latter was not as was expected. So, we chose to place the survey on various online platforms (Facebook, Twitter, among others), to obtain a higher number of responses.

As the first survey sent to the RECs had a lower participation than expected and verifying that we would not achieve an increase in responses, we decided to alter the survey, reducing the number of questions and opening participation to anyone interested in participating. So, we opted to reduce the number of questions in the survey, from 101 to 19, to focus on answers to the most relevant questions for the research. Thus, we will analyse the data in two stages (**stage one** is the survey with **100 questions** oriented towards REC and **stage two** is the survey with **19 questions** open to all participants)¹², and later we will show the combined results of the two surveys for the most pertinent questions and answers.

¹² **Stage one** is the point of view of an CE and **stage two** is the point of view of those who may not belong to an CE.

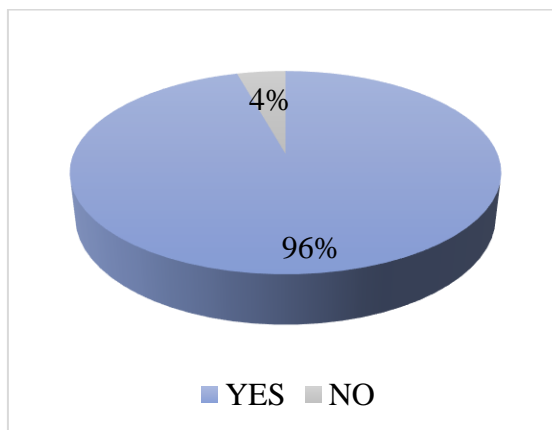
5 Results

In this chapter, we will show the results for the two surveys that have been defined before. As mentioned in the previous chapter, the survey has been applied in two stages, so the analysis of the results will also be divided, and then a comparison will be made between the two analyses to verify equality and/or differences in responses. In each subchapter, a table will be presented with the questions that are analysed at each stage, so that it is easier to understand the analysis that follows. For more details on the survey, a full copy is in annex VIII and IX. But first we will proceed to a statistical analysis of the results.

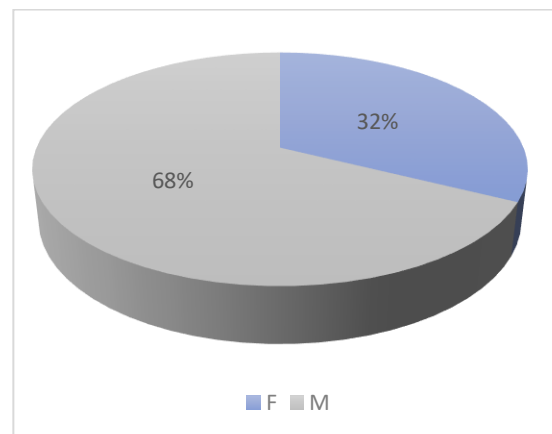
5.1 Statistical results

5.1.1 Stage One

The survey had 115 participants (55 completed). Although there is a high acceptance to participate in the survey, it is not verified at the last questions of the survey (Graph 5.1). Regarding gender (Graph 5.2), there were more men (68%) than women (32%) responding to the survey.



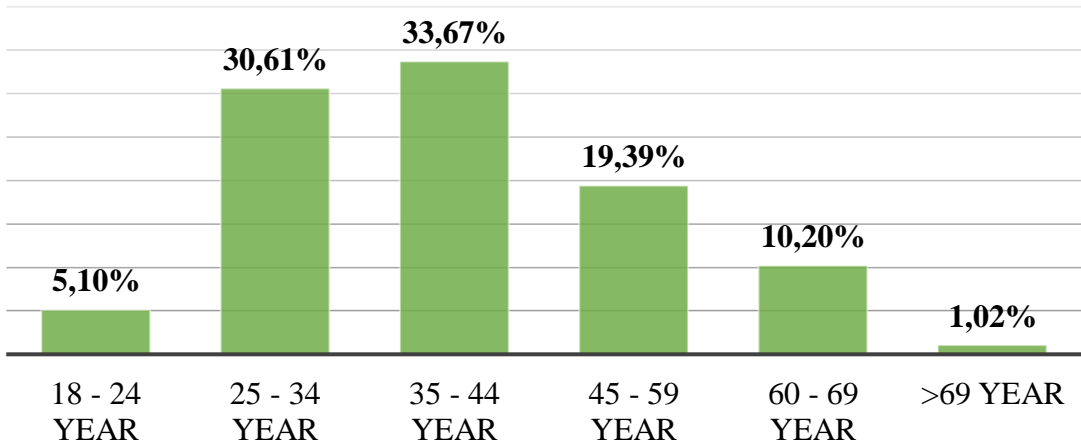
Graph 5.1. Agree to participate in the survey.



Graph 5.2. Gender

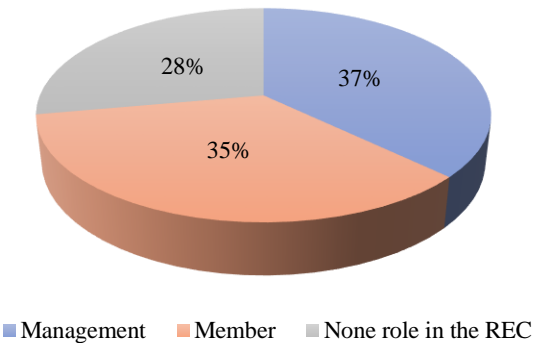
We chose to divide the individuals into 6 age groups (Graph 5.3), to simplify the analysis. The average age of participants is 40 years. It appears that the age group “35 to

44 years old” are the most participating in the REC, closely followed by the age group “25 to 34 years old”, where.



Graph 5.3. Age Group

The Graph 5.4 shows the role that survey participants play in the REC, 37% belong to the management, 35% are members, and 28% do not play any role in the REC. We asked follow-up questions for those participants who have no role in the REC. When we chose in this question to include the option of "none role in the REC" and the complementary questions, it was because we verified that after sending the survey to the REC's, we would not have control over who responded to these, as we can verify by the responses, this fact was proven. These participants did not influence the rest of the survey development. For members and management, we also asked complementary questions concerning the REC's they are part of.

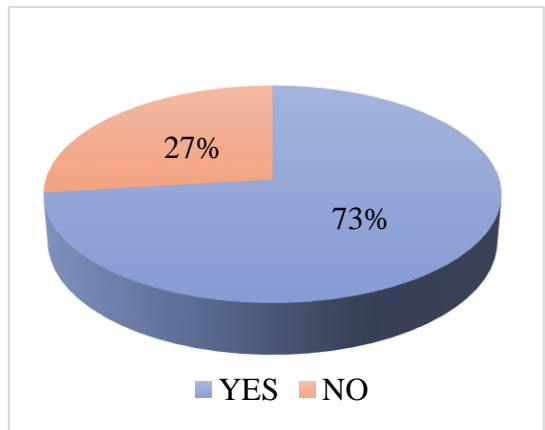


Graph 5.4. Role in the REC

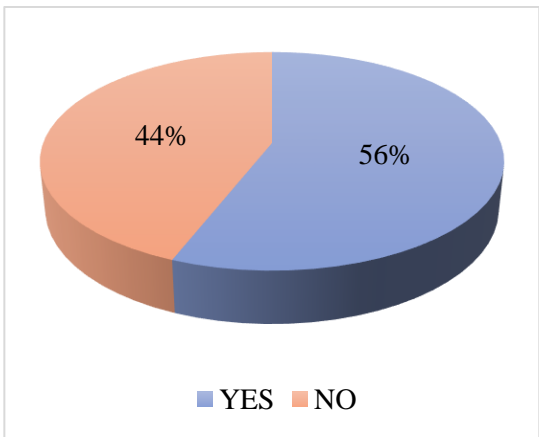
As we can see in Graph 5.5 and Graph 5.6, 73% of the survey participants, who do not have any role in a REC, know what a REC is. Which shows that people are attentive to the reality, regarding the energy transition. However, 56% intend to participate in an

REC in the future. Although it is not a so high percentage, it shows that there is a positive way to make the REC's stronger in the energy market.

The most mentioned reasons to participate in a REC is the willingness to contribute to the energy transition, obtaining energy independence, taking an active role in the energy market, promoting a pragmatic economic and social system, increasing efficiency in energy consumption, reducing energy costs, and keeping the money in the local economy. Lastly, it is mentioned the decision-making power and the consciousness of returning the ownership of energy back into the hands of citizens.

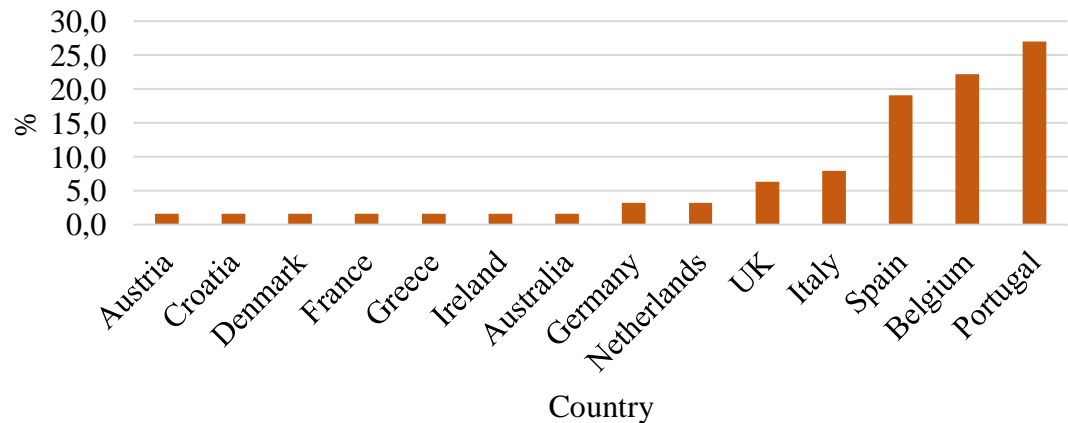


Graph 5.5. Do you know what REC are?



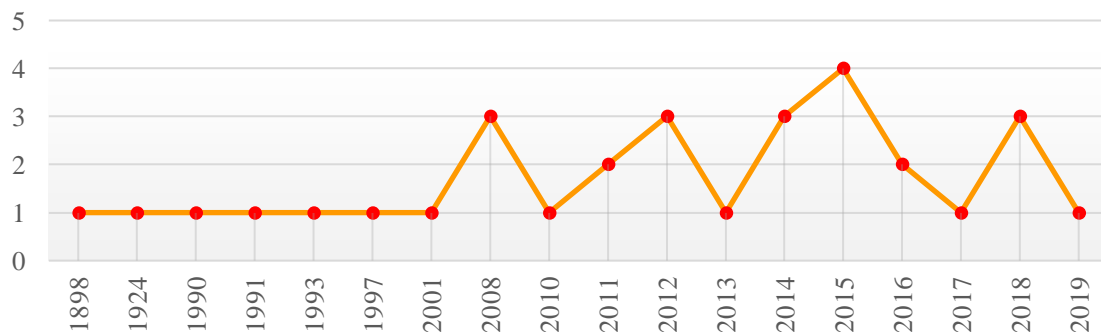
Graph 5.6. Do you want to belong to an REC?

As the survey was addressed to all European countries with REC's, which are represented in REScoop.EU, the Graph 5.7 show which countries are the most represented in our survey: Portugal (27%), Spain (19%) and Belgium (22%). We may mention some answers from other countries.



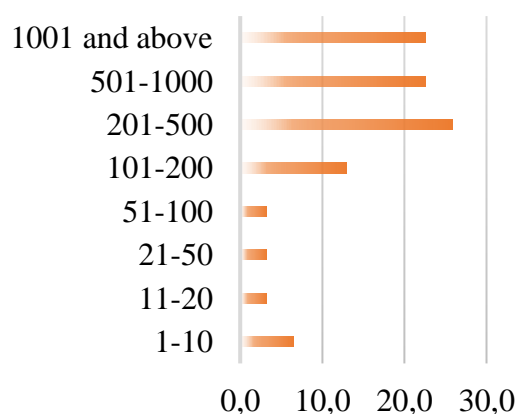
Graph 5.7. Country

The next questions are only for REC members. Concerning the age of the REC, the oldest REC represented was established in 1898 and the newest in 2019. It appears that most of the REC's represented in this study were founded from 2010 onwards (Graph 5.8). This fact is in line with the awake for the wave of creation of REC on this period and the increase in energy consumption on the same year, due to, namely, a combination of severe climatic conditions. The increase in demand in the residential sector was caused by the demand for cheaper and more sustainable energy, which may be one of the reasons for the existence of more REC.

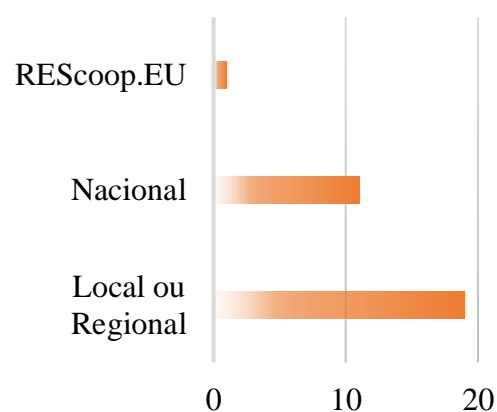


Graph 5.8. Year of Foundation

Regarding the number of members of the REC (Graph 5.9 and Graph 5.10), we may observe that the majority of the REC's where the respondents of the survey belong, 84% have more than 100 members. The REC has a local or regional geographic reach, thus allowing great benefits for small towns where they are implemented. The average dimension of the REC seems to show us the interest of citizens to participate in REC projects.

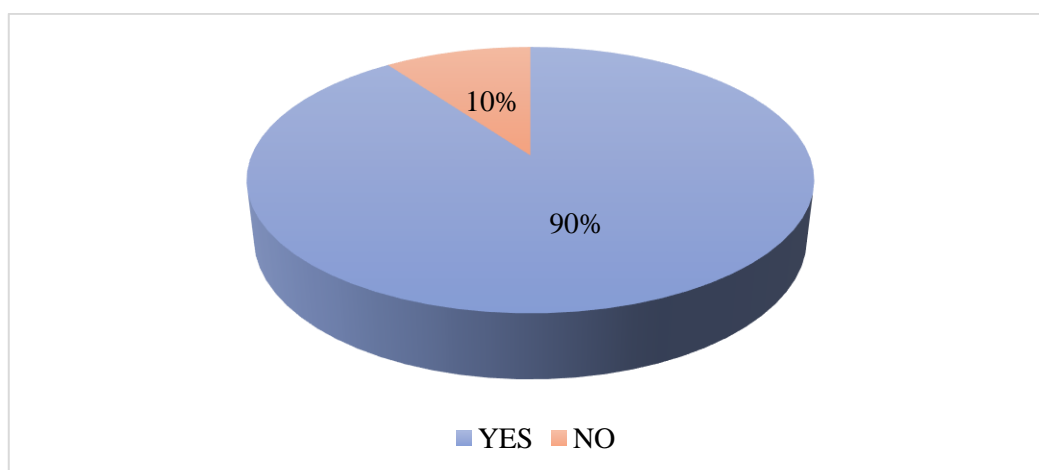


Graph 5.9. How many members does the REC have?



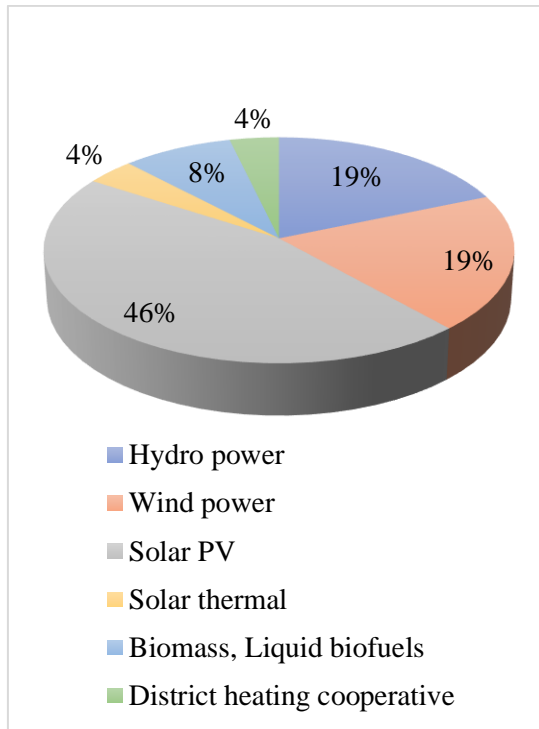
Graph 5.10. Geographic scope of REC members

The Graph 5.11 shows that 90% of the REC members surveyed apply the “*one member, one vote principle*”. This principle is what differentiates REC’s from other companies, since each member has equal rights in important matters within the REC. This system may have its disadvantages, such as the lack of involvement of members to vote, mainly in REC with a high number of members. Another disadvantage is that the REC’s become more risk averse, that is, members may avoid riskier decisions that generate higher rewards in favour of preserving the status quo.

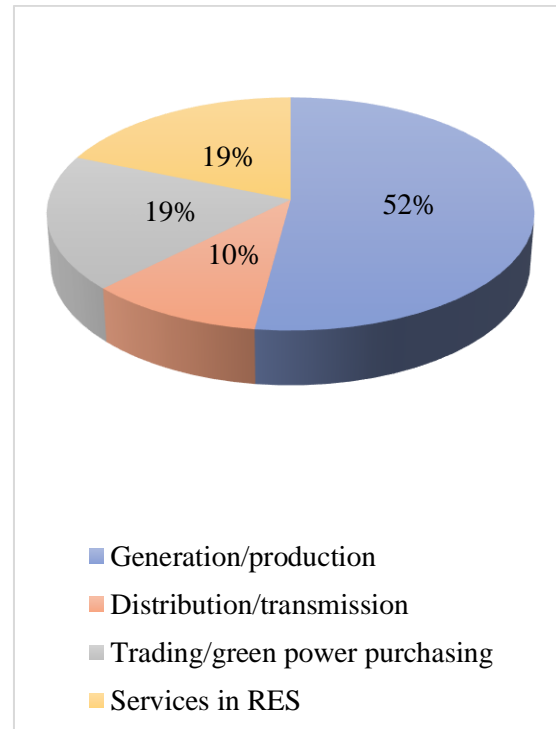


Graph 5.11. one member one vote principle

Survey participants, state that the most widely used technology for electricity generation is solar PV, followed by wind and hydropower (Graph 5.12). 52% of them produce and/or generate RE (Graph 5.13).



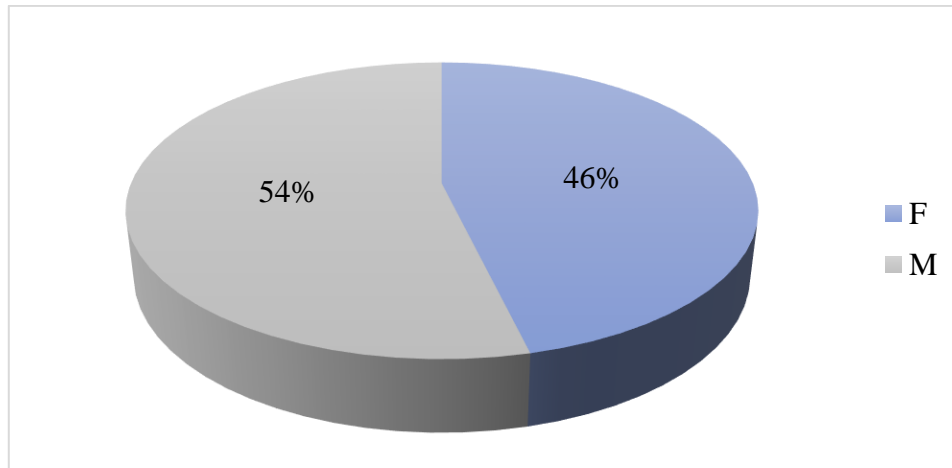
Graph 5.12. Technologies



Graph 5.13. Categories

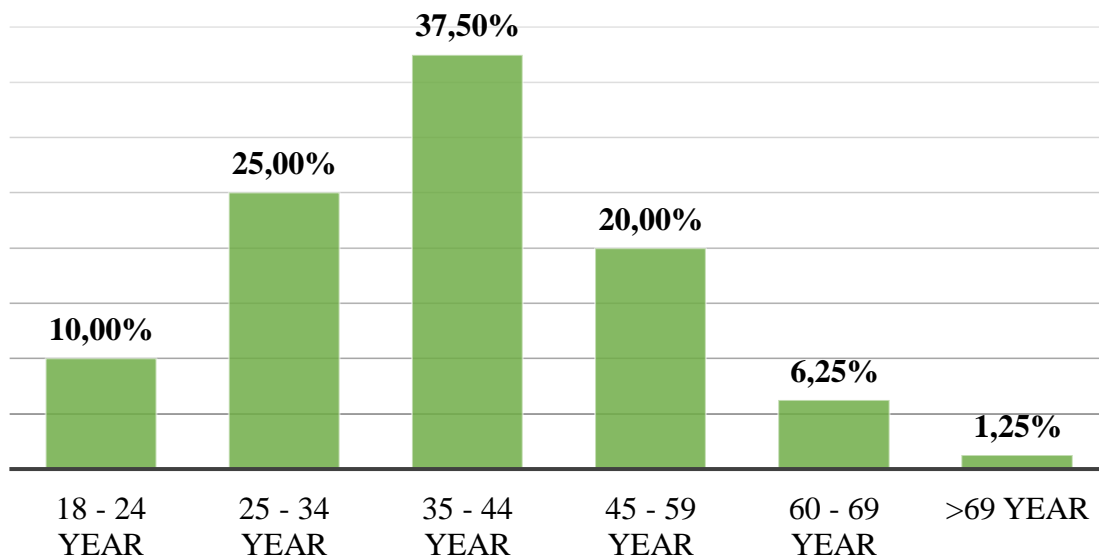
5.1.2 Stage Two

In this stage, the survey was targeted at the general population it was found that regarding gender (Graph 5.14), in these sample there is a smaller difference between participants who are men (54%) and participants who are women (46%). In other words, we observed that women show more interest in these topics and in participating in a REC. However, in a REC context, this fact is not confirmed by actual participation in REC management. As it was possible to conclude in the first phase of the survey, the participants were predominantly men.



Graph 5.14. Gender

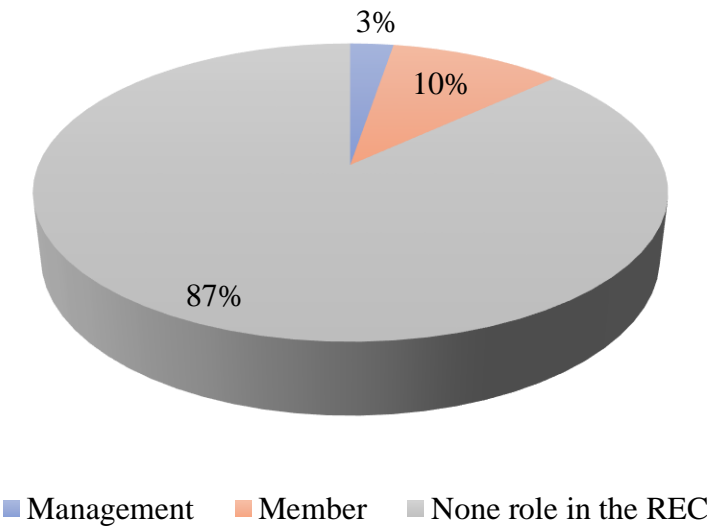
Moreover, those who most participated in the survey are the age group “35 to 44 years”, followed by the group “25 to 34 years”, with an average age of 39 years old (Graph 5.15). This is a very interesting result, as it shows that the younger population is interested in these topics and the environment and how REC’s may be an important step towards achieving the energy transition.



Graph 5.15. Age Group

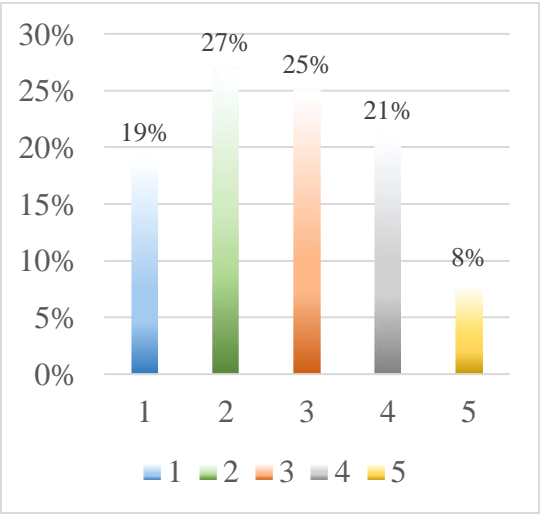
Graph 5.16 shows the role that survey participants have in an REC. 87% of the respondents did not play any role in a REC, 10% are members and 3% belong to the management. It will be interesting in the survey questions to make a comparison between

those who belong to a REC and those who do not in their preferences and priorities, to see whether there are differences in motivations to participate.

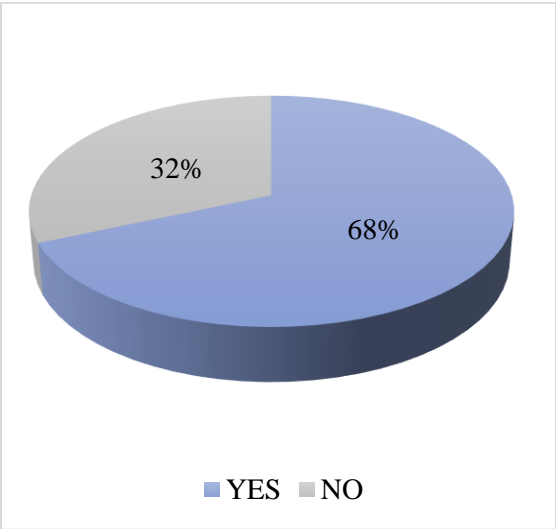


Graph 5.16. Role in the REC

We asked a follow-up question to those who answered that they do not belong to the REC. As we can see in Graph 5.17, where a Likert scale was used (1 - without knowledge up to 5 - a lot of knowledge), 8% assessed that they had great knowledge, 21% reasonable knowledge, that is 25% of respondents have great knowledge about REC, despite not participating. In turn, 19% have no knowledge, 27% have a little knowledge. Graph 5.18 shows that 68% say they intend to participate in a REC in the future.

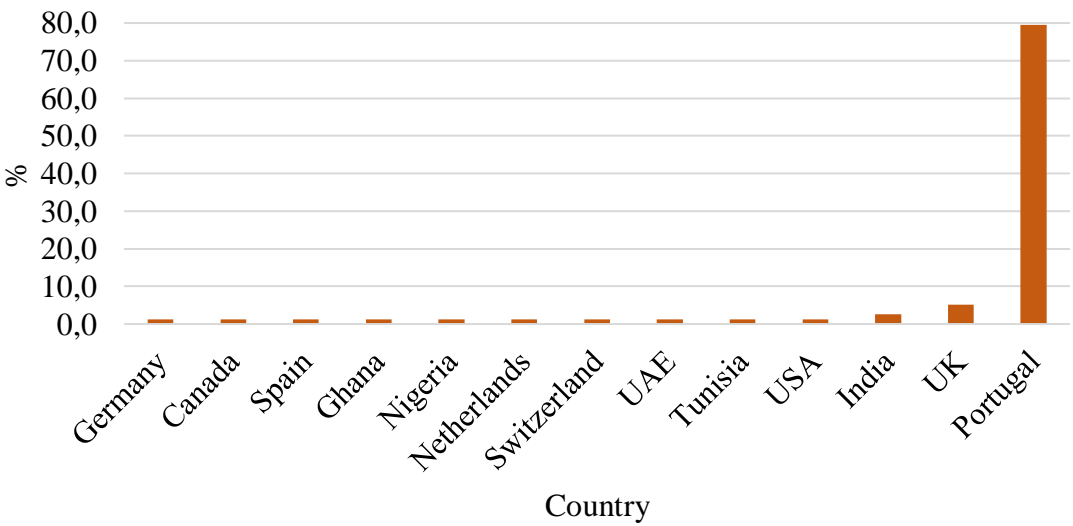


Graph 5.17. How do you classify your knowledge about REC?



Graph 5.18. Do you want to belong to a REC?

Finally, the countries most represented in the survey were Portugal (80%), followed by UK (5%). In this survey, the participants are not only European, but we also have answers from the USA, India, among others (Graph 5.19).



Graph 5.19. Country

5.2 Participation and Motivation

In this segment, we will look at motivation and participation in a REC. The reasons for participating in an REC are very diverse. Understanding the motivation that leads citizens to participate can lead to a better understanding of how and why the system should change. An important point to keep in mind is how challenging it is to keep people motivated to invest their time and resources, sometimes voluntarily, in RE projects over longer periods of time, and even to keep participating when the path gets difficult. Thus, with this two-step analysis, we can understand what motivates an initial participation in a RE project, but also what motivates citizens to continue participating in such projects. The following Table 5.1 shows the questions that were analysed in the two stages of the survey.

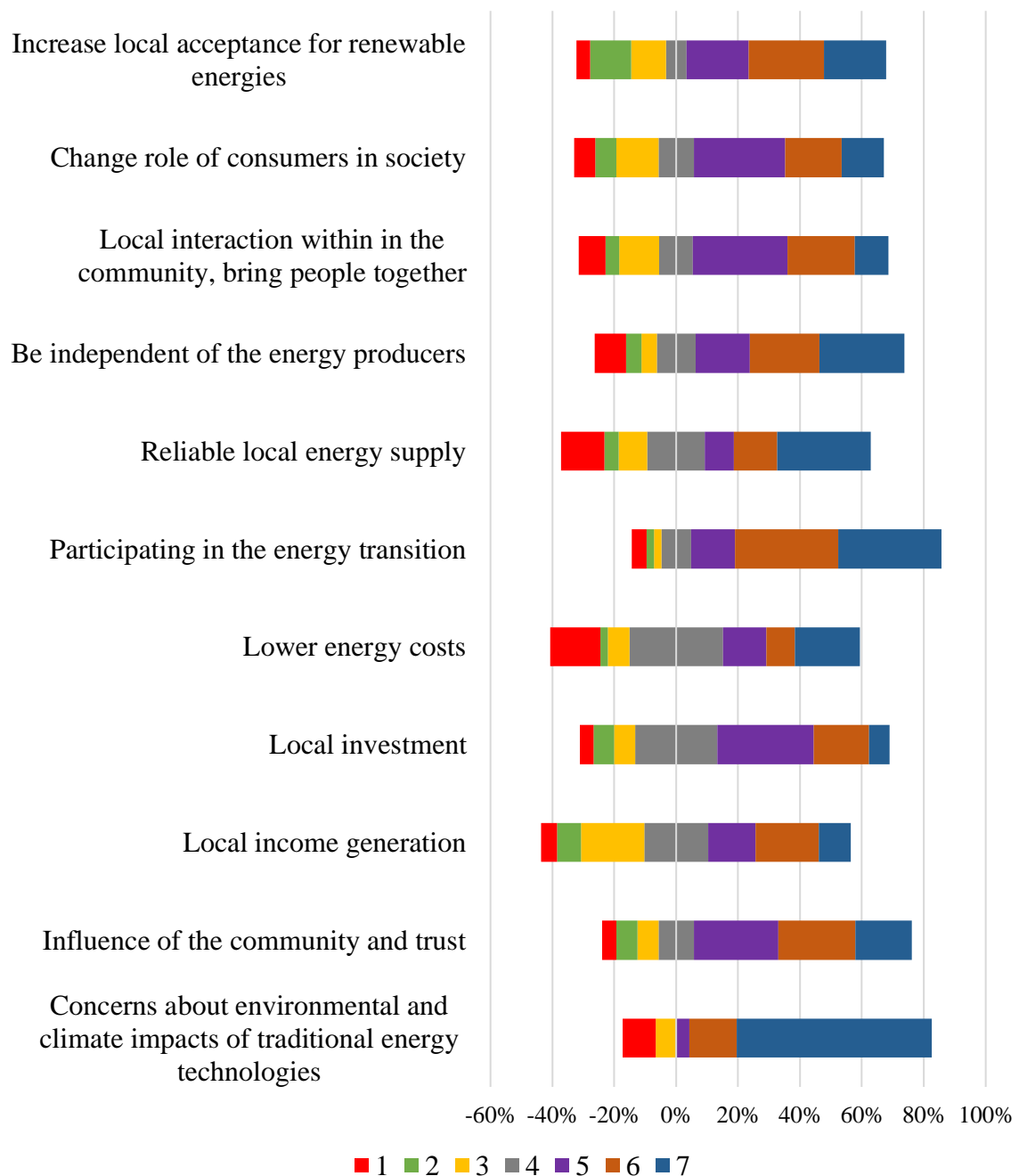
For CE (Stage One)	For All (Stage Two)
What motivates your members to join/found the cooperative / community?	What do you think it is motivates members to join in a cooperative / community?
Please state whether you agree or disagree with the following statements: “Trust plays a crucial role in our cooperative”, “Due to the democratic structure, it is sometimes difficult to make decisions” and “There can be conflicts between older and newer cooperative because they have taken different own risks”	Please state whether you agree or disagree with the following statements: “Trust plays a crucial role in our cooperative”, “Due to the democratic structure, it is sometimes difficult to make decisions” and “There can be conflicts between older and newer cooperative because they have taken different own risks”
Does your cooperative / community provide non-monetary added value to your community? (Region and members)	Does your cooperative / community provide non-monetary added value to your community? (Region and members)

Table 5.1. Participation and Motivation

5.2.1 Stage One

In this section, we analyse stage one of the survey in terms of participation and motivations. Participants should indicate on a scale of 1 to 7 the order of importance, where 1 = not important and 7 = very important Graph 5.20 shows the results of the survey about the several **motivations** for participating in an REC. It should be stressed that, very often,

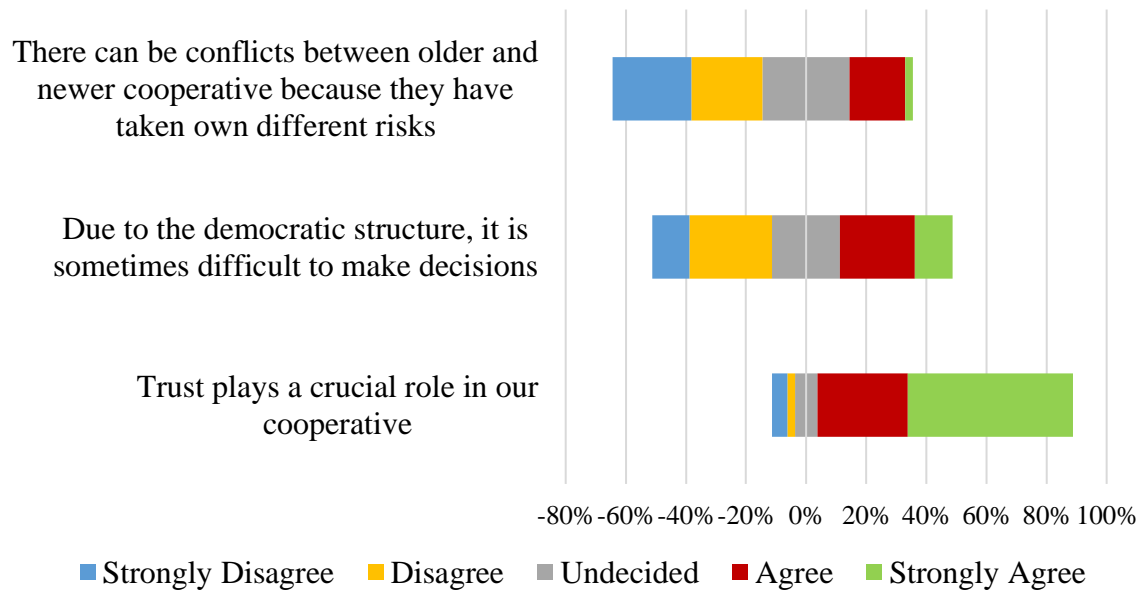
the respondents pick all the motivations. Over 79% agree that the main reason is “*concerns about environmental impacts of traditional energy technologies*”, this is due to the general concern of citizens with environmental and climatic impacts. Following “*participating in the energy transition*” with 71% of answers, although the energy transition itself is an abstract concept to somehow motivate a citizen to participate in an REC and “*be independent of the energy producers*” was chosen by 56% of the participants. Theoretically, it was expected that “*lower energy costs*” and “*local income generation*” would be considered as main motivations for the adoption of REC (Balcombe, Rigby and Azapagic, 2013; Bamberg, Rees and Seebauer, 2015; Hicks and Ison, 2018; Kalkbrenner and Roosen, 2016). However, in our results, that is not the case, and it seems that participants do not think that financial motivations are the most important. Regarding “*influence of the community and trust*” with 65% agreeing and “*local interaction within the community, bring people together*” with 60% agreeing, are considered important motivations, which is a result in line with previous studies (Bomberg and McEwen, 2012; Greenberg, 2014; Hoffman and High-Pippert, 2010). Although participants point out to different motivations for joining an REC, they may be classified as features of an environmental and sustainable lifestyle. Thus, it may be said that the motivation for joining an REC seems to be connected to their lifestyle.



Graph 5.20. Motivation of members to join the REC, from the point of view of those participating in an REC.

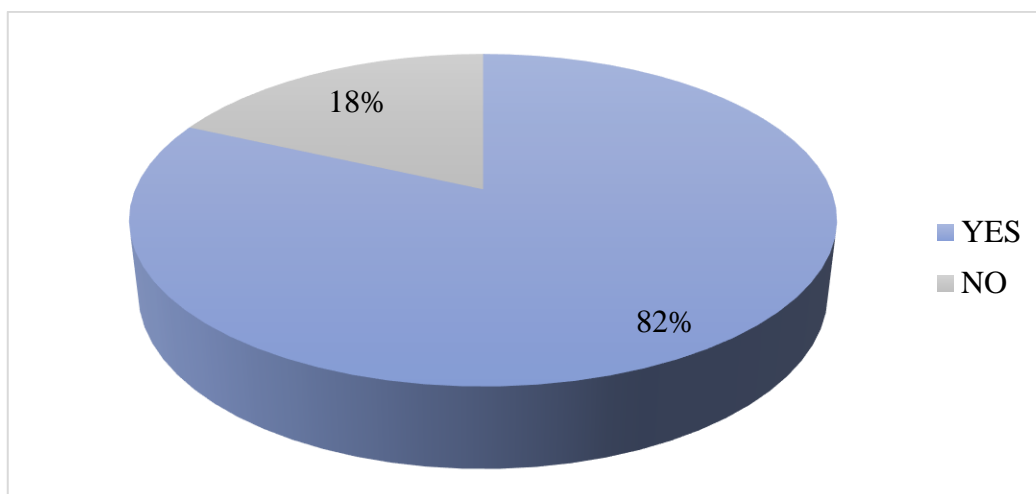
Assuming the theory presented above, we asked respondents what they thought of the following statements: “*Trust plays a crucial role in our cooperative*”, “*Due to the democratic structure, it is sometimes difficult to make decisions*” and “*There can be conflicts between older and newer cooperative because they have taken different own risks*”. Graph 5.21 shows that trust is crucial to increase citizens' willingness to participate

in REC. Therefore, trust can be seen as a prerequisite for the development of RE projects, which is in line with research by Walker et al., (2010), Yildiz et al., (2015) and Bohnerth, (2015). On the other hand, respondents disagree that the democratic structure of the REC makes decision-making difficult and that there may be conflicts between new and old REC, and this result confirms the ones of Bohnerth, (2015).



Graph 5.21. Answers to “Please state whether you agree or disagree with the following statements”, from the point of view of those participating in an REC.

We ask participants if REC add non-monetary value to the communities in which they are located, Graph 5.22 shows that 82% of participants agree that REC bring non-monetary value to their communities, for example, through joint participation and responsibility in a common project, thus leading to an enhanced sense of community.



Graph 5.22. REC provides non-monetary added value to the community, from the point of view of those participating in an REC.

Furthermore, in an open response, we asked participants to describe what kind of non-monetary added value REC's provide in a community. These were summarised in Figure 5.2.1.

Contributions	
✕ involvement in social activities	✕ increased local employment
✕ dissemination of the new energy model	✕ improvements in education
✕ collaboration with social organizations in the dissemination	✕ a pathway to collective participation in the transition to a just and carbon-free economy
✕ energy guidance	✕ social integration (library creation)
✕ social and green action activities	✕ financial (for example, possibilities for local artists to display their works at the CE facility) with the local community.
✕ awareness, promotion, and information on renewable energies.	

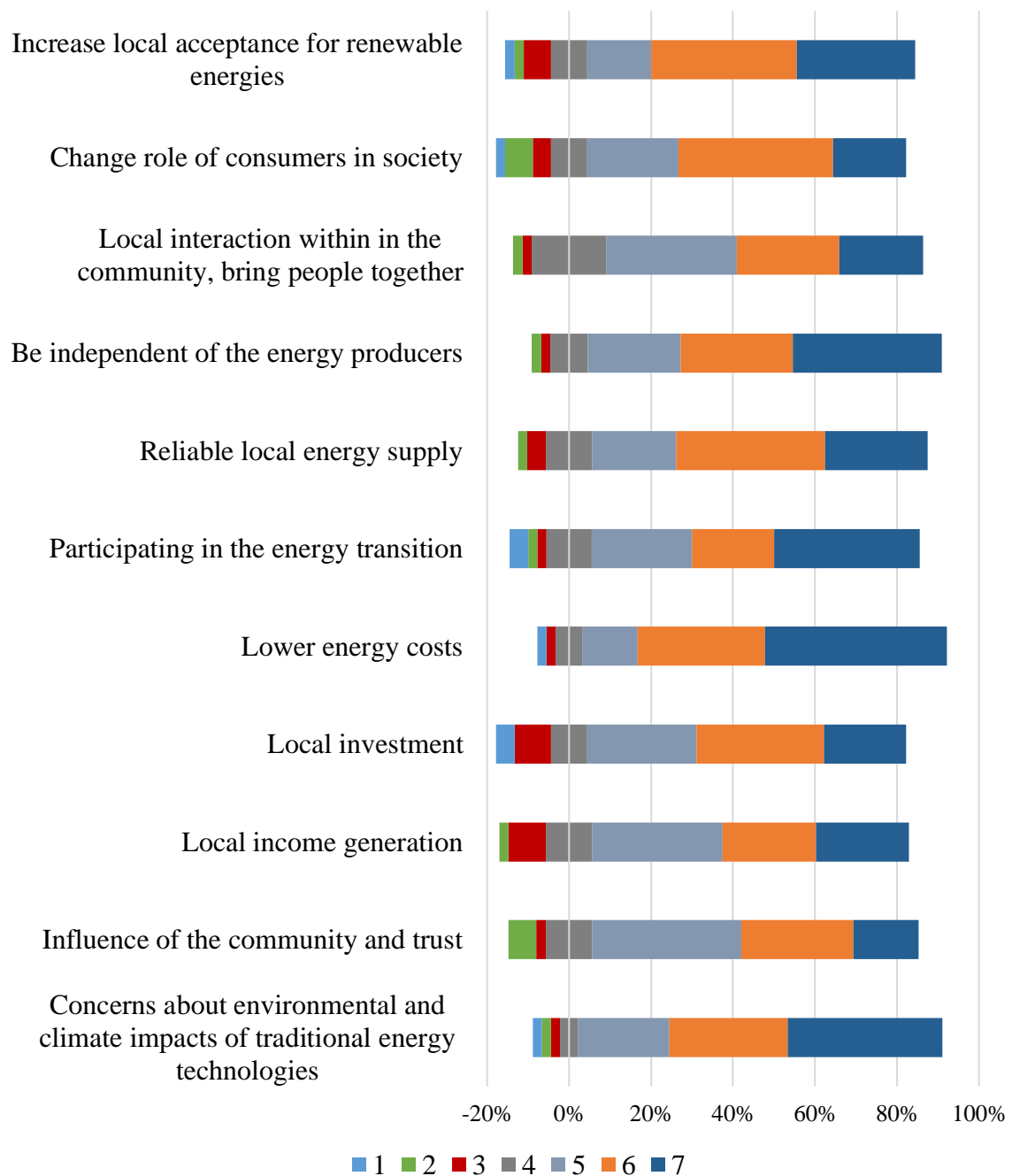
Figure 5.2.1. Contributions to the community

These contributions should also be considered as motivations for members to join a REC, as individuals assume these are the expectations they have when they decided to participate.

5.2.2 Stage Two

Participants should indicate on a scale of 1 to 7 the order of importance, where 1 = not important and 7 = very important. Graph 5.23 illustrates the **motivations** that lead a person to participate in an REC, from the point of view of those not yet connected with an REC. As we may see, 89% of the participants agree that "*concerns about environmental impacts of traditional energy technologies*" and "*lower energy costs*" are the most important reasons to participate in an REC. In this survey, participants state that financial and environmental reasons are both important when deciding whether to participate in an REC. However, a closer look at the chart shows that "*be independent of the energy producers*" (84%), "*participating in the energy transition*" (80%), "*reliable local energy supply*" (80%), "*increase local acceptance for renewable energies*" (80%) are also important reasons for future participation in an REC. Although the participants consider that by joining an REC, the costs will be lower, the environmental reasons are still a driver to consider a change of energy system.

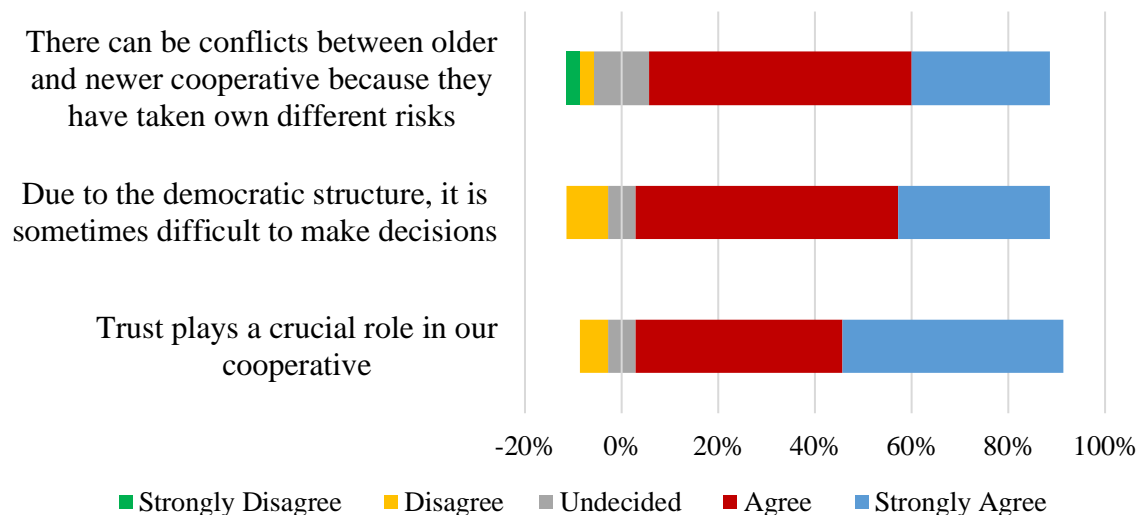
Another inference we can draw is that for people who do not yet participate in an REC, there is not one that is not feasible in this list of reasons, i.e., all the reasons presented have an influence on the decision to participate or not in an REC.



Graph 5.23. Motivates to join an REC, from the point of view of those who do not participate in REC.

Also, in this survey we considered the theory mentioned in the past chapter, so we asked the participants what they thought about three statements. Graph 5.24 shows that 86% think that **trust is extremely important** when one wants to participate in an REC, which is in line with the literature presented (Greenberg, 2014; Sovacool, 2014; Walker et al., 2010; Wiersma and Devine-Wright, 2014; Yildiz et al., 2015). When the other statements, 83%

and 81%, respectively, state that **democratic structure** and **conflicts between new and old members** are also important for decision-making. These two points are not in line with the theory presented, and there is no information as to why this is the case. But it seems likely that there is still a lack of information about how an REC works and therefore, people create some expectations about their inclusion in a REC, causing a positive trend in the responses.



Graph 5.24. Answers to “Please state whether you agree or disagree with the following statements”, from the point of view of those who do not participate in an REC.

We can then conclude, both for members and for those who do not participate in a REC, that the most important motivation to participate in a REC is the concern with the environment. However, in an initial phase, the financial aspects that may arise when actively participating in a RE project are quite important, these change over time and are no longer the motivator to continue participating. This fact is also verified when those who do not participate in a REC are asked about the added value (76%) that REC’s bring to the communities where they are delivered (Annex V). They state that they bring added value and that these contributions and benefits are more environmental and social than financial. The most cited contributions and benefits were “*dissemination of the new energy model*”, “*energy guidance*”, “*social and green action activities*”, “*a pathway to collective participation in the transition to a just and carbon-free economy*”, “*involvement in social activities*”, “*collaboration with social organizations in the dissemination*” and “*awareness, promotion, and information on renewable energies*”.

5.3 Benefits and Drivers

In this section, we will analyse the benefits and drivers that REC's bring to the regions where they will be integrated and to communities in general. The following Table 5.2 shows the questions that were analysed in the two stages of the survey.

For CE (Stage One)	For All (Stage Two)
The following items are generally considered benefits of a cooperative / community.	What do you think are the benefits of a cooperative / community?
Please indicate the main drivers for development of renewable energy cooperatives / community in your region and country?	What do you think are the main drivers for development of renewable energy cooperatives / community in your region and country?

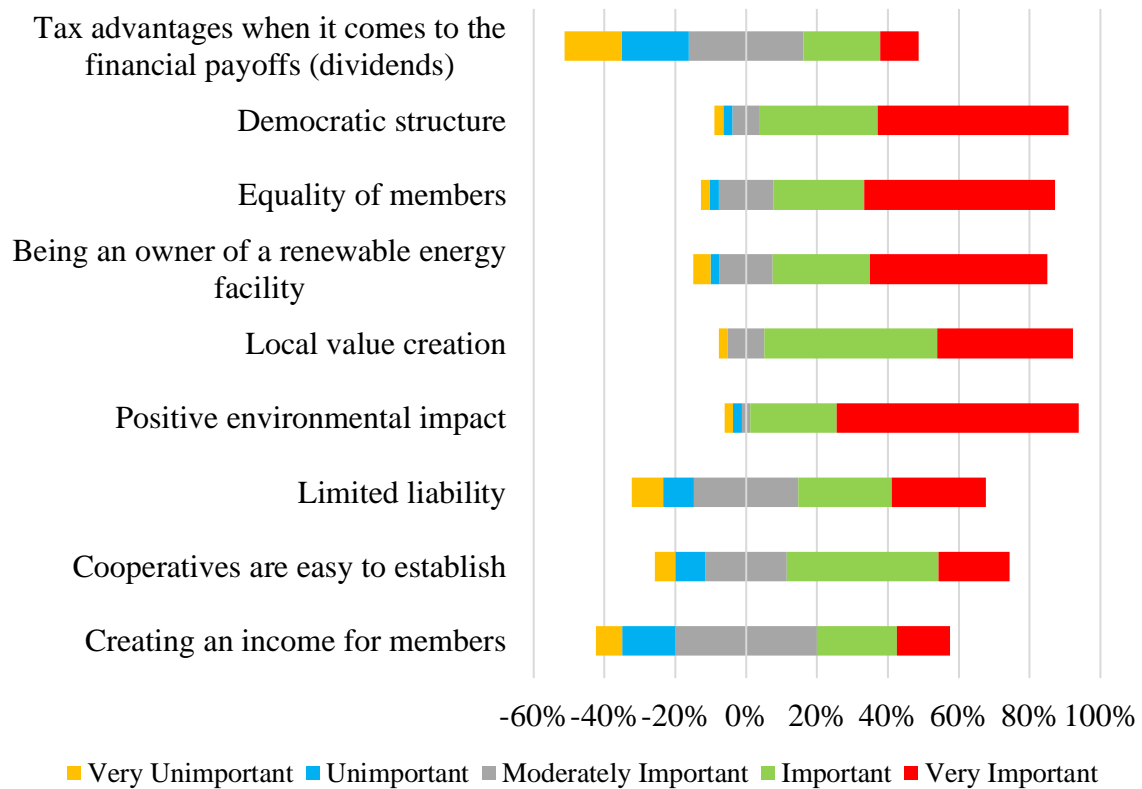
Table 5.2. Benefits and Drivers

5.3.1 Stage one

As already mentioned, there is a difference between benefits and drivers. The benefits are the positive outcomes that will result from RE projects, while the drivers are the strengths for the achievement of a RE project. It is therefore important to analyse these two points together, as they are outcomes of each other.

On Graph 5.25 we may see the **main benefits** assumed by the individuals of being a member in a REC. The most important factor mentioned was the “*positive environmental impact*” shared by the REC. Moreover, the data reflects that the financial benefits are perceived as little importance to the respondents. It is interesting that environmental benefits seem to be more important than financial benefits. As REC's are created to be alternative supply for large companies (Soeiro and Ferreira Dias, 2020), profit making or other financial aspects are not what matters most for their members. Other benefits assumed to be important

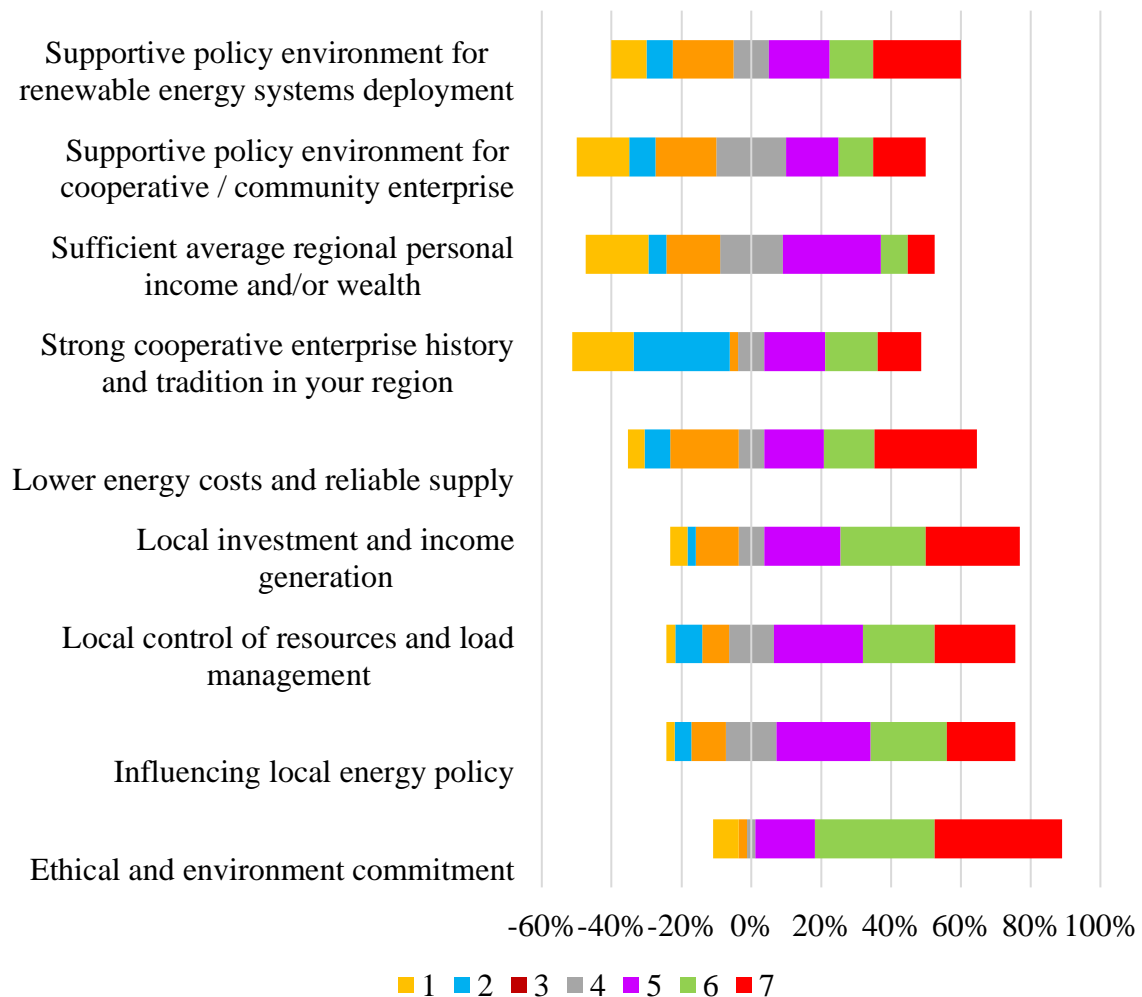
are “*local value creation*,” “*democratic structure*,” “*being an owner of a renewable energy facility*” and “*equality of members*.”.



Graph 5.25. Benefits of an REC, from the point of view of those participating in an REC.

Graph 5.26 shows the REC **development drivers**. Participants should indicate on a scale of 1 to 7 the order of importance, where 1 = not driver and 7 = strong driver. Participants were asked about the main drivers concerning the creation and development of their REC. The conclusions seem to be that drivers with the greatest impact on development for REC’s are “*ethical and environmental committed*” and “*local investment and income generation*,” is in line with the theory presented. When looking at the data, we cannot say that there is, in this list of drivers, one that is mentioned as having a very negative impact on the development of REC’s. We may only say that “*strong cooperative enterprise history and tradition in your region*”, “*supportive policy environment for cooperative/community enterprise*” and “*sufficient average regional personal income and/or wealth*” are drivers considered less important for the development of REC. Regarding the first point, it may be due to the fact that the countries (Portugal and Spain) that most respond to the survey, do

not have tradition in the dissemination of green energy (Soeiro and Dias, 2019; Soeiro and Ferreira Dias, 2020). As for the second point, it is expected that, with the entry into force of the new energy package – Clean Energy for all Europeans (EU, 2019), maybe it will be a positive driver for the development of REC, as correct and well-defined legislation is always a positive incentive (European Commission, [s.d.]; Gancheva et al., 2018). About the last point, it shows that when creating or developing an REC, they contribute to a better income, which in turn contributes to improving the health of citizens. This may be understood as a positive point for REC, i.e., if a region presents statistics that show an elderly or sick population, it will not be an impediment to the creation and development of an REC. This cannot be said about large companies, since the same statistics would lead companies to “flee” from that region.

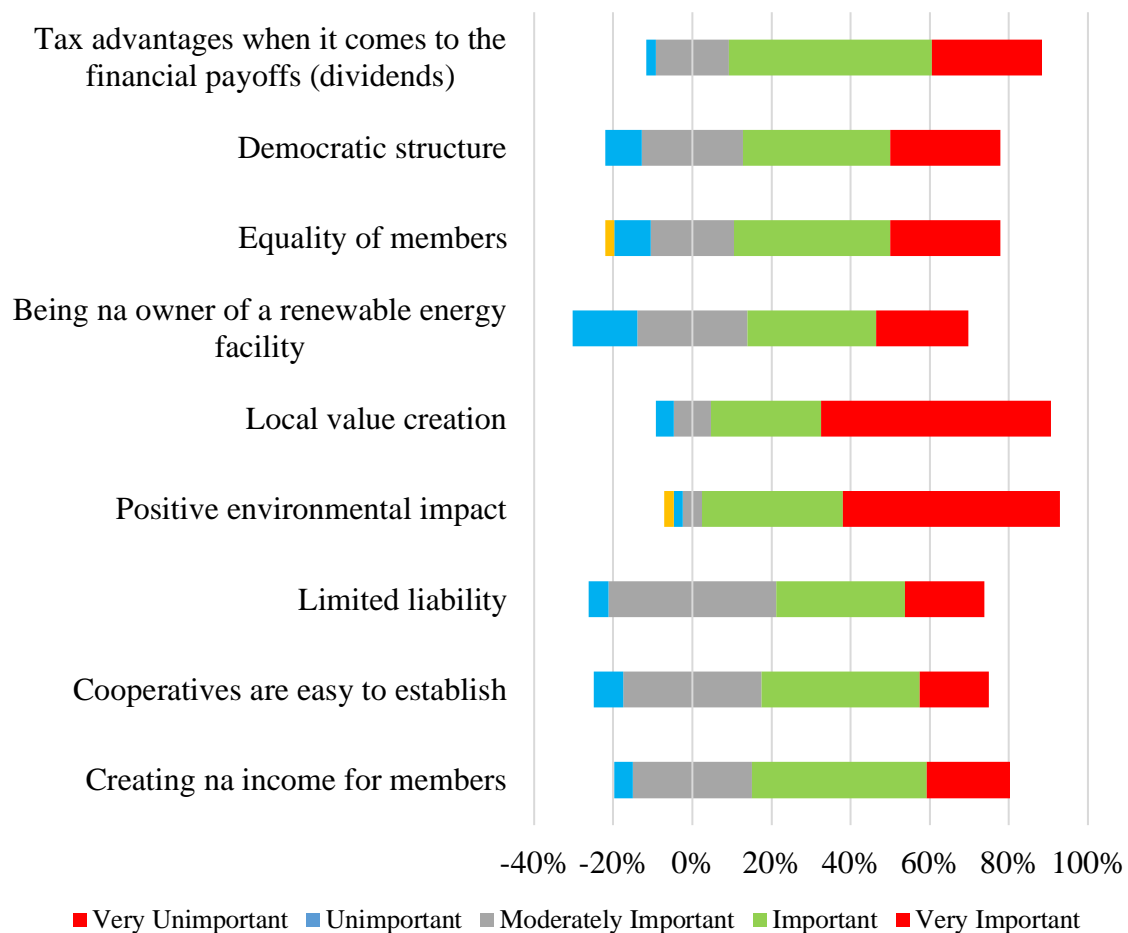


Graph 5.26. Drivers for development of an REC, from the point of view of those participating in an REC.

It seems to us that it was possible to verify that these two points (benefits and drivers) are indeed related. They both show that environmental aspects are of extreme importance for a RE project. And although financial aspects are an important driver to develop an REC, they are not a very important factor for the continuation of the project. It seems to us that the sense of community and mutual benefits that this kind of project brings is more important than the profit.

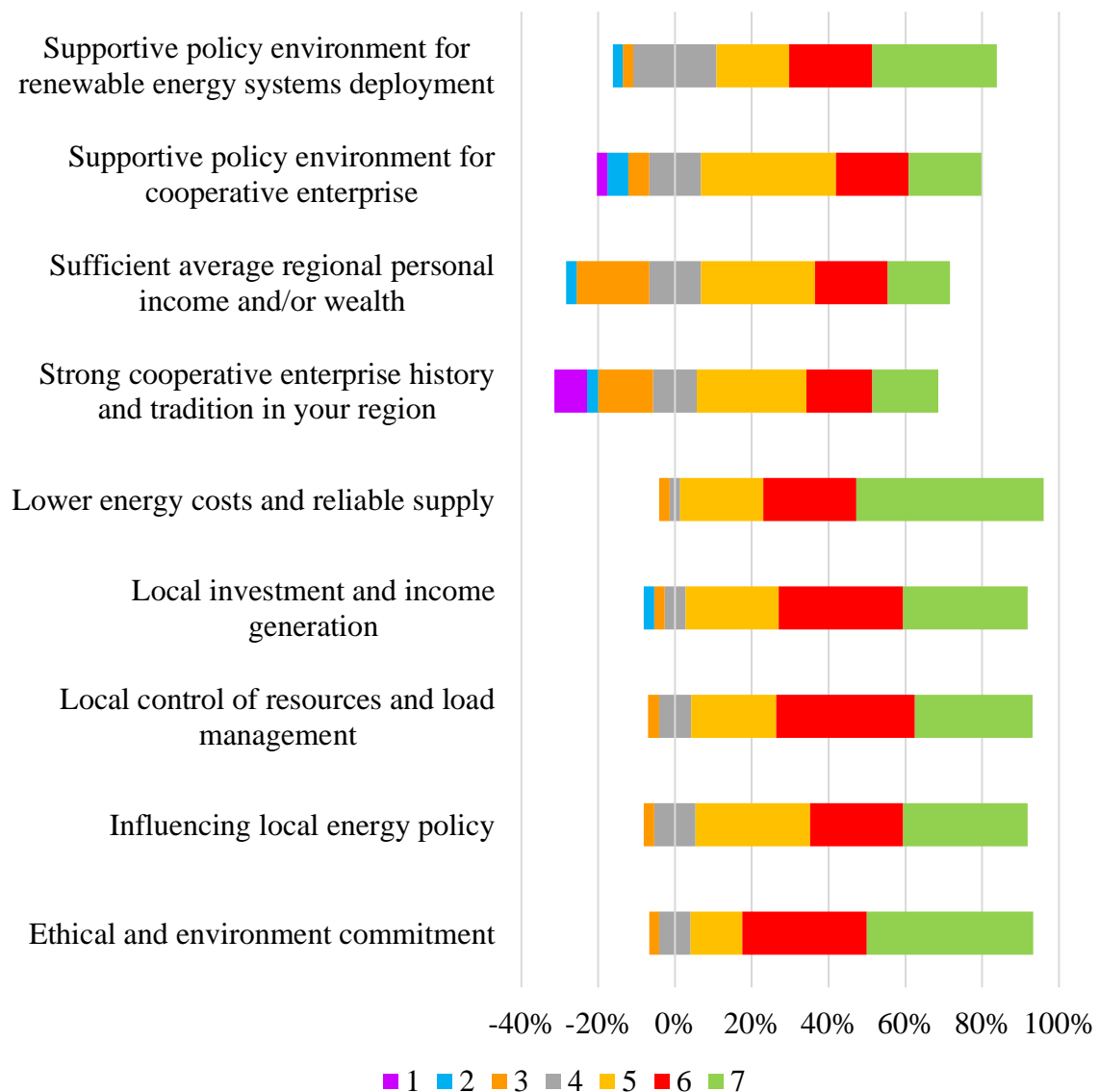
5.3.2 Stage two

The Graph 5.27 shows the **benefits** that are attributed to an REC. The most important, as the most mentioned and with higher rate, are “*positive environmental impact*”; “*local value creation*” and “*tax advantages when it comes to the financial payoffs (dividends)*”. In this analysis we find that the survey participants mention that environmental and financial benefits go hand in hand, i.e., REC’s are important for the environmental future, but also that profit making, or other financial aspects are quite interesting incentives when considering joining an REC. We can also see in the graph that the survey participants think that the benefits presented, at various levels, are all positive when one intends to integrate into an REC.



Graph 5.27. Benefits attributed to an REC, from the point of view of those who do not participate in an REC.

The Graph 5.28 shows which **drivers** are assigned to an REC, i.e., which drivers carry most weight in the creation or development of an REC. Participants should indicate on a scale of 1 to 7 the order of importance, where 1 = not driver and 7 = strong driver. We conclude that there are five drivers that have a major impact on the creation or development of an REC, which are "*ethical and environment commitment*"; "*lower energy costs and reliable supply*"; "*local investment and income generation*"; "*local control of resources and load management*" and "*influencing local energy policy*". They are quite different drivers covering both environment and finance as well as policy.



Graph 5.28. Drivers attributed to an REC, from the point of view of those who do not participate in an REC.

We observed that there are differences in the financial benefits of the responses in the two phases of the survey. While members of a REC no longer attach as much importance to the financial aspects of participating in a REC, non-members still think that the financial aspects of participating are important. Also, in the drivers' non-members include more financial aspects than members of a REC. This difference may be due to changes in priorities and/or mentality when belonging to a REC.

5.4 Barriers to renewable energy development

In this section, we will address the barriers, challenges, and costs that member of a REC face. The barriers are influences that a REC faces from outside, which impact its creation or development, such as environmental policies, the difficulties to enter the energy market, the lack of interest from the communities where it is located, among others. Throughout the development of a REC, these continue to face challenges, which can still be the policies, but can also be in the effort of the members, or even their lack of knowledge. Costs are as much a barrier as a challenge for a REC, ranging from high start-up costs for RE projects, to maintenance costs and licensing fees.

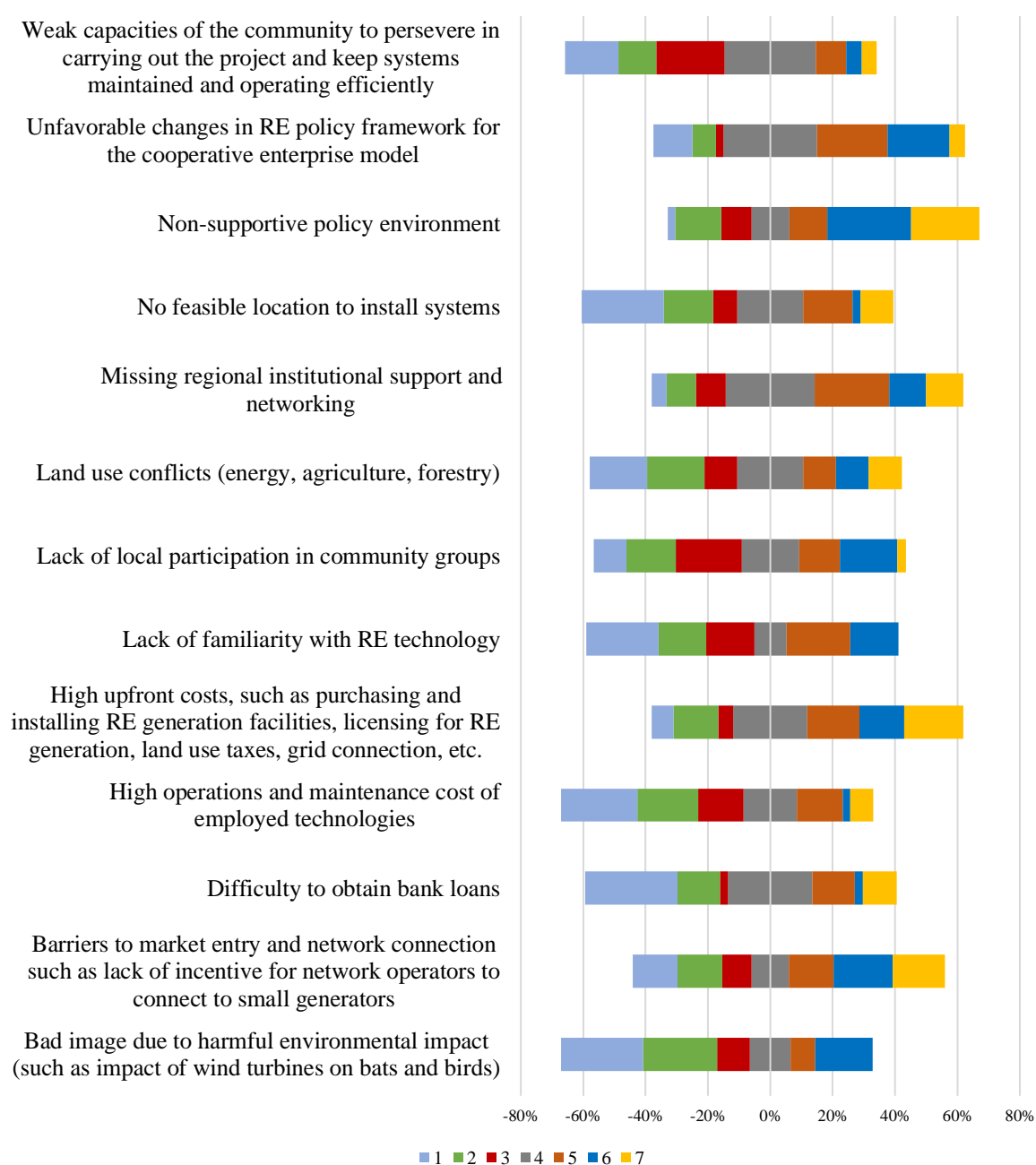
The following Table 5.3 shows the questions that were analysed in the two stages of the survey.

For CE (Stage One)	For All (Stage Two)
What do you think are the main barriers for development of renewable energy cooperative / community in your region and country?	What do you think are the main barriers for development of renewable energy cooperative / community in your region and country?
Please rate your views on the impact of the following cost items on your cooperative / community	Not Applicable
Do the support policies in your country provide equivalent conditions for all actors in the renewable energy sector?	Not Applicable
The following items are generally considered challenges of cooperatives / community.	What do you think are the challenges of cooperatives / community?

Table 5.3. Barriers, Challenges and Costs

5.4.1 Stage One

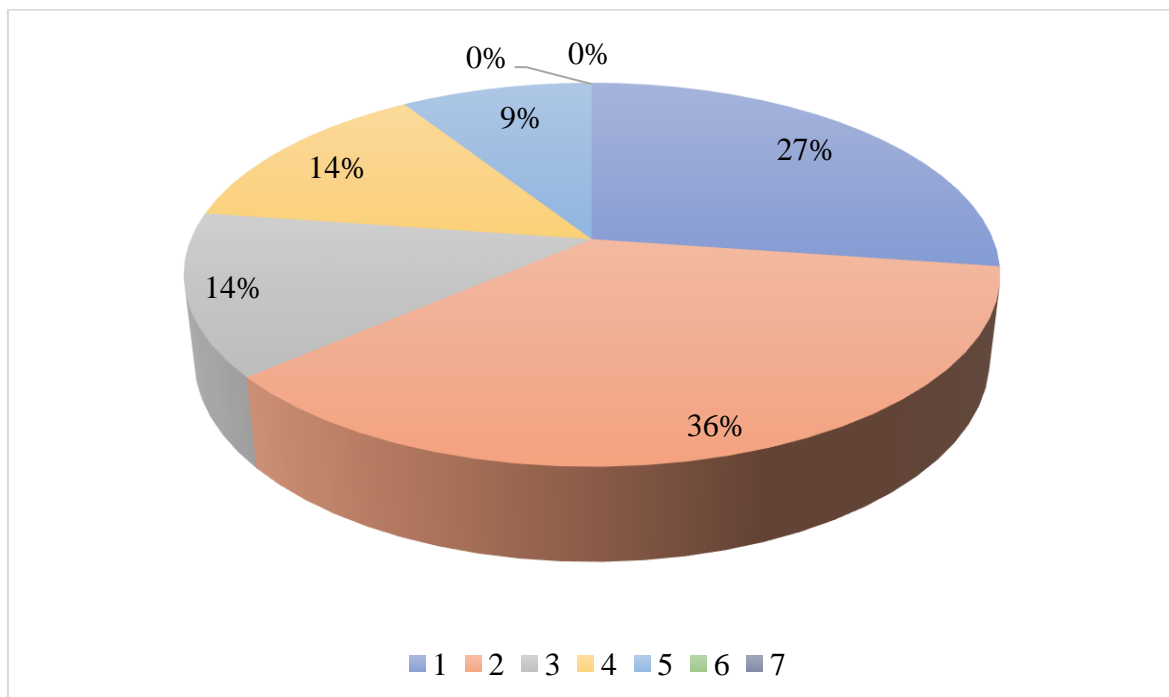
In this section we will address which barriers affect the development of REC's. Participants should indicate on a scale of 1 to 7 the order of importance, where 1 = not a barrier and 7 = strong barrier. It is often argued that environmental policies (laws and regulations) are a major barrier to community energy. Thus, all citizens who want to start a community energy project face legal challenge, at least to some extent. Despite existing **barriers**, many REC's may grow in the energy market, and in fact they do following the question on which barriers affect REC the most (Graph 5.29), participants state that the “*non-supportive policy environment*” and the “*unfavourable changes in RE policy framework for the cooperative enterprise model*” are the barrier that have the most impact on REC adoption and development. This result goes along with the theory shown above (Brummer, 2018).



Graph 5.29. Main barriers to the development of an REC, from the point of view of those participating in an REC.

This barrier meets the question: “*Do the support policies in your country provide equivalent conditions for all actors in the renewable energy sector?*” (Graph 5.30), where over 70% of participants report that there are no equivalent conditions for all actors in the energy sector. This means that the policies that are established seem to benefit the larger companies the most. At least this seems to be the generalized feeling.

With the entry into force of the new European legislation, in particular, the **Renewable Energy Directive (RED)** (Parliament and Council of the European Union, 2018) and the **Internal Energy Market Directive for electricity (IEM)** (European Commission, 2019), and with the transpose of the European directives to the national Law on each country, it is expected that support policies will no longer be a barrier to REC adoption and development. This was also highlighted by the participants as a solution to address the barriers.



Graph 5.30. Do the support policies in your country provide equivalent conditions for all actors in the renewable energy sector?, from the point of view of those participating in an REC.

They are also pointed out as important barriers, “*high upfront costs, such as purchasing and installing RE generation facilities, licensing for RE generation, land use taxes, grid connection, etc.*”, “*barriers to market entry and network connection such as lack of incentive for network operators to connect to small generators*” and “*missing regional institutional support and networking*”. All the barriers pointed out by the participants seem to be in line with previous literature (Brummer, 2018; Kowalska-Pyzalska, 2018; Soeiro and Dias, 2019).

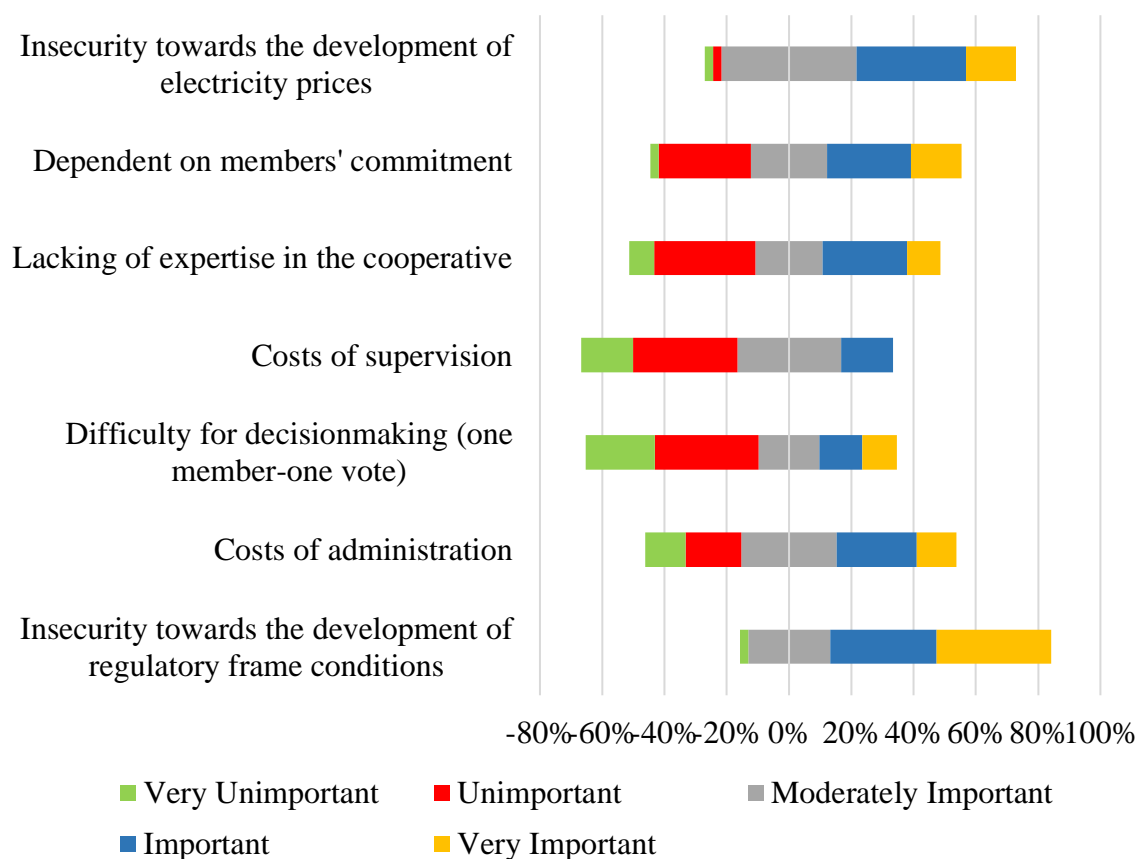
On a very positive note, “*lack of local participation in community groups*”, “*high operations and maintenance cost of employed technologies*”, “*lack of familiarity with RE*

technology” and “*bad image due to harmful environmental impact (such as impact of wind turbines on bats and birds)*”, participants did not consider them as barriers. These results differ from the theory presented earlier.

To overcome these barriers, REC’s try several strategies or implement measures. From some comments it seems that there should be state support for initial planning and soft loans, reduce environmental impact (hydropower), educate the community to reduce energy consumption, among others. Strategies include dialogue with communities and policymakers and informing citizens of the benefits of REC to their communities. These results agree with the findings of Viardot, (2013).

5.4.1.1 Challenges that influence the REC

There are several **challenges** that members of a REC face in its creation and/or development. These challenges are mostly attributed to the barriers mentioned in the previous point. Since the energy sector is subject to both European and national legislation, we can assume that the challenges with the greatest impact are changes in legislation and the volatility of electricity prices in the energy market. Thus, through Graph 5.31 we may observe that 68% of the respondents reply that “*insecurity towards the development of regulatory frame conditions*” and 48% identify “*insecurity towards the development of electricity prices*” as challenges, which meets the barriers presented above. In fact, the concerns about political barriers seem to be higher than the costs of administration or supervision. In turn, 50% choose that “*difficulty for decision-making (one member-one vote)*” is not a challenge for the creation or development of an REC.



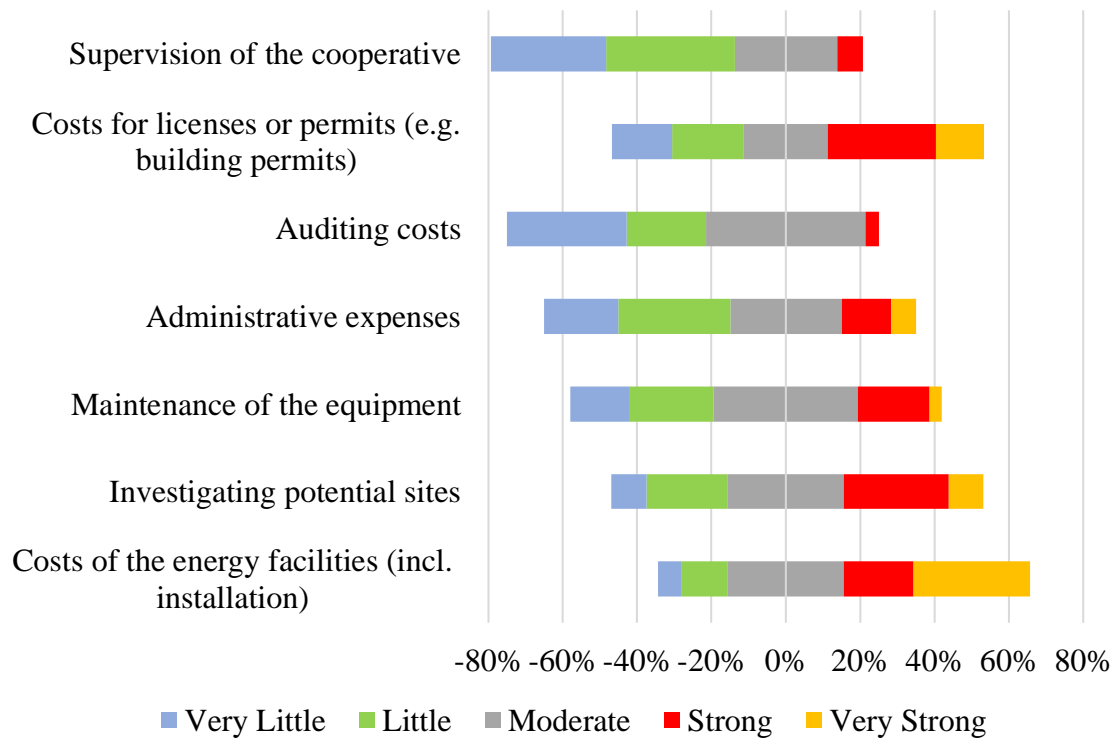
Graph 5.31. Challenges of an REC, from the point of view of those participating in an REC.

From the data presented, it can be observed that supervision and administration costs seem to play a secondary role in the challenges for REC members, even though REC's present high costs for their operation and maintenance. This may be due to the trust that members have amongst themselves and the structure of the REC itself. These challenges may present biases, mainly in relation to costs. This may be since the survey participants in stage one is directly or indirectly involved with a REC. That is, they tend to express opinions on the benefits that REC's bring to the energy transition.

5.4.1.2 Costs that influence the REC

One of the barriers that most influences REC adoption and development is the high costs faced, mainly in the early stages. However, they may also have impact on their progress and development. In Graph 5.32 we may see REC members' opinion on the influence of **cost factors**. It is found that the costs of energy installations, including the purchase, installation,

and connection of the installation, are the most influential. Besides that, “*investigating potential sites*” and “*costs for licences or permits*” are also related to costs. In contrast, “*supervision of the cooperative*”, “*auditing costs*”, “*administrative expenses*” and “*maintenance of the equipment*” seem not to have much relevance.

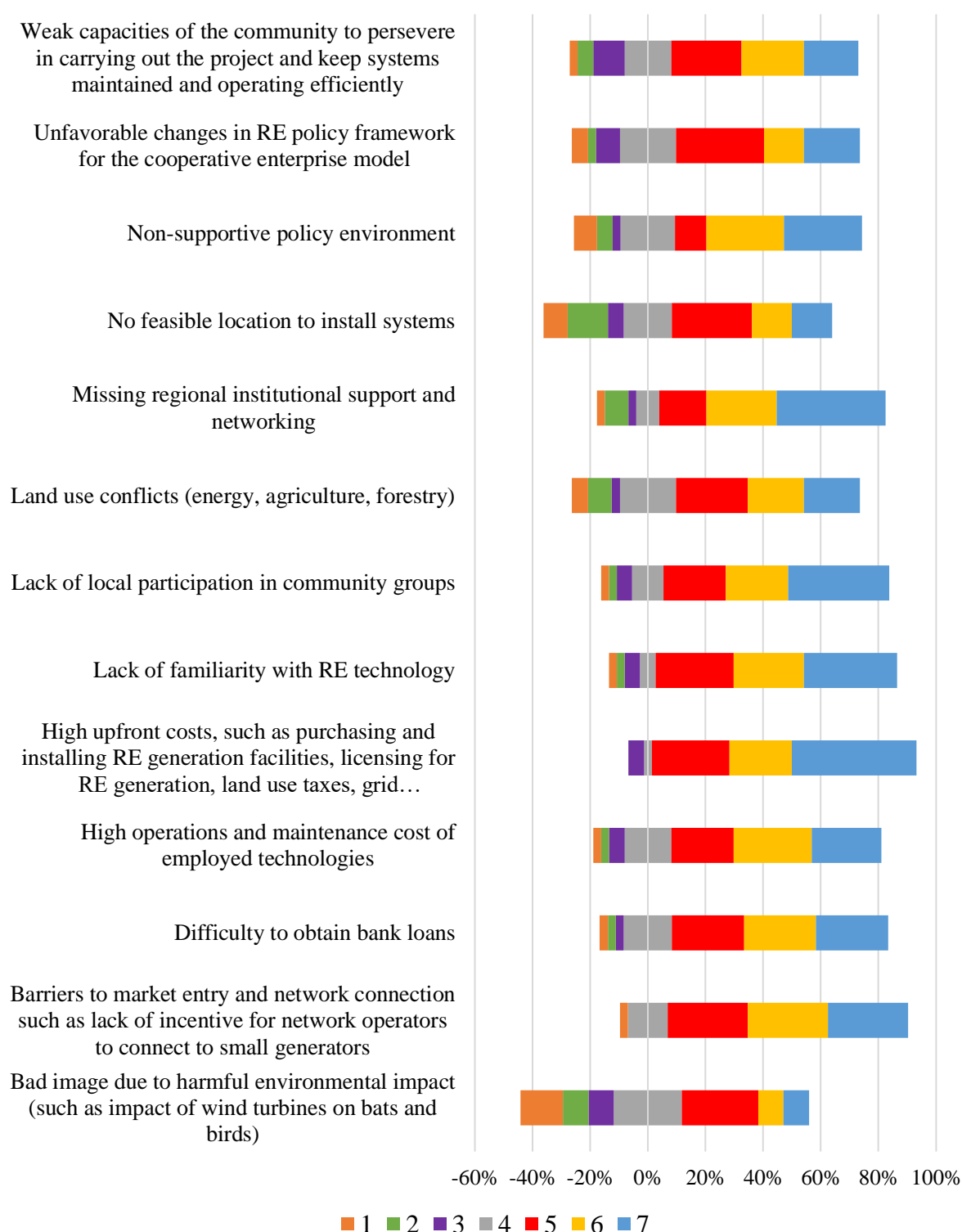


Graph 5.32. Impact of the following cost items on an REC, from the point of view of those participating in an REC.

It is understandable why installation costs are more important than the costs of activities considered less relevant by survey participants. Therefore, a REC that focuses primarily on wind energy requires a very high capital investment than a REC that focuses on solar energy or biomass, as mentioned by Huybrechts and Mertens, (2014) states “*the high costs of acquiring RE facilities, windmills in particular, appeared as one of the main obstacles for setting up RE cooperatives*”. And that maintaining these facilities in the future entails significant costs for the project, as stated by Walker, (2008) “*...costs of keeping systems maintained may become significant and problematic unless an adequate income stream is being generated*”.

5.4.2 Stage Two

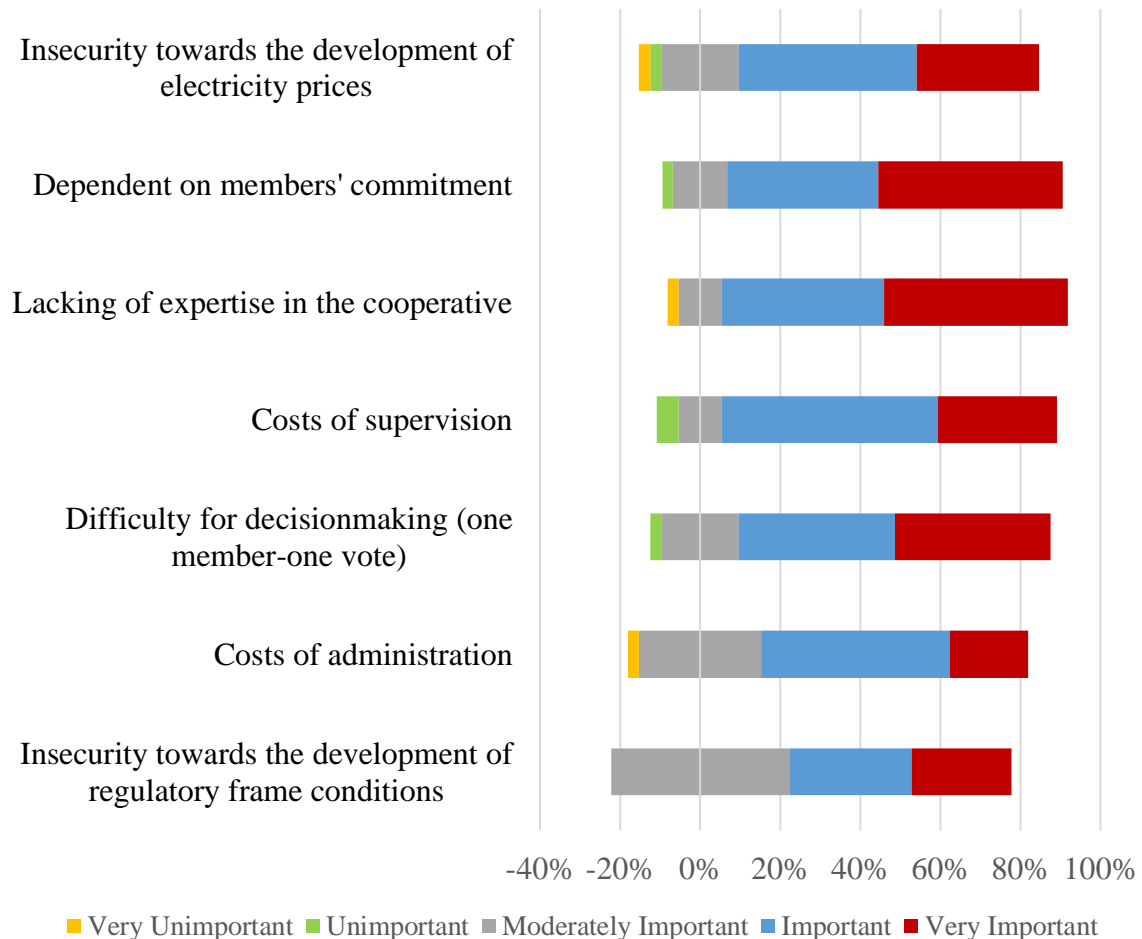
In this section we will address which barriers participants who are not connected to a REC believe will affect the development of a REC. Participants should indicate on a scale of 1 to 7 the order of importance, where 1 = not a barrier and 7 = strong barrier. When questioning the participants who have no relation with an REC (Graph 5.33), they state that, all items presented as **barriers** are possible barriers when creating and/or developing an REC, because all of them were chosen at some point by the respondents. However, we identified three more relevant barriers, since they had more replies: *"high upfront costs, such as purchasing and installing RE generation facilities, licensing for RE generation, land use taxes, grid connection, etc."* (92%), *"lack of familiarity with RE technology"* (84%) and *"barriers to market entry and network connection such as lack of incentive for network operators to connect to small generators"* (81%). It is not possible to mention a barrier that is clearly less important. We may only say that *"bad image due to harmful environmental impact (such as impact of wind turbines on bats and birds)"* seems to be the one pointed out as a negative impact when setting up or developing an REC. In other words, the environmental impact does not seem to be an impediment to the creation or development of a REC project.



Graph 5.33. Barriers attributed to an REC, from the point of view of those who do not participate in an REC.

Regarding the **challenges**, from the point of view of those who do not participate in an REC, (Graph 5.34), it may be seen that all items are considered major challenges.

"Lacking of expertise in the cooperative" (86%) is the most important challenge, followed by the *"costs of supervision"* (84%) and the *"dependent on members' commitment"* (84%).



Graph 5.34. Challenges attributed to an REC, from the point of view of those who do not participate in an REC.

There is a great difference in the answers between the two stages of the survey, since those who do not participate in a REC are concerned about the costs associated with the creation and development of a RE project, the lack of knowledge of the technologies used and the commitment that citizens will have with the project. The lack of knowledge about what a cooperative or energy community is evident in the answers given. With these results, collaboration between social organizations in the dissemination of information on REC and the awareness, promotion and information on renewable energy seems important.

5.5 The disparities between the REC of the EU

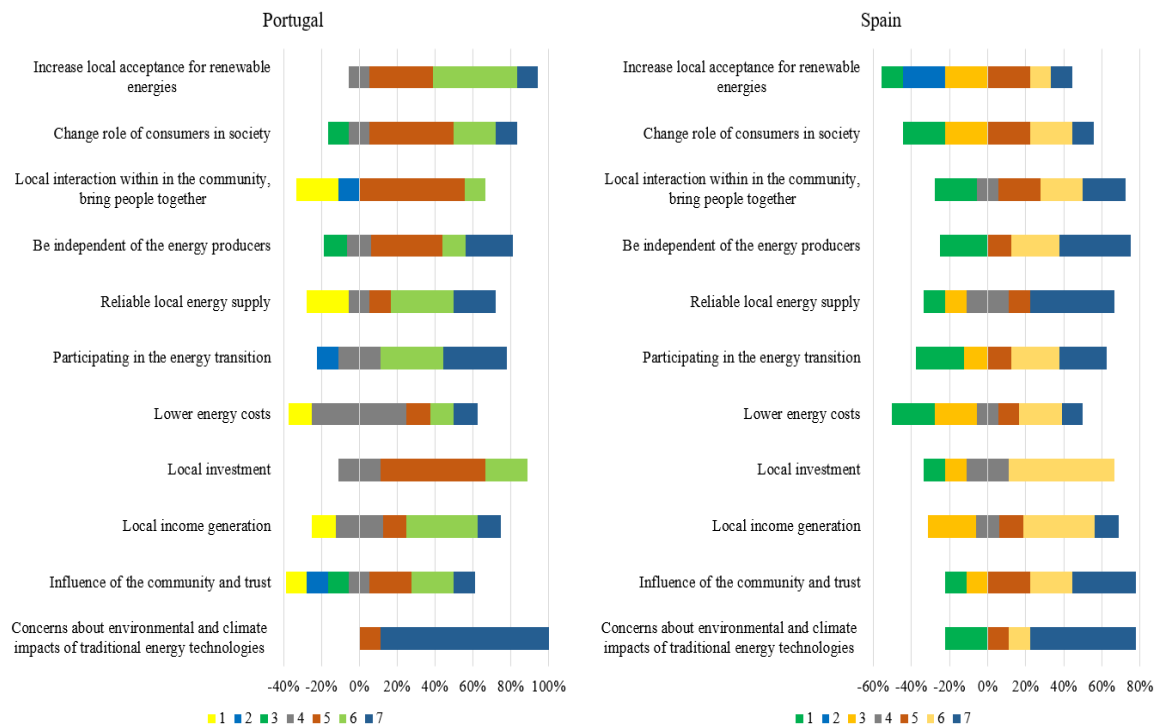
In the following sections, we will analyse the survey data (**stage one**) for the two southern countries (Portugal and Spain) and then they will be compared with two northern European countries (Germany and Denmark). With this analysis, we can better understand whether or not there is a disparity between the countries.

5.5.1 Analysing Portugal and Spain

In this section, we will make a comparison between the two southern European countries (Portugal and Spain), to understand how there can be such big differences in the creation and development of new REC's.

Observing the answers given by the participants who are members of a REC in regard to motivations (Graph 5.35), it may be verified that the most important motivation for establishing or creating an REC is *“concerns about environmental and climate impacts of traditional energy technologies”*. This factor is shared by the REC members in the countries under analysis, but with a slightly higher importance assumed by Portuguese respondents. Social norms are the most important factor when participating in an REC, confirming the conclusions of (Rogers et al., 2012, p. 240), where it is stated that RE projects have the ability to *“promote new social norms”*. *“Participating in the energy transition”* is an important point mentioned, more specifically that this participation may lead to environmental awareness and for the creation of future green jobs and investments. *“Increase local acceptance for RE”* and *“change role of consumers”* in the energy market and in the society are very important for Portuguese citizens, and they are not mentioned as very important for Spanish. This may be since in Spain there is an awareness to participate in a REC, while in Portugal the importance of REC's for the energy transition of the country still needs to be further disseminated. The latest mention that reasons such as *“influence of the community and trust”*, *“be independent of the energy producers”* and *“local interaction within in the community, bring people together”*, are more relevant when participating in an REC. This fact agrees with the mentioned above literature. *“Be independent of the energy producers”* is a common motivation consider important for both country citizens. Finally,

we find that “*lower energy costs*” are not mentioned as an important reason for citizens of both countries, which is a very interesting result, as sometimes is used to disseminate these kinds of projects to the public opinion. Regarding the remaining, they are equally important for the REC’s of the two countries.

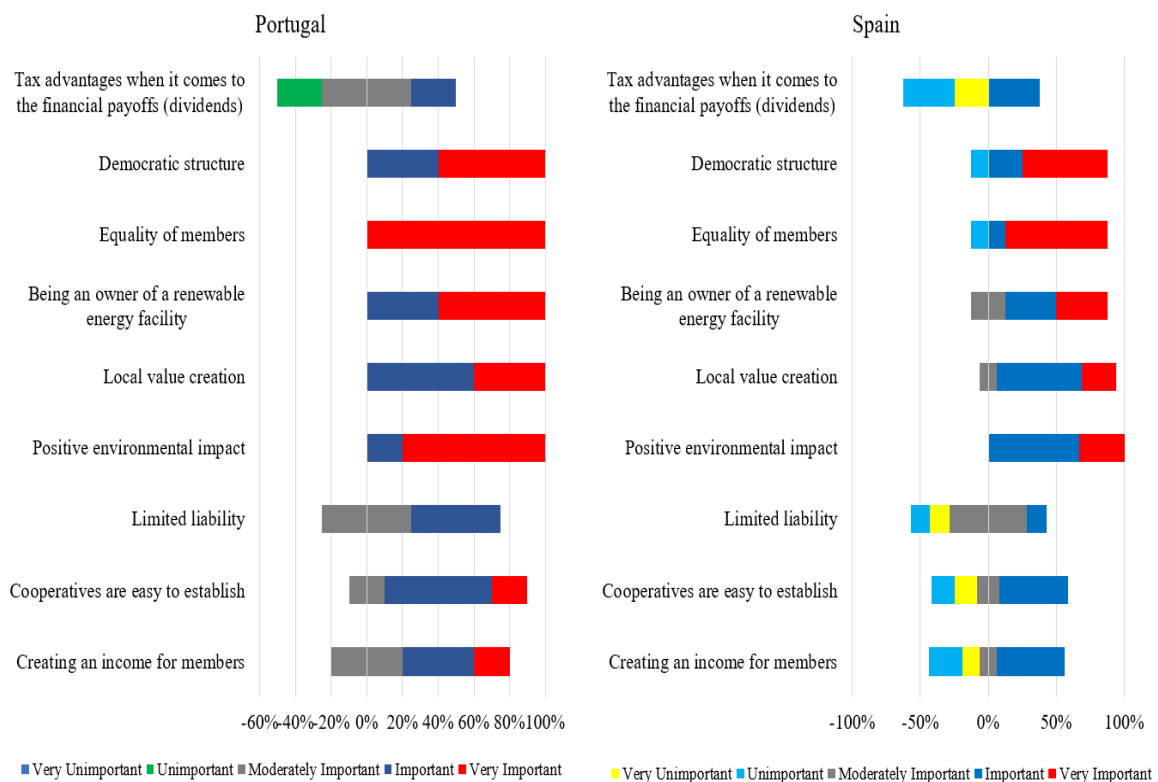


Graph 5.35. Most important motivation for participating in an REC in Portugal and Spain, from the point of view of those participating in an REC.

It is interesting to conclude that the motivations for participating in an REC in these two southern European countries are relatively the same, despite the difference in numbers of REC’s existing in each country. In a comparison of the results between respondents in Portuguese and Spanish REC’s, with the rest of respondents of the survey from other countries (Graph 5.20), we observed that there is a reason commonly important for all, that is, “*concerns about environmental and climate impacts of traditional energy technologies*”. This is in fact a reason mentioned by almost all respondents as very strong to participate in an REC. In fact, there does not seem to exist a large difference between the Portuguese and Spanish REC’s and the rest of the European respondents on our survey.

Analysing the answers about the benefits (Graph 5.36) that a REC brings to its members and to the community where it will be installed, it can be seen that all participants

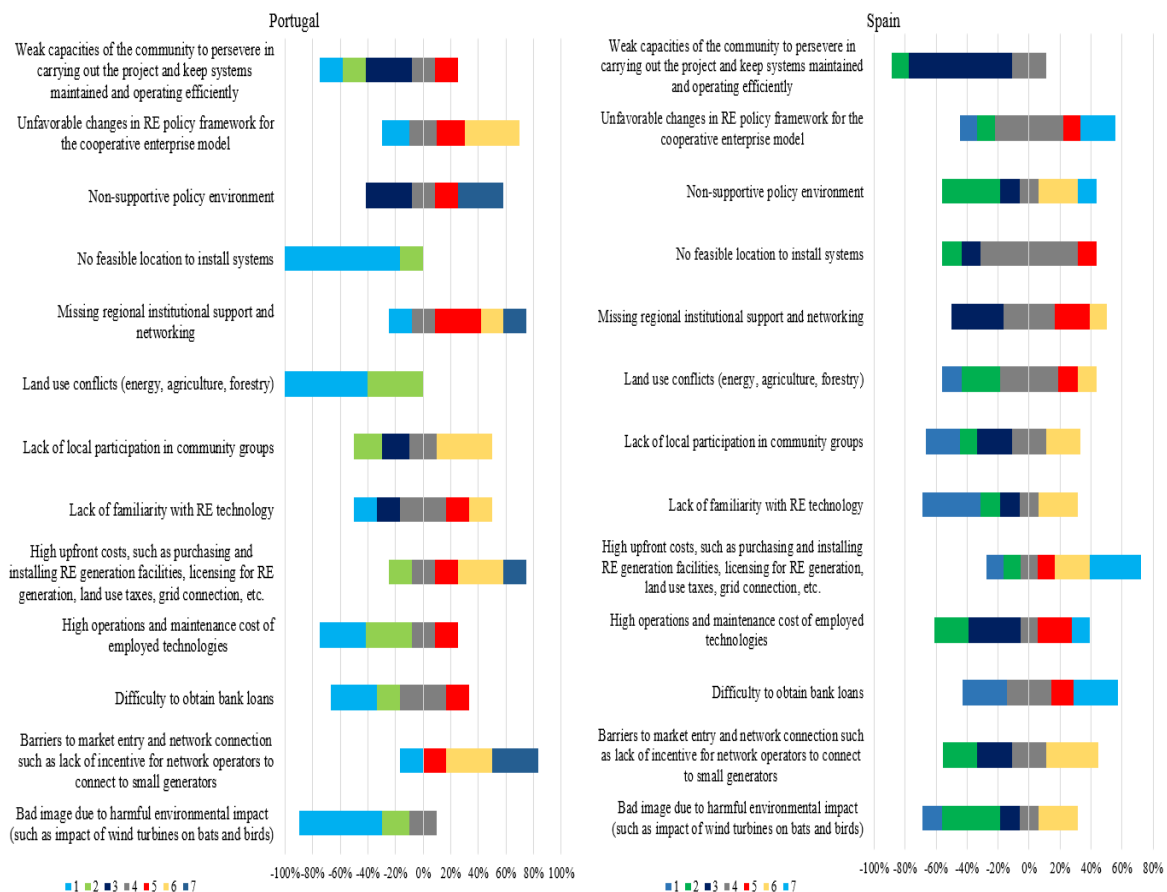
in the study consider almost all items to be beneficial to the creation or development of an REC in both countries. In Spain, members consider "*positive environmental impact*" a more important benefit than members in Portugal, but in contrast "*tax advantages when it comes to the financial payoffs (dividends)*" is not considered a benefit for members of an REC in Spain and Portugal. This fact may be due to the lack of tax incentives that the Spanish and Portuguese governments give to the creation of an REC. However, we find that these observations are in line with the overall participants of the study.



Graph 5.36. Most important benefits for participating in an REC in Portugal and Spain, from the point of view of those participating in an REC.

Analysing the answers on the barriers (Graph 5.37) for the creation and/or the development of a REC, we verify that for the Portuguese participants it is "*barriers to market entry and network connection, such as lack of incentive for network operators to connect to small generators*". In the case of Spain, it is "*high upfront costs, such as purchasing and installing RE generation facilities, licensing for RE generation, land use taxes, grid connection, etc.*". These differences are maybe due to the lack of incentives that the Portuguese government provides to RE projects trying to emerge in Portugal, while in Spain

there is a greater incentive, but the costs for the creation of a REC are difficult to overcome, requiring the creation of accessible financing lines. Despite being different opinions, in a more detailed analysis of the chart, we observe that both barriers have great weight in the constitution of an REC. In a comparison with the other participants in the survey, we verify that the *"non-supportive policy environment"* does not have the same weight, being relatively lower, for the Portuguese and Spanish participants as it does for the global participants. This is an interesting point, since legislation in these countries is only now evolving. Although it already presents some results, as in the Portuguese case where the first REC was recently created under the new legislation and more will follow, these are not yet satisfactory to have an impact on the energy market.



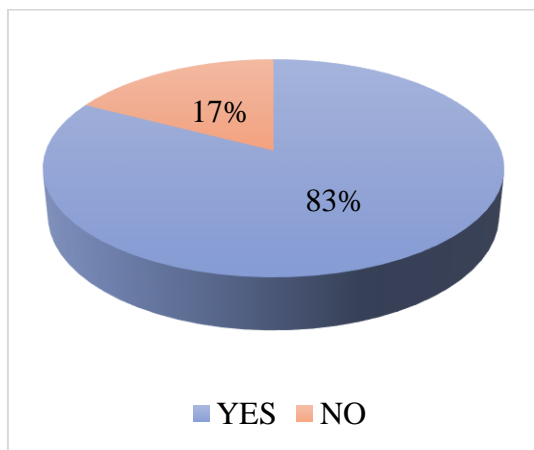
Graph 5.37. Most important barriers for participating in an REC in Portugal and Spain, from the point of view of those participating in an REC.

The reasons presented are not only intrinsically related to the identity of the community, but also, connected to the collaboration with the local region which also aims

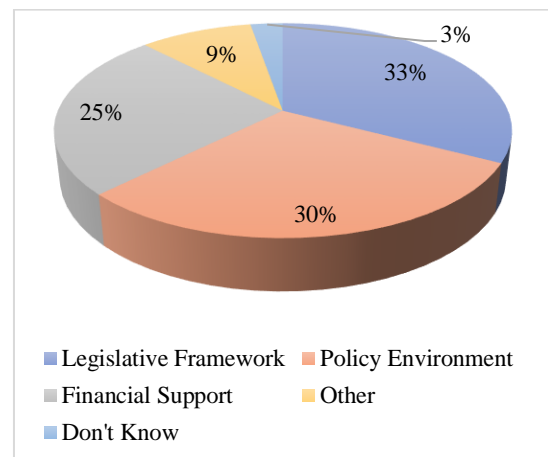
to create a perception of the community. With this analysis, we find that the survey participants' answers on the motivations, benefits, and barriers in the Southern European countries, represented by Portugal and Spain, do not differ from the global participants. Thus, it seems to us that other factors are negatively influencing the development of new REC in the energy market.

5.5.2 Comparison between Portugal, Spain, Germany, and Denmark

To understand if there are differences between the REC of the Southern countries and the Northern European countries, our survey has a question on the perception from the individuals on this topic. From the total responses, 83% of the participants referred that there are differences between the REC of the South and the REC of the North (Graph 5.38). On a question about the reasons for this difference, the Legislative Framework stands out with 33%, Policy Environment with 30% and Financial Support with 25% (Graph 5.39). Some survey participants point to other factors that may lead to this difference, such as awareness, environmental education, environmental culture, and mentality.



Graph 5.38. “Is there a difference between REC in northern Europe and southern Europe?”



Graph 5.39. “What factors contribute most to this difference?”

At this point of the analysis, we will make a comparison between two southern European countries (Portugal and Spain) that do not present a tradition of CE dissemination (Heras-Saizarbitoria et al., 2018; Soeiro and Dias, 2019; Soeiro and Ferreira Dias, 2020),

with two countries with a high implementation of REC (Germany and Denmark). The two southern countries have a small but emerging number of REC within the EU (Heras-Saizarbitoria et al., 2018). In order to understand the differences between REC's in Southern countries and those in Northern countries, Table 5.4 shows a comparative analysis of four REC: Coopérnico, Som Energia, Hvide Sande and Jühnde¹³ (Coopérnico, 2019; Heras-Saizarbitoria et al., 2018; Morris, 2019; Simcock, Willis and Capener, 2016).

The REC models developed in Portugal and Spain are quite different from the models in Northern European countries. In Germany and Denmark, there are several REC's consisting of projects developed by small communities of neighbours who are, simultaneously, producers and consumers. On the other hand, in Portugal and Spain there is a kind of "big business", i.e., the REC's trying to expand throughout the country, creating small cooperative points, with the name of the original REC. One can also see differences in the membership of the REC's in the south, i.e., the membership is differentiated between investor members and consumers who hold an electricity contract. Not all consumers are REC members, and not all investors are consumers.

	Som Energia	Coopérnico	Jühnde	Hvide Sande
Country	Spain	Portugal	Germany	Denmark
Founded	2010	2013	2005	2012
Number of members	56 490	1288	More 560 (nearly 75% of Jühnde's inhabitants)	400
Technology	Photovoltaic Biogas Hydropower	Photovoltaic	Bioenergy and other technologies – small scale but whole village	Village
Rural / Urban	Urban	Urban	Rural	Rural
Organisational structure	Cooperative	Cooperative	Cooperative	Cooperative
Installed power	8,88 MW	1,33 MW	1.25 MW	9 MW
Number of Contracts	126 879	1649	-	-
Production / Distribution	Yes	Yes	Yes	Yes

¹³ The use of these REC's is merely illustrative, any other REC could have been used, except for Portugal, where we can only use Coopérnico.

	Som Energia	Coopérnico	Jühnde	Hvide Sande
Share of RES (2019)	18,4%	30,6%	17,4%	37,2%
Date of foundation first REC	1925	2013	1994	Early 80's

Table 5.4. Comparative analysis between two REC's from Southern Europe and two from Northern Europe, based on (Coopérnico, 2019; Heras-Saizarbitoria et al., 2018; Morris, 2019; Simcock, Willis and Capener, 2016)

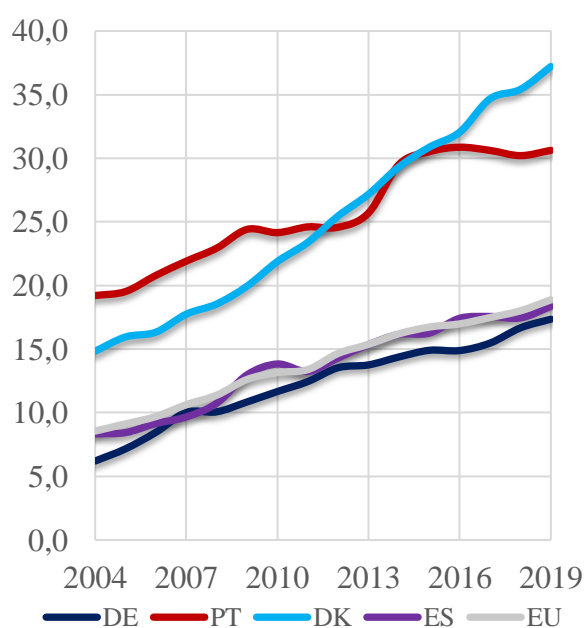
When analysing the REC on the South, we may already see great differences. The Som Energy, although recent, has a high number of members, and continues to grow. In turn, although Portugal is the country with the most share of RE consumption, of the two REC's, it has only one cooperative, with almost 1649 contracts in a period of 8 years, however it shows an increasing growth, and with quite interesting values of RES energy sold.

Although we are analysing relatively small, rural-based REC's in Northern European countries for comparison, it does not prevent us from seeing differences. In these countries there is a tendency towards more regionally based REC's, but there are also large REC's with national reach. This evolution is proved to bring great benefits to the regions where they are delivered (Simcock, Willis and Capener, 2016).

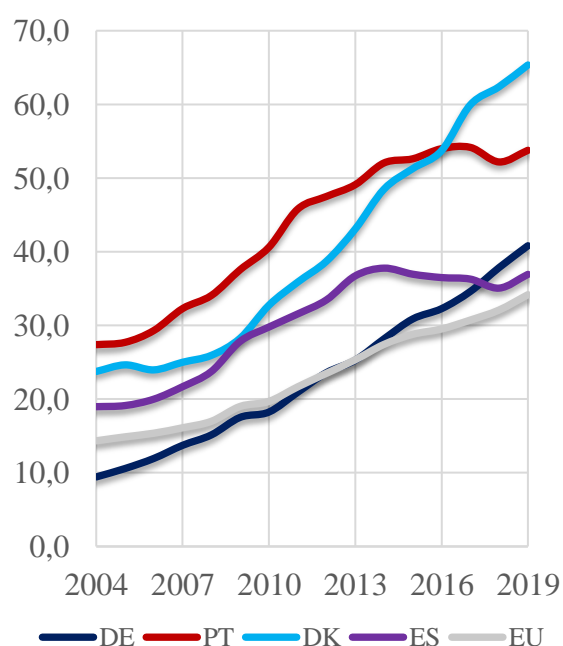
In the German project, Jühnde, we may see a great involvement of everyone for the success of the project. Göttingen University played a crucial role in the start of the project and important support in the development of the project. There was also support on a political level, with the personal involvement of the local mayor, to motivate local participation in the project. As REC's are quite widespread in Germany, residents had knowledge of the cooperative business model and shared the same beliefs and values to make the project a success. This project also brought interpersonal trust and social cohesion among local residents (Simcock, Willis and Capener, 2016).

The Danish project, Hvide Sande, was set up to reverse the country's trend towards wind farms owned by private developers. Also, in the ownership structure and profit distribution, this REC aims to be a differentiator from the cooperative model that has dominated the community energy sector in Denmark. This project has gained wide acceptance from the local population due to its unique community model (Simcock, Willis and Capener, 2016).

After analysing the comparison between the four REC (Table 5.4) and the measures that have been taken by the different countries regarding the promotion of RE projects (see cap. 2.8.1), several data from Portugal, Spain, Denmark and Spain will be compared in order to obtain an explanation of the disparity that exists in the success of RE projects promoted by citizens in each of the countries. Firstly, we observe the evolution of renewable energy consumption in these countries (Annex VI), there is a clear increase from the lowest values of the 1990s (below 15%) for all countries. The exception is Portugal (~27%), where geothermal and wind energy plays a very important role.



Graph 5.40. Share of energy from renewable sources in % of gross final energy consumption, based on Eurostat (Eurostat, [s.d.])

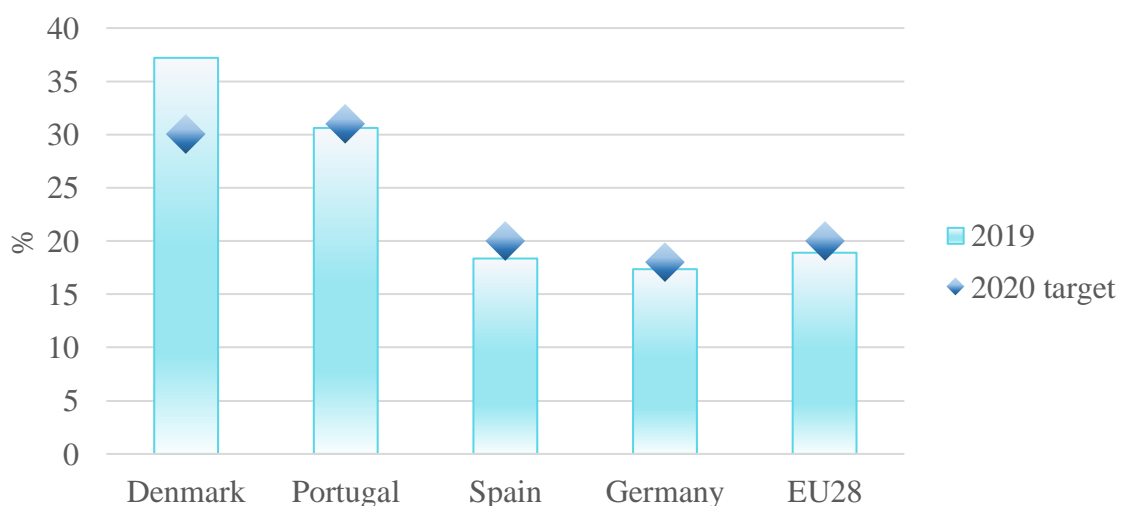


Graph 5.41. Share of renewable energy in electricity generation, based on Eurostat (Eurostat, [s.d.])

Graph 5.40 and Graph 5.41 show that in 2005, all countries show a significant increase in RE consumption. From a positive evolution over the years, we can see that RE consumption shows a significant increase from 2010 onwards this fact may be due to a higher incentive for the use of RES, both for large and small producers. Compared to the EU average, both Germany and Spain show very similar values and growth. Since 2009, the figures are all above 10%. This development may echo the first activities of energy cooperatives in Spain, while in Portugal, the single cooperative still plays a marginal role in the energy market. Portugal is well above the EU average, due to the increase in wind farms

in the country in the years of 2010. The creation of Coopernico in 2013 and their cooperative's PV projects in various places in the country may be seen as a small contribution to these levels of consumption (Soeiro and Ferreira Dias, 2020). Denmark, as mentioned above, in 2001, where the impact of increased wind energy production is already noticeable in energy consumption. This fact is interesting as the installed powers of RE technologies in Germany and Spain are much higher than in Portugal and Denmark, however the latter two countries, which has less population relative to the other two countries, have the highest final and electrical RES energy. In 2018, Denmark produced 93.6% of RE electricity that was generated in wind energy. Solar and hydro energy, also contributed to the electricity production (International Energy Agency, 2019).

Graph 5.42 shows the data for the year 2019 for the RE share and the 2020 target for the four countries under analysis. The only country that has reached the target is Denmark, having already achieved this target in 2015. Although Portugal has high ER shares, but also the highest target of the four countries, it has not yet reached this target, it is expected that in the 2021 report they will have already reached the proposed target. Regarding Spain and Germany, they have not yet reached the target and are still short of the target. Thus, with the entry of REC into the energy market, and with the implementation of some policy measures, these may greatly help the Southern Europe countries to reach the targets for 2020.

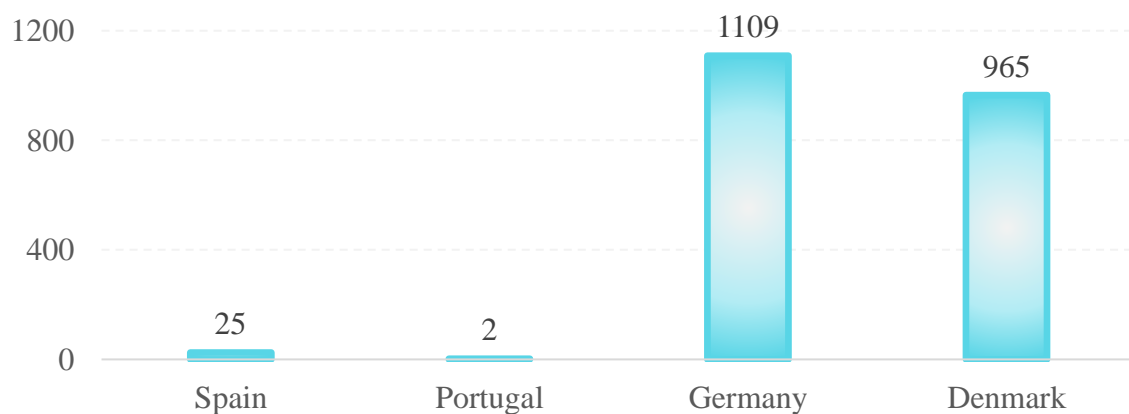


Graph 5.42. Share of energy from renewable sources and 2020 target, based on Eurostat (Eurostat, [s.d.]).

A brief analysis of the literature on these four countries shows that the evolution of the REC shows very disparate values (Graph 5.43). In the Northern European countries,

there are high numbers of REC's. Germany in recent years had a peak of new REC, while Denmark had very high values, but in the last two decades, several REC's have been disappearing. This evolution has various reasons such as the disappearance of Feed-in Tariff, the liberalization of the energy market and the appearance of large investments in offshore wind farms (Morris, 2019; Wierling et al., 2018). Southern European countries have very low values.

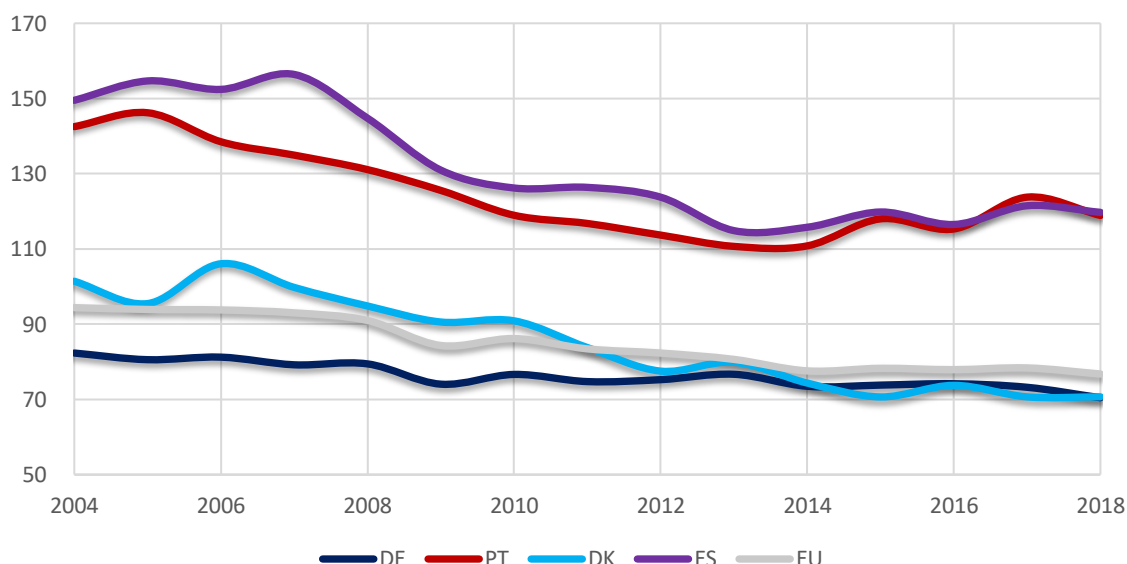
Most of the REC, in Spain, appeared in the last two decades, which may show the great involvement of citizens in the energy matters and the growing interest in this type of projects. In Portugal there are still only two REC's, one being created very recently., and much work needs to be done to involve citizens in this type of project. The four countries that constitute the so-called Southern European countries (Portugal, Spain, Italy and Greece) show a deficit in the promotion of REC's (Soeiro and Ferreira Dias, 2020).



Graph 5.43. Approximate number of REC, based on (Heras-Saizarbitoria et al., 2018; Morris, 2019; Primeira comunidade de energia nasce em Miranda do Douro. , 2021; Soeiro and Ferreira Dias, 2020; Wierling et al., 2018)

When comparing with 1990 levels, we see that in 2018 greenhouse gas emissions in the EU have decreased by 21%, or about 1 018 million tonnes of CO2 equivalent. This fact puts pressure on EU, as it is defined a target to reduce GHG emissions by 20% in 2020, and on track to reduce 40% by 2030 (European Commission, [s.d.]). Both Germany and Denmark have already met their 2020 targets, with a reduction of around 30% in 2018, and are on track for the 2030 target. In Spain, on the other hand, despite the great efforts have made in recent years, still have very high GHG values, falling short of the 2020 and 2030 targets (see Graph 5.44). However, in Portugal, the Nacional para as Alterações Climáticas 2020/2030 (Programa Nacional para as Alterações Climáticas 2020/2030 , [s.d.]) has set the

target of reducing GHG emissions (phase at 2005 levels) between 18% and 23% in 2020 and between 30% and 40% in 2030. Thus, according to the Inventário Nacional de Emissões 2021 (Inventário Nacional de Emissões 2021, [s.d.]), GHG emissions in Portugal in 2019 represent a decrease of more than 25.9% compared to 2005 and 5.4% compared to 2018. However, the comparison with 1990 shows an increase in emissions in the order of 8.1%.

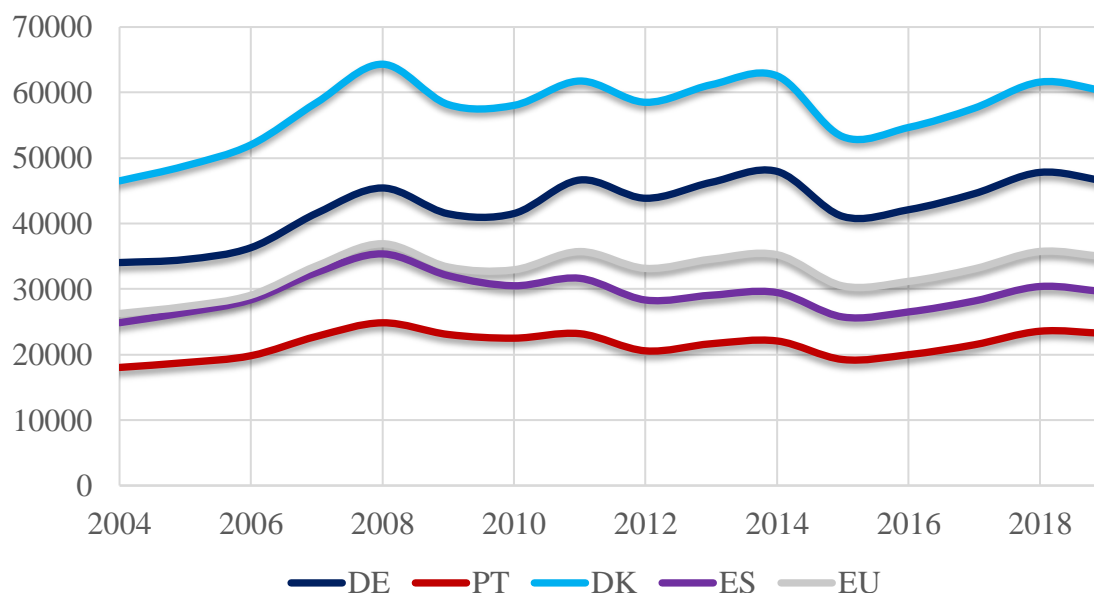


Graph 5.44. Greenhouse gas emissions compared to 1990 levels, based on Eurostat (Eurostat, [s.d.])

When analysing the economic and social factors for each country, we can glimpse some further differences. If we look at the role that the governments of each country play in promoting REC participation and the involvement of citizens, we may see great discrepancies. Germany and Denmark are presented as the example to follow for the other European countries. In fact, these countries show great confidence and propensity of citizens to participate in these projects, as there is great transparency and responsibility of governments, and they are known for the dissemination of content through very effective electronic tools. In turn, Spain is in an intermediate position, while Portugal may be considered a country with little promotion of citizen participation in REC or similar environmental projects (Royo, Yetano and Acerete, 2012).

As for the economic factors, this may be an important factor in the success of REC promotion. Graph 5.45 shows, that both Germany and Denmark have a GDP *per capita* well above the other two countries and the European average. These figures always remained higher, even in the years 2008-2009 during the "Great Recession", in the years 2009-2010

with the "debt crisis in Europe" and in the pandemic crisis of Covid-19 (Annex VII). These are still countries that invest heavily in the RES sector, are more industrialized and with a wealthier population than Portugal and Spain, which will reflect in the investment and promotion of RES projects.



Graph 5.45. GDP per capita (value in \$), based on (The World Bank Data Bank , [s.d.]

As we can see throughout this analysis, Portugal, and Spain, and some other southern European countries, are still far from reaching the levels achieved by the northern European countries, represented here by Denmark and Germany. Thus, these differences seem to be a trend that is mainly related to political incentives and implementation. A lot of changes will be needed, in several areas (economic, environmental, legislative framework, etc.).

With the evolution of existing technologies and the creation of new ones, there will be a greater diversity of REC's. Thus, public authorities must play an essential role in motivating citizens who are already environmentally conscious, but who are still reluctant to invest in RE projects, especially in Southern European countries. It seems important to create a better relationship between the common citizen and the public institutions to promote community energy production, which is a fundamental pillar to meet the objectives established for climate change.

The EU countries that are represented in the surveys are diverse enough to allow a general analysis on how the development and *prosumerism* of RES is taking place in the EU. Since there are countries at the forefront of RES *prosumerism* (Germany, UK, and the Netherlands), countries where RES *prosumerism* has only recently been legalized (Portugal and Spain) and countries that have a rather long history of self-consumption, both at industrial and regional level and where new *prosumerism* initiatives face new challenges (Belgium and Italy). Each country presents a very different landscape concerning the energy market that depends on various factors: may be geographical, political, environmental, social, economic, technical, or cultural factors. These factors interlink and create unique conditions that may promote or hinder the evolution of prosumerism within a country.

REC's have a mixed membership structure, and this business opens the possibility for various and new actors of the energy market to work together (Debor, 2014). The reasons for taking part in an REC, and to be a founder member of a REC, vary and may be quite different. Although, several trends may be detected. There are three different groups of reasons that may explain the membership in an REC. First, REC's attract people who are aware and follow an environmental and sustainable lifestyle, as these organizations invest in RE. Traditional energy sources, such as coal and gas, are not a viable investment for the REC as those sources are capital intensive. For example, these kinds of environmental movements tend to have more supporters when there is an environmental catastrophe (Chernobyl or Fukushima).

Another reason to become a member of an REC is the members' self-efficacy, that is, people get together and carry out RE projects and those projects that would not come true without this joint effort. Finally, the financial aspects are also pointed out as a reason to be a member of an REC are clear, as all REC's offer some type of return for initial investments and provide cheaper electricity from renewable sources.

On the other hand, it appears that the reasons for establishing an REC are quite subjective and individual and may not be generalized on the conclusions of a survey. Since survey respondents are often involved in creating a REC, the reasons for becoming a member are coincident with the ones for setting up a REC. However, we may define four distinct reasons. First, a specific event can lead to the creation of an REC, for example, Chernobyl or a political decision in favour of RE (EU, 2019). Second, a political decision in favour of RE and citizen participation may lead to the creation of an REC, since the creation of such

an organization becomes easier with the support of political decisions (EU, 2019). Moreover, another motivation for setting up an REC is the feeling of belonging and participating, that is, a participatory approach should lead to a greater support to RE. Finally, another reason for creating a REC may be a reaction or behaviour due to disagreement about the dominance of the energy market by large companies, as some studies point out (Soeiro and Dias, 2019; Vansintjan, 2015).

Finally, we should highlight a potential bias regarding the answers of members belonging to a REC. That is, there is a tendency for members of a REC to highlight all the environmental benefits that REC's bring to the places where they will be implemented, such as energy transition, leaving out possible negative factors (visual impact, destruction of jobs when abandoning the use of fossil energy, land conflicts, among others) that a RE project brings.

6 Conclusions

Renewable Energy Community are social enterprises in the RE sector, which are considered as collectively owned organizations that combine RES production with other ecological or social objectives and integrate a specific demand for civic participation. The challenges presented by the geographical territory, the countries' legislative framework for RE projects and the activities that the REC's intended to carry out, make possible a great diversity of REC's and with quite different functioning from each other. Thus, a common European legislation is essential to incorporate any RE project. Then, the policy instruments at EU level that have the greatest impact on the Renewable Energy Community and the Citizen Energy Community, are the Renewable Energy Directive (RED) and the common rules for the Internal energy market (IEM). Since RED promotes renewable energies, particularly using support schemes, guidelines on state support may render various national support mechanisms incompatible with the internal market. National legislation that exceeds or supplements EU legislation may, in fact, affect even more local energy community.

Therefore, a review of the main provisions regarding RE projects in the various Member States was urgent, since most countries do not have a legal definition of “*renewable energy community*”, “*citizen energy community*” or important concepts for the development of RE projects. Although all Member States provide support mechanism for RE, including feed-in tariffs, feed-in premiums, or quota obligations, only a few countries allow priority access to the RE network or even a simple process for authorizing small RE projects.

Although EU legislation by 2020 does not have a specific focus on CEC and/or REC, the new proposals for RED and IEM for electricity presented in the framework of the EU's climate and energy policy for 2030, show considerable progress. We saw that the new directives provide significant definitions, describe provisions that aim to guarantee the access of communities to the energy market, and focus on citizen participation in the energy transition. In conclusion, this revision in the European legislation helps the development of RE projects, mainly in the creation of energy communities.

This study contributes to identifying relevant approaches, organizational objectives, and measures to be analysed in more depth. In other words, by identifying the motivations, benefits and barriers that lead to participation in a REC, helping public decision makers to identify specific public policies and measures that can be implemented to promote the spread

of REC across Europe, more precisely in Southern Europe. However, REC's also have their limitations, in the context of the energy market, which explains their still limited market share and their difficult development in certain contexts.

In our research, we aim to understanding what may motivate citizens to participate in a REC. In fact, participation in an energy community is developed by the identity of the community, as well as, by the community collaboration (Hoffman and High-Pippert, 2010), thus creating a perception of the community (García-Valiñas, Macintyre and Torgler, 2012), strengthening participation. It becomes quite clear that environmental and non-financial motivations are the main motivator for most of the participants of the surveys, although not a very significant difference, this difference exists. This conclusion may be due to the features of the countries where people that participate in our survey are from, such as legislation is still changing, complex or even unfavourable to REC in the energy sector. As mentioned above, all the countries that are represented in the study have different characteristics which make them have different energy needs. The size of the population also affects energy needs, in urban areas the demand is higher but more localized, while in more rural areas there seems to be a greater difficulty in obtaining energy or even a connection to the grid, even if the demand is lower. On the other hand, rural areas, which could in a way be left aside during the globalization of the energy transition, can become a supplier of energy to urban areas, thus creating economic opportunities (such as jobs), but can also promote more interaction between rural and urban areas. The populations' knowledge about REC can also have an impact on this result, since in Northern European countries, public education about REC is the main component for the realization of RE projects. Thus, REC's should place public education as a main objective, to convince the public of the value that involvement in community-based projects presents. In general terms, the Northern European countries have a greater industrial capacity and higher average incomes, which implies a greater purchasing power than the Southern European countries, which explains a higher energy consumption.

We have found that social norms, through concerns about environmental and climate, are a determining factor in the motivation to participate in REC. Indeed, energy projects have the potential to “*promote new social norms*” (Rogers et al., 2012, p. 240) concerning RE. Previous studies have shown that trust also influences participation. Trust is considered, by all respondents, to be crucial and to promote participation in REC's. This point goes along

with the 7 cooperative principles, as concern for the community is one of those principles. We may understand responsibility and concern for the community in two ways. On the one hand, when installing an energy project, local communities will be affected (noise, visual disturbances, or landscape changes). On the other hand, when installing an energy project, local communities will benefit from it, due to local jobs creation, lower electricity prices, among others. Citizens may also be involved in the REC and change decisions and avoiding negative outcomes.

A point to be stressed in our conclusions is the fact that the reason “*lower energy costs*” and “*local income generation*”, was forecasted as a relevant motivator, and, in our sample, it does not confirm these and even may conclude that it seems to be pointed out by the participants as one of the least important factors.

The two groups analysed refer that the REC’s provide non-monetary added value in the regions where they will be installed. When asked about the contributions that REC’s bring to the region, it is curious to verify that respondents mention environmental benefits as the most significant for the region, and only much later they mention green jobs or other financial benefits. Thus, we may conclude that, even with little knowledge on the subject, participants always favour environmental benefits over financial ones. Among these values are the promotion of energy transition, energy guidance, and social and green action activities. In short, we may conclude that citizens are willing to participate in an REC, if they recognize that it brings benefits to the community where the RE project will be installed and to the environment.

In the stage one, we note that the environmental impacts are much more important than the financial impacts, which is quite interesting and a point in favour of the REC in the eyes of the citizens, since they do not have profits as the main objective. Regarding drivers for development, effects on the environment, places and communities are what matter most when developing an REC. Thus, we may conclude that when creating or developing an REC, we must consider the environment, and which are the main impact for the regions where they will be implemented. In a comparison of the two stages about benefits, we see a significant disparity, i.e., when you are an REC member, they show much more environmental than financial interest, but when you ask what the benefits would be if you were to join an REC, you see that environmental as well as financial aspects are both important. This shows that more information on the energy transition process still needs to

be disseminated to show that these are very important for the environmental future of the world, regardless of the financial benefits they bring. Of course, the financial benefits are very attractive and important for a region, like the green jobs that will be created, but we must understand that if you do not show an interest in the environment, future generations will not have a world in which to prosper.

The REC has a variety of barriers to overcome for high growth. As for the barriers and challenges the REC faces, changes in the surrounding legislative conditions (environmental policies) are the factor that most negatively affects the REC, but as these factors are not within the influence of the REC, they must be acknowledged but cannot be changed by the REC. So, well-defined policies are needed for participation in RE projects. Thus, we may conclude that members of an REC assume that disadvantages are outside their scope, while internal factors show little importance. It is then expected that the new European legislation will bring improvements aimed at the development of the REC.

Another important barrier is the high installation costs, as REC initiatives lack the financial power to invest and face problems in accessing funding sources. These financial issues could be a threat to the existence of the REC.

In a comparison of the two graphs of barriers, we see different very predominant ones. When non-members are asked about REC's, it is observed that all barriers are selected as strong or very strong barriers. In turn, the responses of an REC member focus on political barriers and on costs. Regarding costs, it is observed that the costs related to the internal activities of the REC are very low, while the focus is on money spend in building facilities.

Several steps must be taken to try to combat the barriers highlighted by the participants. We need to understand whether different policies and regulations for the energy sector can shape the importance they hold in the adoption and development of the REC. On the other hand, other major barriers that decide on the success or failure of REC initiatives are beyond the reach of policymakers.

In short, although the success or failure of a REC depends on the community itself, the political structure plays a crucial role in providing conditions for the emergence of the REC. That is, policymakers must understand the consequences that new regulations or incentives have on the energy sector.

Cooperative or Renewable Energy Community organizations that encourage the production and consumption of RES are developing around the world. As we can see, the

Southern Europe countries are a good example of the strength of the new generation of REC. In Spain and Italy, and in Portugal, but on a still very small scale, REC appears to be legitimate and well-positioned alternatives, with a pretension to compete in markets dominated, in these countries, by large companies.

Differently, from the northern countries, this recent emergence of REC in southern European countries may be due to the dissatisfaction of citizens and consumers with the current market models, characterized by the dominance of the electric companies on the energy market for electric power. Regrettably, REC seem to have a small weight in the RE market in each country, and this is also true for the number of existing REC. Even though, the role of the REC seems to be determinant for the achievement of the sustainability aims of each country. Considering the survey data, may be seen that the motivations, barriers, and benefits in southern European countries, do not differ significantly from the rest of Europe. So, although the Northern European countries have a tradition of disseminating green energy and are more advanced in the creation and development of REC than the Southern European countries, the problem is not the structure of a REC and the advantages they bring to the environment, which is already scientifically proven, but in the European and internal legislation of the countries that differ widely from country to country.

Despite, the reasons for participating in an REC being quite personal, that is, each citizen has different motivations to consider participating in the energy transition, it seems that a central point is very similar to concern about the future of our planet to the future generations and the way we may have impact on this. So, before installing any type of REC, it seems important to focus on the dissemination of information on the subject. Invest in conferences, workshops and lectures at universities and schools or even open to the general population, including experts in the field, political agents, among others, to point out all the benefits and barriers to answer all the questions before the installation of a RES project. In this way, one may understand all the environmental benefits, but above all the financial and legal benefits that are gained when integrating an REC. In short, this data shows that, in fact, a lot needs to be changed to close the gap between European countries. And that tradition has a great power over this disparity.

Several limitations have emerged in the preparation of this work. The one that proved most difficult to overcome was the collection of data through surveys. Despite the number of contacts made to obtain a response, this was far below expectations. For this reason, a

second survey has been designed to increase the number of responses so that we can carry out a more detailed analysis. Even so, although we have better results, it would be important in a future analysis to improve the results and use this work to better understand the future of Renewable Energy Community in the energy market.

Another point that should be mentioned is the lack of information about certain countries. In other words, when analysing southern European countries, we are faced with a lack of articles on Greece, thus making it impossible to include it in the analysis for southern European countries. Some articles found are limited to specific areas and do not provide information on the existence of other REC in the country. We also excluded Italy from the analysis, since the data obtained from the surveys showed that there were very few responses for this country. The same happened with Greece.

Finally, we refer to the analysis itself, i.e., with a somewhat limiting method (survey) being used in terms of analysis, it was difficult to implement other methodologies to the data collected. It would be important to create a database with information on this type of companies to help researchers and/or future investors.

Further research is needed to infer perceptions before, during and after the implementation of an REC. Therefore, future research must be carried out to analyse the potential of the REC to provide sustainable solutions for the development of communities. Thus, with the implementation of RE associated with the community, they can provide benefits for individuals, communities in general and regions, considering that local involvement and the impact of benefits is real, and the needs of the communities satisfied. It would also be important to elaborate the research on the southern European countries, through a more comprehensive survey, i.e., including the remaining southern countries. Another important point would be a comparison between a REC in Southern Europe and one in Northern Europe, to draw conclusions on whether there are differences between the two. This difference may justify different developments for REC's across Europe, even if we have similar policy and legislation, based on European directives. Finally, since there is an evolution in the field of REC's in Portugal, it would be important to use this as a case study, to analyse the motivations that led members to join the community and how these evolve over time. Another point to take into consideration in future research is the impact of REC in network defection. This increase in REC can cause grid defection, i.e., local production

may become cheaper, than the increase in network tasks, which will result from the investments needed to remain connected to the network systems.

REFERENCES

2030 climate & energy framework - [Em linha], atual. 2020. [Consult. 17–1 2020]. Disponível em WWW:<URL:https://ec.europa.eu/clima/policies/strategies/2030_en>.

ABRAHAMSE, Wokje *et al.* - A review of intervention studies aimed at household energy conservation. **Journal of environmental psychology**. 25:3 (2005) 273-291.

ADAMS, David; HESS, Michael - Social innovation and why it has policy significance. 2010).

AITKEN, Mhairi - Why we still don't understand the social aspects of wind power: A critique of key assumptions within the literature. **Energy policy**. 38:4 (2010) 1834-1841.

AITKEN, Mhairi - Wind power and community benefits: Challenges and opportunities. **Energy policy**. 38:10 (2010) 6066-6075.

AJZEN, Icek; FISHBEIN, Martin - The influence of attitudes on behavior. 2005).

ALLCOTT, Hunt - Social norms and energy conservation. **Journal of public Economics**. 95:9-10 (2011) 1082-1095.

AVELINO, Flor *et al.* - Transformative social innovation and (dis) empowerment. **Technological Forecasting and Social Change**. 145:2019) 195-206.

BADDELEY, Michelle - Energy, the Environment and Behaviour Change: A survey of insights from behavioural economics. 2011).

BALCOMBE, Paul; RIGBY, Dan; AZAPAGIC, Adisa - Motivations and barriers associated with adopting microgeneration energy technologies in the UK. **Renewable and Sustainable Energy Reviews**. 22:2013) 655-666.

BAMBERG, Sebastian; REES, Jonas; SEEBAUER, Sebastian - Collective climate action: Determinants of participation intention in community-based pro-environmental initiatives. **Journal of Environmental Psychology**. 43:2015) 155-165.

BAUWENS, Thomas - What roles for energy cooperatives in the diffusion of distributed generation technologies? **Available at SSRN 2382596**. 2013).

BAUWENS, Thomas - Propriété coopérative et acceptabilité sociale de l'éolien terrestre. **Reflets et perspectives de la vie économique**. 54:1 (2015) 59-70.

BAUWENS, Thomas - Explaining the diversity of motivations behind community renewable energy. **Energy Policy**. 93:2016) 278-290.

BAUWENS, Thomas; DEFOURNY, Jacques - Social capital and mutual versus public benefit: The case of renewable energy cooperatives. **Annals of Public and Cooperative Economics**. 88:2 (2017) 203-232.

BAUWENS, Thomas; GOTCHEV, Boris; HOLSTENKAMP, Lars - What drives the development of community energy in Europe? The case of wind power cooperatives. **Energy Research & Social Science**. 13:2016) 136-147.

BAXTER, Jamie; MORZARIA, Rakhee; HIRSCH, Rachel - A case-control study of support/opposition to wind turbines: Perceptions of health risk, economic benefits, and community conflict. **Energy Policy**. 61:2013) 931-943.

BECKER, Sören; KUNZE, Conrad - Transcending community energy: collective and politically motivated projects in renewable energy (CPE) across Europe. **People, Place & Policy Online**. 8:3 (2014).

BECKER, Sören; KUNZE, Conrad; VANCEA, Mihaela - Community energy and social entrepreneurship: Addressing purpose, organisation and embeddedness of renewable energy projects. **Journal of Cleaner Production**. 147:2017) 25-36.

BEGGIO, Giovanni; KUSCH, Sigrid - Renewable energy cooperatives: main features and success factors in collectively implementing energy transition. In **QUAESTI-Virtual Multidisciplinary Conference**

BELL, Derek *et al.* - Re-visiting the “social gap”: public opinion and relations of power in the local politics of wind energy. **Environmental Politics**. 22:1 (2013) 115-135.

BERTOLDI, Paolo; HIRL, Bettina; LABANCA, Nicola - **Energy Efficiency Status Report 2012-electricity consumption and efficiency trends in the EU-27** [Em linha], atual. 2012. Disponível em WWW:<URL:<https://ec.europa.eu/jrc/sites/default/files/energy-efficiency-status-report-2012.pdf>>.

BEVERIDGE, Ross; GUY, Simon - The rise of the eco-preneur and the messy world of environmental innovation. **Local environment**. 10:6 (2005) 665-676.

BIEL, Anders; THØGERSEN, John - Activation of social norms in social dilemmas: A review of the evidence and reflections on the implications for environmental behaviour. **Journal of economic psychology**. 28:1 (2007) 93-112.

BIRCHALL, Johnston - The potential of co-operatives during the current recession; theorizing comparative advantage. **Journal of entrepreneurial and organizational diversity**. 2:1 (2013) 1-22.

BIRCHALL, Johnston; KETILSON, Lou Hammond - **Resilience of the cooperative business model in times of crisis**. [S.l.] : International Labour Organisation, 2009

BOHNERTH, Jan Christoph - **Energy cooperatives in Denmark, Germany and Sweden: A transaction cost approach**

BOMBERG, Elizabeth; MCEWEN, Nicola - Mobilizing community energy. **Energy policy**. 51:2012) 435-444.

BOON, Frank Pieter; DIEPERINK, Carel - Local civil society based renewable energy organisations in the Netherlands: Exploring the factors that stimulate their emergence and development. **Energy Policy**. 69:2014) 297-307.

BRACE, Ian - **Questionnaire design: How to plan, structure and write survey material for effective market research**. [S.l.] : Kogan Page Publishers, 2018

BRUMMER, Vasco - Community energy-benefits and barriers: A comparative literature review of Community Energy in the UK, Germany and the USA, the benefits it provides for society and the barriers it faces. **Renewable and Sustainable Energy Reviews**. 94:2018) 187-196.

BUKARICA, Vesna; TOMŠIĆ, Željko - Energy efficiency policy evaluation by moving from techno-economic towards whole society perspective on energy efficiency market. **Renewable and Sustainable Energy Reviews**. 70:2017) 968-975.

BURCHELL, Kevin; RETTIE, Ruth; ROBERTS, Tom C. - Householder engagement with energy consumption feedback: the role of community action and communications. **Energy Policy**. 88:2016) 178-186.

CAGNO, Enrico *et al.* - A novel approach for barriers to industrial energy efficiency. **Renewable and Sustainable Energy Reviews**. 19:2013) 290-308.

CAPELLÁN-PÉREZ, Iñigo; CAMPOS-CELADOR, Álvaro; TERÉS-ZUBIAGA, Jon - Renewable Energy Cooperatives as an instrument towards the energy transition in Spain. **Energy Policy**. 123:2018) 215-229.

CASS, Noel; WALKER, Gordon; DEVINE-WRIGHT, Patrick - Good neighbours, public relations and bribes: the politics and perceptions of community benefit provision in renewable energy development in the UK. **Journal of environmental policy & planning**. 12:3 (2010) 255-275.

CATNEY, Philip *et al.* - Big society, little justice? Community renewable energy and the politics of localism. **Local Environment**. 19:7 (2014) 715-730.

CHEN, Kee Kuo - Assessing the effects of customer innovativeness, environmental value and ecological lifestyles on residential solar power systems install intention. **Energy Policy**. 67:2014) 951-961.

CHENEY, George *et al.* - Worker cooperatives as an organizational alternative: Challenges, achievements and promise in business governance and ownership. **Organization**. 21:5 (2014) 591-603.

COENEN, FHJM *et al.* - Exploring energy saving policy measures by renewable energy supplying cooperatives (REScoops). In **Proceedings of the ECEEE**

COHEN, Jed *et al.* - An empirical analysis of local opposition to new transmission lines across the EU-27. **The Energy Journal**. 37:3 (2016).

COMMUNITY POWER - **Friends of the Earth and REScoop. The benefits of community ownership of renewable energy** [Em linha], atual. 2016. [Consult. 6 2019]. Disponível em WWW:<URL:<http://www.rescoop.eu/blog/the-benefits-of-community-ownership-ofrenewable-energy>>.

Cooperative Europe - [Em linha], atual. 2017. [Consult. 24–9 2020]. Disponível em WWW:<URL:<https://coopseurope.coop>>.

Cooperatives: Characteristics, activities, status, challenges - [Em linha] [Consult. 20–2 2021]. Disponível em WWW:<URL:[https://www.europarl.europa.eu/RegData/etudes/BRIE/2019/635541/EPRS_BRI\(2019\)635541_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2019/635541/EPRS_BRI(2019)635541_EN.pdf)>.

COOPÉRNICO - **Coopérnico** <https://www.coopernico.org> [Em linha], atual. 2019. [Consult. mar. 2019]. Disponível em WWW:<URL:<https://www.coopernico.org>>.

CORSINI, Filippo *et al.* - Participatory energy: Research, imaginaries and practices on people's contribute to energy systems in the smart city. **Technological Forecasting and Social Change**. 142:2019) 322-332.

COWELL, Richard; BRISTOW, Gill; MUNDAY, Max - Acceptance, acceptability and environmental justice: the role of community benefits in wind energy development. **Journal of Environmental Planning and Management**. 54:4 (2011) 539-557.

CREUPELANDT, D.; VANSINTJAN, D. - **Mobilising EU citizens to invest in sustainable energy** [Em linha] Disponível em WWW:<URL:<http://www.rescoop.eu/blog/mobilising-eu-citizens-to-invest-in-sustainable-energy>>.

DANISH ENERGY AGENCY - **Energy Policy Toolkit on System Integration of Wind Power: Experiences from Denmark** [Em linha] Disponível em WWW:<URL:www.ens.dk/en/Global-assistance>.

DARBY, Sarah - Smart metering: what potential for householder engagement? **Building research & information**. 38:5 (2010) 442-457.

DARBY, Sarah J.; MCKENNA, Eoghan - Social implications of residential demand response in cool temperate climates. **Energy Policy**. 49:2012) 759-769.

DBK S.A. - **Estudio Sectores: Energías Renovables**

DEBOR, Sarah - **The socio-economic power of renewable energy production cooperatives in Germany: Results of an empirical assessment**

DER SCHOOR, Tineke VAN *et al.* - Challenging obduracy: How local communities transform the energy system. **Energy Research & Social Science**. 13:2016) 94-105.

DER SCHOOR, Tineke VAN; SCHOLTENS, Bert - Power to the people: Local community initiatives and the transition to sustainable energy. **Renewable and sustainable energy reviews**. 43:2015) 666-675.

DEVINE-WRIGHT, Patrick - Beyond NIMBYism: towards an integrated framework for understanding public perceptions of wind energy. **Wind Energy: An International Journal for Progress and Applications in Wind Power Conversion Technology**. 8:2 (2005) 125-139.

DEVINE-WRIGHT, Patrick - Reconsidering public attitudes and public acceptance of renewable energy technologies: a critical review. **Beyond Nimbyism: a multidisciplinary investigation of public engagement with renewable energy technologies**. 15:2007).

DEVINE-WRIGHT, Patrick - Place attachment and public acceptance of renewable energy: A tidal energy case study. **Journal of Environmental Psychology**. 31:4 (2011) 336-343.

DÓCI, Gabriella; VASILEIADOU, Eleftheria - “Let’s do it ourselves” Individual motivations for investing in renewables at community level. **Renewable and sustainable energy reviews**. 49:2015) 41-50.

DÓCI, Gabriella; VASILEIADOU, Eleftheria; PETERSEN, Arthur C. - Exploring the transition potential of renewable energy communities. **Futures**. 66:2015) 85-95.

DOMANICO, Fabio - Concentration in the European electricity industry: The internal market as solution? **Energy Policy**. 35:10 (2007) 5064-5076.

DUNN, Peter D. - **Appropriate technology: technology with a human face**. [S.l.] : Macmillan International Higher Education, 1979

Ecopower - [Em linha] [Consult. may. 2020]. Disponível em WWW:<URL:<https://www.ecopower.be>>.

EESC - Revision of the Renewable Energy Directive TEN/622. **European Economic And Social Committee**. 2017).

EESC - Electricity Market Design. **Opinion TEN/625**. 2017) 1-13.

ENERCOOP - **People power renewable energy cooperatives in Europe** [Em linha]. Energy Community, Bonn, Germany : [s.n.] [Consult. 31 jan. 2019]. Disponível em WWW:<URL:<https://www.irena.org/EventDocs/ENERCOOP,%20People%20Power%20-%20Renewable%20Energy%20Cooperatives%20in%20Europe.pdf>>.

ENERGY ATLAS - **Energy Atlas 2018-Facts and figures about renewables in Europe**

ENERGY CITIES; RESCOOP - Committee of the Regions Opinion: Stakeholders consultation: “Models of local energy ownership.”2018) 1-11.

ENERGY CITIES; RESCOOP - The new energy market design: how the EU can support energy communities and citizens to participate in the energy transition. 2018) 1-5.

ENGELKEN, Maximilian *et al.* - Comparing drivers, barriers, and opportunities of business models for renewable energies: A review. **Renewable and Sustainable Energy Reviews**. 60:2016) 795-809.

EU - **Clean energy for all Europeans** [Em linha], atual. 2019. [Consult. 22 mar. 2020]. Disponível em WWW:<URL:https://ec.europa.eu/energy/topics/energy-strategy/clean-energy-all-europeans_en>.

EU Legislation - [Em linha], atual. 2003. [Consult. 25–9 2020]. Disponível em WWW:<URL:<https://eur-lex.europa.eu/legal-content/PT/TXT/?uri=LEGISSUM%3A126018>>.

EUROPEAN COMMISSION - Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. **Official Journal of the European Union**. 140:16 (2009) 1-47.

EUROPEAN COMMISSION - Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC. **Official Journal of the European Union**. 211:55 (2009) 55-93.

EUROPEAN COMMISSION - DIRECTIVE 2009/73/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 July 2009 concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC. **Official Journal of the European Union**. 211:94 (2009) 1-43.

EUROPEAN COMMISSION - A renewed EU strategy 2011-14 for Corporate Social Responsibility. **COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS**. 681 (2011) 1-15.

EUROPEAN COMMISSION - Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC. **Official Journal of the European Union**. 315:1 (2012) 1-56.

EUROPEAN COMMISSION - Entrepreneurship 2020 action plan: reigniting the entrepreneurial spirit in Europe. In . [S.l.] : European Commission, Brussels, Belgium, 2013

EUROPEAN COMMISSION - GREEN PAPER-a 2030 framework for climate and energy policies. **COM (2013)**. 169:2013).

EUROPEAN COMMISSION - Guidelines on State aid for environmental protection and energy 2014-2020 (2014/C 200/01). **Official Journal of the European Union**. 200:1 (2014) 1-55.

EUROPEAN COMMISSION - **Proposes New Rules for Consumer Centred Clean Energy Transition**

EUROPEAN COMMISSION - Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources (recast). **Official Journal of the European Union**. COM (2016) 767:2017) 1-116.

EUROPEAN COMMISSION - Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources. **Official Journal of the European Union**. L:328 (2018) 82-209.

EUROPEAN COMMISSION - **Energy, transport and environment statistics** Statistical Books. [Em linha] [Consult. 19 sep. 2020]. Disponível em WWW:<URL:<https://ec.europa.eu/eurostat/documents/3217494/10165279/KS-DK-19-001-EN-N.pdf/76651a29-b817-eed4-f9f2-92bf692e1ed9>>.

EUROPEAN COMMISSION - 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 (recast). **Official Journal of the European Union**. L 158/125:2019) 1-75.

EUROPEAN COMMISSION - The State of the Energy Union Explained; Fact sheet; **European Commission**. Brussels, Belgium. 5 (2019).

EUROPEAN COMMISSION - **Clean Energy for All Europeans Package Completed: Good for Consumers, Good for Growth and Jobs, and Good for the Planet** [Em linha] [Consult. 19]. Disponível em WWW:<URL:<https://ec.europa.eu/info/news/clean-energy-all-europeans-package-completed-good-consumers-good-growth-and-jobs-an>>.

European Commission Clean Energy for All Europeans - [Em linha] [Consult. 24 feb. 2020]. Disponível em WWW:<URL:https://ec.europa.eu/info/news/clean-energy-all-europeans-package-completed-good-consumers-good-growth-and-jobs-and-good-planet-2019-may-22_en>.

EUROPEAN COMMISSION IME - Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on common rules for the internal market in electricity (recast). **Official Journal of the European Union**. COM (2016) 864:2016) 1-124.

EUROPEAN COMMITTEE OF THE REGIONS - Renewable energy and the internal market in electricity (2017/C 342/12). **Opinion: CDR 832/2017, Amendment 18**. 342:79

(2017) 1-32.

EUROPEAN COUNCIL - Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources-Analysis of the final compromise text with a view to agreement. **Interinstitutional File: 2016/0382 (COD)**. 2018) 1-269.

Eurostat - [Em linha] [Consult. 19 sep. 2020]. Disponível em WWW:<URL:<https://ec.europa.eu/eurostat/data/database>>.

FELDHOFF, Thomas - Asset-based community development in the energy sector: energy and regional policy lessons from community power in Japan. **International Planning Studies**. 21:3 (2016) 261-277.

FORD, Rebecca; WHITAKER, Juliet; STEPHENSON, Janet - Prosumer collectives: a review. 2016).

FORMAN, Alister - Energy justice at the end of the wire: Enacting community energy and equity in Wales. **Energy Policy**. 107:2017) 649-657.

FOXON, Timothy J. *et al.* - UK innovation systems for new and renewable energy technologies: drivers, barriers and systems failures. **Energy policy**. 33:16 (2005) 2123-2137.

FRANTZESKAKI, Niki *et al.* - Elucidating the changing roles of civil society in urban sustainability transitions. **Current Opinion in Environmental Sustainability**. 22:2016) 41-50.

FRANTZESKAKI, Niki; AVELINO, Flor; LOORBACH, Derk - Outliers or frontrunners? Exploring the (self-) governance of community-owned sustainable energy in Scotland and the Netherlands. In **Renewable Energy Governance**. [S.l.] : Springer, 2013. p. 101-116.

FRAUNE, Cornelia - Gender matters: Women, renewable energy, and citizen participation in Germany. **Energy Research & Social Science**. 7:2015) 55-65.

FREDERIKS, Elisha R.; STENNER, Karen; HOBMAN, Elizabeth V. - Household energy use: Applying behavioural economics to understand consumer decision-making and behaviour. **Renewable and Sustainable Energy Reviews**. 41:2015) 1385-1394.

FULLER, Sara; MCCAULEY, Darren - Framing energy justice: perspectives from activism and advocacy. **Energy Research & Social Science**. 11:2016) 1-8.

GABINETE DO MINISTRO DO AMBIENTE E DA AÇÃO CLIMÁTICA - **Plano Nacional Energia e Clima 2030 aprovado em Conselho de Ministros**

GADENNE, David *et al.* - The influence of consumers' environmental beliefs and attitudes on energy saving behaviours. **Energy policy**. 39:12 (2011) 7684-7694.

GANCHEVA, Mariya *et al.* - **Models of local energy ownership and the role of local energy communities in energy transition in Europe**. [S.l.] : European Committee of the Regions, 2018

GANS, Will; ALBERINI, Anna; LONGO, Alberto - Smart meter devices and the effect of feedback on residential electricity consumption: Evidence from a natural experiment in Northern Ireland. **Energy Economics**. 36:2013) 729-743.

GARCÍA-VALIÑAS, María A.; MACINTYRE, Alison; TORGLER, Benno - Volunteering, pro-environmental attitudes and norms. **The Journal of Socio-Economics**. 41:4 (2012) 455-467.

GEELS, Frank W. - Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. **Research policy**. 31:8-9 (2002) 1257-1274.

GEELS, Frank W. - The multi-level perspective on sustainability transitions: Responses to seven criticisms. **Environmental innovation and societal transitions**. 1:1 (2011) 24-40.

GEELS, Frank W. *et al.* - The enactment of socio-technical transition pathways: a reformulated typology and a comparative multi-level analysis of the German and UK low-carbon electricity transitions (1990-2014). **Research policy**. 45:4 (2016) 896-913.

GERPOTT, Torsten J.; PAUKERT, Mathias - Determinants of willingness to pay for smart meters: An empirical analysis of household customers in Germany. **Energy Policy**. 61:2013) 483-495.

GOBIERNO DE ESPAÑA - **Plan Nacional Integrado de Energía y Clima 2021-2030** [Em linha] [Consult. apr. 2021]. Disponível em WWW:<URL:<https://www.idae.es/informacion-y-publicaciones/plan-nacional-integrado-de-energia-y-clima-pniec-2021-2030>>.

GOOD, Nicholas; ELLIS, Keith A.; MANCARELLA, Pierluigi - Review and classification of barriers and enablers of demand response in the smart grid. **Renewable and Sustainable Energy Reviews**. 72:2017) 57-72.

GORISSEN, Leen *et al.* - Moving towards systemic change? Investigating acceleration dynamics of urban sustainability transitions in the Belgian City of Genk. **Journal of cleaner production**. 173:2018) 171-185.

GREENBERG, Michael R. - Energy policy and research: the underappreciation of trust. **Energy Research & Social Science**. 1:2014) 152-160.

GYAMFI, Samuel; KRUMDIECK, Susan; URMEE, Tania - Residential peak electricity demand response—Highlights of some behavioural issues. **Renewable and Sustainable Energy Reviews**. 25:2013) 71-77.

HAAS, Reinhard *et al.* - A historical review of promotion strategies for electricity from renewable energy sources in EU countries. **Renewable and sustainable energy reviews**.

15:2 (2011) 1003-1034.

HAGGETT, Claire; AITKEN, Mhairi - Grassroots energy innovations: The role of community ownership and investment. **Current Sustainable/Renewable Energy Reports**. 2:3 (2015) 98-104.

HANSLA, Andre *et al.* - Psychological determinants of attitude towards and willingness to pay for green electricity. **Energy policy**. 36:2 (2008) 768-774.

HANSMANN, Henry - **The ownership of enterprise**. [S.l.] : Harvard University Press, 2000

HARGREAVES, Tom *et al.* - Grassroots innovations in community energy: The role of intermediaries in niche development. **Global environmental change**. 23:5 (2013) 868-880.

HARNMEIJER, Anna *et al.* - A report on community renewable energy in Scotland. **Edinburgh Centre for Carbon Innovation**. (2012).

HARNMEIJER, Jelte; HARNMEIJER, Anna; LOYD, Charlie - Towards a global database of community-led renewable energy development. **Regions Magazine**. 287:1 (2012) 16-18.

HAVE, Robert P. VAN DER; RUBALCABA, Luis - Social innovation research: An emerging area of innovation studies? **Research Policy**. 45:9 (2016) 1923-1935.

HERAS-SAIZARBITORIA, Iñaki - The ties that bind? Exploring the basic principles of worker-owned organizations in practice. **Organization**. 21:5 (2014) 645-665.

HERAS-SAIZARBITORIA, Iñaki *et al.* - The emergence of renewable energy cooperatives in Spain: A review. **Renewable and Sustainable Energy Reviews**. 94:2018) 1036-1043.

HICKS, Jarra; ISON, Nicola - An exploration of the boundaries of “community” in community renewable energy projects: Navigating between motivations and context. **Energy Policy**. 113:2018) 523-534.

HITEVA, Ralitsa; SOVACOOOL, Benjamin - Harnessing social innovation for energy justice: A business model perspective. **Energy Policy**. 107:2017) 631-639.

HOBMAN, Elizabeth V.; FREDERIKS, Elisha R. - Barriers to green electricity subscription in Australia: “Love the environment, love renewable energy... but why should I pay more?” **Energy Research & Social Science**. 3:2014) 78-88.

HOFFMAN, Steven M. *et al.* - Public values and community energy: lessons from the US and UK. **Sustainability**. 5:4 (2013) 1747-1763.

HOFFMAN, Steven M.; HIGH-PIPPERT, Angela - Community energy: a social architecture for an alternative energy future. **Bulletin of Science, Technology & Society**. 25:5 (2005) 387-401.

HOFFMAN, Steven M.; HIGH-PIPPERT, Angela - From private lives to collective action: Recruitment and participation incentives for a community energy program. **Energy Policy**. 38:12 (2010) 7567-7574.

HOLYOAKE, George Jacob - **Self-help by the people: the history of the Rochdale Pioneers**. [S.l.] : S. Sonnenschein & Company, 1893

HORIUCHI, Kazuki - Diverse interpretations enabling the continuity of community renewable energy projects: A case study of a woody biomass project in rural area of Japan. **Local Economy**. 33:8 (2018) 822-841.

HORST, Dan VAN DER - Social enterprise and renewable energy: emerging initiatives and communities of practice. **Social Enterprise Journal**. 2008).

HU, Zheng *et al.* - Review of dynamic pricing programs in the US and Europe: Status quo and policy recommendations. **Renewable and Sustainable Energy Reviews**. 42:2015) 743-751.

HUFEN, JAM; KOPPENJAN, JFM - Local renewable energy cooperatives: revolution in disguise? **Energy, Sustainability and Society**. 5:1 (2015) 1-14.

HUIJBEN, Josephina CCM; VERBONG, Geert PJ - Breakthrough without subsidies? PV business model experiments in the Netherlands. **Energy Policy**. 56:2013) 362-370.

HUYBRECHTS, Benjamin; MERTENS DE WILMARS, Sybille - Renewable Energy Source Cooperatives (REScoops): assets, obstacles and diffusion strategies. 2011).

HUYBRECHTS, Benjamin; MERTENS, Sybille - The relevance of the cooperative model in the field of renewable energy. **Annals of Public and Cooperative Economics**. 85:2 (2014) 193-212.

ICA - **Cyprus International Year of Cooperatives Conference | ICA: International Co-operative Alliance** [Em linha], atual. 2012. [Consult. 25-9 2020]. Disponível em WWW:<URL:<https://www.ica.coop/en/events/cyprus-international-year-cooperatives-conference>>.

ICA - **International Co-operative Alliance** [Em linha], atual. 2019. Disponível em WWW:<URL:<https://www.ica.coop/en>>.

ICA, The International Co-operative Alliance - **Cooperative identity, values & principles | ICA** [Em linha], atual. 2017. [Consult. 2020]. Disponível em WWW:<URL:<https://www.ica.coop/en/cooperatives/cooperative-identity>>.

ILO - **Providing clean energy and energy access through cooperatives** [Em linha], atual. 2013. [Consult. 5 2019]. Disponível em WWW:<URL:https://www.ilo.org/global/topics/green-jobs/publications/WCMS_233199/lang-en/index.htm>.

INTERNATIONAL ENERGY AGENCY - IEA Electricity Information. 2019).

INTERREG EUROPE - **A policy brief from the policy learning platform on low-carbon economy** [Em linha], atual. 2019. Disponível em WWW:<URL:https://www.interregeurope.eu/fileadmin/user_upload/plp_uploads/policy_briefs/2017-09-11_TO4_policy_brief__EE_in_existing_buildings_v3_KM_kp_final.pdf>.

Inventário Nacional de Emissões 2021 - [Em linha] [Consult. 30–9 2020]. Disponível em WWW:<URL:https://apambiente.pt/sites/default/files/_Clima/Inventarios/20210309MemoEmissoes.pdf>.

KALKBRENNER, Bernhard J.; ROOSEN, Jutta - Citizens' willingness to participate in local renewable energy projects: The role of community and trust in Germany. **Energy Research & Social Science**. 13:2016) 60-70.

KARAKAYA, Emrah; HIDALGO, Antonio; NUUR, Cali - Diffusion of eco-innovations: A review. **Renewable and Sustainable Energy Reviews**. 33:2014) 392-399.

KARYTSAS, Spyridon; CHOROPANITIS, Ioannis - Barriers against and actions towards renewable energy technologies diffusion: A Principal Component Analysis for residential ground source heat pump (GSHP) systems. **Renewable and Sustainable Energy Reviews**. 78:2017) 252-271.

KAUFMANN, Alexander; TÖDTLING, Franz - How effective is innovation support for SMEs? An analysis of the region of Upper Austria. **Technovation**. 22:3 (2002) 147-159.

KEMP, René; SCHOT, Johan; HOOGMA, Remco - Regime shifts to sustainability through processes of niche formation: the approach of strategic niche management. **Technology analysis & strategic management**. 10:2 (1998) 175-198.

KHACHATRYAN, Hayk; JOIREMAN, Jeff; CASAVANT, Ken - Relating values and consideration of future and immediate consequences to consumer preference for biofuels: A three-dimensional social dilemma analysis. **Journal of Environmental Psychology**. 34:2013) 97-108.

KIM, Hana - A community energy transition model for urban areas: The energy self-reliant village program in Seoul, South Korea. **Sustainability**. 9:7 (2017) 1260.

KLAGGE, B.; MEISTER, T. - Energy cooperatives in Germany-an example of successful alternative economies? **Local Environment**. 23:7 (2018) 697-716.

KOIRALA, Binod Prasad *et al.* - Energetic communities for community energy: A review of key issues and trends shaping integrated community energy systems. **Renewable and**

Sustainable Energy Reviews. 56:2016) 722-744.

KOSTAKIS, Ioannis; SARDIANOU, Eleni - Which factors affect the willingness of tourists to pay for renewable energy? **Renewable Energy.** 38:1 (2012) 169-172.

KOWALSKA-PYZALSKA, Anna - What makes consumers adopt to innovative energy services in the energy market? A review of incentives and barriers. **Renewable and Sustainable Energy Reviews.** 82:2018) 3570-3581.

KUNZE, Conrad; BECKER, Sören - **Energy Democracy in Europe: a survey and outlook.** [S.l.] : RLS, 2014

LACEY-BARNACLE, Max; BIRD, CM - Intermediating energy justice? The role of intermediaries in the civic energy sector in a time of austerity. **Applied energy.** 226:2018) 71-81.

LARKIN, Alice *et al.* - What if negative emission technologies fail at scale? Implications of the Paris Agreement for big emitting nations. **Climate policy.** 18:6 (2018) 690-714.

Ley 24/2013, de 26 de diciembre, del Sector Eléctrico - [Em linha] [Consult. apr. 2021]. Disponível em WWW:<URL:<https://www.boe.es/buscar/doc.php?id=BOE-A-2013-13645>>.

LIPP, Judith - **Accelerating renewable energy co-operatives in Canada: A review of experiences and lessons.** [S.l.] : Trec Renewable Energy Co-Operative, 2016

LIPP, Judith; LAPIERRE-FORTIN, Émanuèle; MCMURTRY, JJ - Renewable Energy Co-op Review: Scan of Models & Regulatory Issues. 2012).

LIPP, Judith; MCMURTRY, JJ - Benefits of renewable energy co-operatives: summary of literature review from the measuring the co-operative difference research network. 2015).

LOVINS, Amory B. - Soft energy paths: Toward a durable peace. 1977).

MACCALLUM, Diana - **Social innovation and territorial development.** [S.l.] : Ashgate Publishing, Ltd., 2009

MAGNANI, Natalia; OSTI, Giorgio - Does civil society matter? Challenges and strategies of grassroots initiatives in Italy's energy transition. **Energy Research & Social Science.** 13:2016) 148-157.

MARSHALL, George - **Don't even think about it: Why our brains are wired to ignore climate change.** [S.l.] : Bloomsbury Publishing USA, 2015

MARUYAMA, Yasushi; NISHIKIDO, Makoto; IIDA, Tetsunari - The rise of community wind power in Japan: Enhanced acceptance through social innovation. **Energy Policy.** 35:5 (2007) 2761-2769.

MÉNARD, Claude - The economics of hybrid organizations. **Journal of Institutional and Theoretical Economics (JITE)/Zeitschrift für die gesamte Staatswissenschaft**. 2004) 345-376.

MEY, Franziska; DIESENDORF, Mark - Who owns an energy transition? Strategic action fields and community wind energy in Denmark. **Energy research & social science**. 35:2018) 108-117.

MIGNON, Ingrid; RÜDINGER, Andreas - The impact of systemic factors on the deployment of cooperative projects within renewable electricity production-An international comparison. **Renewable and sustainable energy reviews**. 65:2016) 478-488.

MINISTER FOR ENERGY, Mineral Resources; MINISTER FOR DEVELOPMENT COOPERATION - **Integration of Wind Energy in Power Systems. A summary of Danish experiences**. Jakarta : [s.n.]

MISCHKOWSKI, Niklas; WITTMAYER, Julia - **Social Innovation Meets Energy: About the social dimension of energy transitions**. [S.l.] : ICLEI Europe, 2020

MORI, Pier Angelo - COMMUNITY AND COOPERATION: THE EVOLUTION OF COOPERATIVES TOWARDS NEW MODELS OF CITIZENS' DEMOCRATIC PARTICIPATION IN PUBLIC SERVICES PROVISION. **Annals of Public and Cooperative Economics**. 85:3 (2014) 327-352.

MORRIS, C: - **Germany's Renewable Energy Agency** [Em linha], atual. 2019. Disponível em WWW:<URL:https://www.unendlich-viel-energie.de/media/file/3591.89_Renews_Spezial_Community_energy_LECo.pdf>.

MORTENSEN, Andrea; HEISELBERG, Per; KNUDSTRUP, M. - Identification of key parameters determining Danish homeowners' willingness and motivation for energy renovations. **International Journal of Sustainable Built Environment**. 5:2 (2016) 246-268.

MULGAN, Geoff *et al.* - Social Innovation: what it is, why it matters, how it can be accelerated. 2007).

MÜLLER-CHRIST, Georg *et al.* - The role of campus, curriculum, and community in higher education for sustainable development-a conference report. **Journal of Cleaner Production**. 62:2014) 134-137.

MULUGETTA, Y.; JACKSON, T.; HORST, D. VANDER - Carbon reduction at community. **Energy Policy**. 38:7541-7545 (2010).

MUMFORD, John; GRAY, David - Consumer engagement in alternative energy—Can the regulators and suppliers be trusted? **Energy Policy**. 38:6 (2010) 2664-2671.

MURRAY, Robin *et al.* - **The open book of social innovation**. [S.l.] : Nesta London, 2010

NEGRO, Simona O.; ALKEMADE, Floortje; HEKKERT, Marko P. - Why does renewable energy diffuse so slowly? A review of innovation system problems. **Renewable and sustainable energy reviews**. 16:6 (2012) 3836-3846.

NELSON, Teresa *et al.* - Emergent identity formation and the co-operative: theory building in relation to alternative organizational forms. **Entrepreneurship & Regional Development**. 28:3-4 (2016) 286-309.

NOLAN, Jessica M. *et al.* - Normative social influence is underdetected. **Personality and social psychology bulletin**. 34:7 (2008) 913-923.

NOPPERS, Ernst H. *et al.* - The adoption of sustainable innovations: The role of instrumental, environmental, and symbolic attributes for earlier and later adopters. **Journal of environmental psychology**. 44:2015) 74-84.

NOWAK, Andrzej; RYCHWALSKA, Agnieszka; SZAMREJ, Jacek - Social, psychological and technological determinants of energy use. **IEEE Technology and Society Magazine**. 33:3 (2014) 42-47.

NYGRÉN, Nina A. *et al.* - Early adopters boosting the diffusion of sustainable small-scale energy solutions. **Renewable and Sustainable Energy Reviews**. 46:2015) 79-87.

OTEMAN, Marieke; WIERING, Mark; HELDERMAN, Jan-Kees - The institutional space of community initiatives for renewable energy: a comparative case study of the Netherlands, Germany and Denmark. **Energy, sustainability and society**. 4:1 (2014) 1-17.

OZAKI, Ritsuko - Adopting sustainable innovation: what makes consumers sign up to green electricity? **Business strategy and the environment**. 20:1 (2011) 1-17.

PARLIAMENT, European; COUNCIL OF THE EUROPEAN UNION - DIRECTIVE (EU) 2018/2001 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2018 on the promotion of the use of energy from renewable sources. **Official Journal of the European Union**. 328:82 (2018) 1-128.

PARLIAMENT, European; COUNCIL OF THE EUROPEAN UNION - DIRECTIVE (EU) 2018/2002 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2018 amending Directive 2012/27/EU on energy efficiency. **Official Journal of the European Union**. 328:210 (2018) 1-21.

PARLIAMENT, European; COUNCIL OF THE EUROPEAN UNION - REGULATION (EU) 2018/1999 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council

Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council. **Official Journal of the European Union**. 328:1 (2018) 1-77.

PARRA, David *et al.* - An interdisciplinary review of energy storage for communities: Challenges and perspectives. **Renewable and Sustainable Energy Reviews**. 79:2017) 730-749.

PEPERMANS, Yves; LOOTS, Ilse - Wind farm struggles in Flanders fields: A sociological perspective. **Energy Policy**. 59:2013) 321-328.

PERLAVICIUTE, Goda; STEG, Linda - Contextual and psychological factors shaping evaluations and acceptability of energy alternatives: integrated review and research agenda. **Renewable and Sustainable Energy Reviews**. 35:2014) 361-381.

PEUTER, Greig DE; DYER-WITHEFORD, Nick - Commons and cooperatives. **Affinities: A journal of radical theory, culture, and action**. 2010).

PIHKALA, Timo; YLINENPAA, Hakan; VESALAINEN, Jukka - Innovation barriers amongst clusters of European SMEs. **International Journal of Entrepreneurship and Innovation Management**. 2:6 (2002) 520-536.

POLMAN, NBP *et al.* - Classification of Social Innovations for Marginalized Rural Areas. 2017).

PONGIGLIONE, Francesca - Climate change and individual decision making: an examination of knowledge, risk perception, self-interest and their interplay. 2011).

PRESIDÊNCIA DO CONSELHO DE MINISTROS - Decreto-Lei n.º162/2019 de 25 de outubro. **Diário da República**. 2019).

Primeira comunidade de energia nasce em Miranda do Douro. - [Em linha], atual. 2021. [Consult. 31 aug. 2021]. Disponível em WWW:<URL:<https://eco.sapo.pt/2021/08/24/primeira-comunidade-de-energia-nasce-em-miranda-do-douro-governo-quer-mais-para-ajudar-a-baixar-fatura-da-luz/>>.

Programa Nacional para as Alterações Climáticas 2020/2030 - [Em linha] [Consult. 30-9 2020]. Disponível em WWW:<URL:<https://apambiente.pt/clima/antecedentes-pnac>>.

RAE, Callum; BRADLEY, Fiona - Energy autonomy in sustainable communities—A review of key issues. **Renewable and Sustainable Energy Reviews**. 16:9 (2012) 6497-6506.

RESCOOP, European Federation Of Renewable Energy Cooperatives - **REScoop** [Em linha], atual. 2019. [Consult. 2019]. Disponível em WWW:<URL:www.rescoop.eu>.

RESCOOP.EU - **What local energy communities need from the Clean Energy Package.** 1-9 p.

RESCOOP.EU - **The Market Design Initiative: creating a space for local energy communities.** 1-9 p.

RIJPENS, Julie; RIUTORT, Sebastia; HUYBRECHTS, Benjamin - **Report on REScoop business models**

RITTEL, Horst WJ; WEBBER, Melvin M. - Dilemmas in a general theory of planning. **Policy sciences.** 4:2 (1973) 155-169.

ROBERTS, Josh; BODMAN, Frances; RYBSKI, Robert - Community power: model legal frameworks for citizen-owned renewable energy. **Client Earth energy.** 1:2014) 271-295.

ROBSON, Colin - **Real world research: A resource for social scientists and practitioner-researchers.** [S.l.] : Wiley-Blackwell, 2002

ROGERS, Jennifer C. *et al.* - Public perceptions of opportunities for community-based renewable energy projects. **Energy policy.** 36:11 (2008) 4217-4226.

ROGERS, Jennifer C. *et al.* - Social impacts of community renewable energy projects: findings from a woodfuel case study. **Energy Policy.** 42:2012) 239-247.

ROMERO-RUBIO, Carmen; ANDRÉS DÍAZ, José Ramón DE - Sustainable energy communities: A study contrasting Spain and Germany. **Energy Policy.** 85:2015) 397-409.

ROYO, Sonia; YETANO, Ana; ACERETE, Basilio - E-participation and climate change: Are local governments actively promoting responsible behaviors and offering opportunities for citizen involvement? In **2012 45th Hawaii International Conference on System Sciences**

SCHREUER, Anna - Energy cooperatives and local ownership in the field of renewable energy-Country Cases Austria and Germany. 2012).

SCHREUER, Anna; WEISMEIER-SAMMER, Daniela - Energy cooperatives and local ownership in the field of renewable energy technologies: A literature review. 2010).

SCHUMACHER, Ernst Friedrich - **Small is beautiful: A study of economics as if people mattered.** [S.l.] : Random House, 2011

SCHWARK, Adrian - **Emergence and development factors of renewable energy cooperatives: A cross-country comparative study of Germany and Portugal**

SEYFANG, Gill *et al.* - A grassroots sustainable energy niche? Reflections on community energy in the UK. **Environmental Innovation and Societal Transitions.** 13:2014) 21-44.

SEYFANG, Gill *et al.* - A grassroots sustainable energy niche? Reflections on community energy in the UK. **Environmental Innovation and Societal Transitions**. 13:2014) 21-44.

SEYFANG, Gill; HAXELTINE, Alex - Growing grassroots innovations: exploring the role of community-based initiatives in governing sustainable energy transitions. **Environment and Planning C: Government and Policy**. 30:3 (2012) 381-400.

SEYFANG, Gill; PARK, Jung Jin; SMITH, Adiran - Community Energy in the UK. **University of East Anglia, Norwich, 3S Working Paper**. 11:2012).

SEYFANG, Gill; PARK, Jung Jin; SMITH, Adrian - A thousand flowers blooming? An examination of community energy in the UK. **Energy policy**. 61:2013) 977-989.

SEYFANG, Gill; SMITH, Adrian - Grassroots innovations for sustainable development: Towards a new research and policy agenda. **Environmental politics**. 16:4 (2007) 584-603.

SIMCOCK, N.; WILLIS, Rebecca; CAPENER, Peter - **Cultures of community energy: International case studies**

SLEE, Bill; HARNMEIJER, Jelte - Community renewables: balancing optimism with reality. In **A Critical Review of Scottish Renewable and Low Carbon Energy Policy**. [S.l.] : Springer, 2017. p. 35-64.

SOCIAL BUSINESS INITIATIVE - Creating a favourable climate for social enterprises, key stakeholders in the social economy and innovation, Brussels. 2011).

SOEIRO, Susana; DIAS, Marta Ferreira - Renewable energy cooperatives: a systematic review. In **2019 16th International Conference on the European Energy Market (EEM)**

SOEIRO, Susana; FERREIRA DIAS, Marta - Energy cooperatives in southern European countries: Are they relevant for sustainability targets? **Energy Reports**. 6:2020) 448-453.

Som Energia - [Em linha], atual. 2010. [Consult. apr. 2020]. Disponível em WWW:<URL:<https://www.somenergia.coop>>.

SOPHA, Bertha Maya; KLÖCKNER, Christian A. - Psychological factors in the diffusion of sustainable technology: A study of Norwegian households' adoption of wood pellet heating. **Renewable and Sustainable Energy Reviews**. 15:6 (2011) 2756-2765.

SOVACOOOL, Benjamin K. - The cultural barriers to renewable energy and energy efficiency in the United States. **Technology in Society**. 31:4 (2009) 365-373.

SOVACOOOL, Benjamin K. - What are we doing here? Analyzing fifteen years of energy scholarship and proposing a social science research agenda. **Energy Research & Social Science**. 1:2014) 1-29.

SOVACOOOL, Benjamin K.; DWORKIN, Michael H. - Energy justice: Conceptual insights and practical applications. **Applied Energy**. 142:2015) 435-444.

STENNER, Karen *et al.* - Willingness to participate in direct load control: The role of consumer distrust. **Applied energy**. 189:2017) 76-88.

STERN, Paul C. - Information, incentives, and proenvironmental consumer behavior. **Journal of consumer Policy**. 22:4 (1999) 461-478.

STERN, Paul C. - Individual and household interactions with energy systems: toward integrated understanding. **Energy Research & Social Science**. 1:2014) 41-48.

SZULECKI, Kacper - Conceptualizing energy democracy. **Environmental Politics**. 27:1 (2018) 21-41.

TARHAN, Mumtaz - Renewable energy cooperatives: a review of demonstrated impacts and limitations. **Journal of Entrepreneurial and Organizational Diversity**. 4:1 (2015) 104-120.

TARHAN, Mumtaz - Renewable energy cooperatives: a review of experiences and lessons. **co-operatives and mutuals canda**. 2016).

The SONNET project - [Em linha], atual. 2019. [Consult. aug. 2020]. Disponível em WWW:<URL:<https://sonnet-energy.eu/about/>>.

The World Bank Data Bank - [Em linha] Disponível em WWW:<URL:<https://data.worldbank.org/indicator/EG.FEC.RNEW.ZS>>.

TIWARI, Rajnish; BUSE, Stephan - Barriers to innovation in SMEs: Can the internationalization of R&D mitigate their effects? In **Proceedings of the First European Conference on Knowledge for Growth: Role and Dynamics of Corporate R&D-CONCORD**

TOPOREK, M.; CAMPOS, IS - Assessment of Existing EU-Wide and Member State-Specific Regulatory and Policy Frameworks of RES Prosumers (Deliverable N° 3.1). **ClientEarth: Brussels, Belgium**. 128:2019).

VALKENBURG, Govert; COTELLA, Giancarlo - Governance of energy transitions: about inclusion and closure in complex sociotechnical problems. **Energy, Sustainability and Society**. 6:1 (2016) 1-11.

VANSINTJAN, D. - **Power to the people. Energy Transition to Energy Democracy in Europe?** Germany : [s.n.]

VEELEN, Bregje VAN - Making sense of the Scottish community energy sector-an organising typology. **Scottish Geographical Journal**. 133:1 (2017) 1-20.

VERWEIJ, Marco; THOMPSON, Michael - **Clumsy solutions for a complex world: Governance, politics and plural perceptions**. [S.l.] : Springer, 2006

VIARDOT, Eric - The role of cooperatives in overcoming the barriers to adoption of renewable energy. **Energy Policy**. 63:2013) 756-764.

VIETA, Marcelo; LIONAIS, Doug - The cooperative advantage for community development. **Journal of Entrepreneurial and Organizational Diversity**. 4:1 (2015) 1-10.

VUGT, Mark VAN - Community identification moderating the impact of financial incentives in a natural social dilemma: Water conservation. **Personality and Social Psychology Bulletin**. 27:11 (2001) 1440-1449.

WALKER, Benjamin JA; WIERSMA, Bouke; BAILEY, Etienne - Community benefits, framing and the social acceptance of offshore wind farms: an experimental study in England. **Energy Research & Social Science**. 3:2014) 46-54.

WALKER, Gordon *et al.* - Harnessing community energies: explaining and evaluating community-based localism in renewable energy policy in the UK. **Global Environmental Politics**. 7:2 (2007) 64-82.

WALKER, Gordon - What are the barriers and incentives for community-owned means of energy production and use? **Energy policy**. 36:12 (2008) 4401-4405.

WALKER, Gordon - Decentralised systems and fuel poverty: are there any links or risks? **Energy Policy**. 36:12 (2008) 4514-4517.

WALKER, Gordon *et al.* - Trust and community: Exploring the meanings, contexts and dynamics of community renewable energy. **Energy policy**. 38:6 (2010) 2655-2663.

WALKER, Gordon; DEVINE-WRIGHT, Patrick - Community renewable energy: What should it mean? **Energy policy**. 36:2 (2008) 497-500.

WARING, Timothy; LANGE, Taylor - The Adaptive Evolution of the Co-operative Principles. **Available at SSRN 3322978**. 2019).

WARREN, Charles R.; MCFADYEN, Malcolm - Does community ownership affect public attitudes to wind energy? A case study from south-west Scotland. **Land use policy**. 27:2 (2010) 204-213.

WEBER, Lukas - Some reflections on barriers to the efficient use of energy. **Energy policy**. 25:10 (1997) 833-835.

WIERLING, August *et al.* - Statistical evidence on the role of energy cooperatives for the energy transition in European countries. **Sustainability**. 10:9 (2018) 3339.

WIERSMA, Bouke; DEVINE-WRIGHT, Patrick - Decentralising energy: comparing the drivers and influencers of projects led by public, private, community and third sector actors. **Contemporary Social Science**. 9:4 (2014) 456-470.

WILLIS, Rebecca; WILLIS, Jenny - Co-operative renewable energy in the UK. **A guide to this growing sector. Manchester: The Co-operative Group and Co-operatives UK**. 2012).

WIRTH, Steffen - Communities matter: Institutional preconditions for community renewable energy. **Energy policy**. 70:2014) 236-246.

WOLSINK, Maarten - Entanglement of interests and motives: assumptions behind the NIMBY-theory on facility siting. **Urban studies**. 31:6 (1994) 851-866.

WOLSINK, Maarten - Wind power implementation: the nature of public attitudes: equity and fairness instead of “backyard motives.” **Renewable and sustainable energy reviews**. 11:6 (2007) 1188-1207.

YALÇIN-RIOLLET, Melike; GARABUAU-MOUSSAOUI, Isabelle; SZUBA, Mathilde - Energy autonomy in Le Mené: A French case of grassroots innovation. **Energy Policy**. 69:2014) 347-355.

YILDIZ, Özgür - Financing renewable energy infrastructures via financial citizen participation-The case of Germany. **Renewable Energy**. 68:2014) 677-685.

YILDIZ, Özgür *et al.* - Research perspectives on renewable energy cooperatives in Germany: empirical insights and theoretical lenses. 2014).

YILDIZ, Özgür *et al.* - Renewable energy cooperatives as gatekeepers or facilitators? Recent developments in Germany and a multidisciplinary research agenda. **Energy Research & Social Science**. 6:2015) 59-73.

ZADEMACH, Hans-Martin; HILLEBRAND, Sebastian - **Alternative economies and spaces: new perspectives for a sustainable economy**. [S.l.] : transcript Verlag, 2013

ZAMAGNI, Stefano; ZAMAGNI, Vera - **Cooperative enterprise: Facing the challenge of globalization**. [S.l.] : Edward Elgar Publishing, 2010

ZEULI, Kimberly A.; CROPP, Robert; SCHAARS, Marvin Arnold - Cooperatives: Principles and practices in the 21st century. 2004).

ZHOU, Kaile; YANG, Shanlin - Understanding household energy consumption behavior: The contribution of energy big data analytics. **Renewable and Sustainable Energy Reviews**. 56:2016) 810-819.

**Annex I. The Evolution of Global Cooperative Principles by Waring and Lange
(Waring and Lange, 2019)**

Rochdale Pioneers Principles (1844)	ICA Principles (1937)	ICA Principles (1966)	ICA Principles (1995)
The principle of “one member one vote” should obtain in government and the equality of the sexes in membership. Management should be in the hands of officers and committee elected periodically	Open Membership	Open, Voluntary Membership	Voluntary and Open Membership
Capital should be of their own providing and bear a fixed rate of interest. Profits should be divided pro rata upon the amount of purchases made by each member Frequent statements and balance sheets should be presented to members	Democratic Control	Democracy	Democratic Member Control
A definite percentage of profits should be allotted to education	Distribution of the surplus to the members in proportion to their transactions	Limited interest on share capital	Member Economic Participation
Market prices should be charged, and no credit given nor asked	Limited interest on capital	Equitable return of surpluses to members	Autonomy and Independence
Only the purest provisions procurable should be supplied to members. Full weight and measure should be given	Political and religious neutrality	Provision of education	Education, Training, and Information
	Cash trading	Co-operation between coops	Co-operation among Co-operatives
	Promotion of Education		Concern for Community

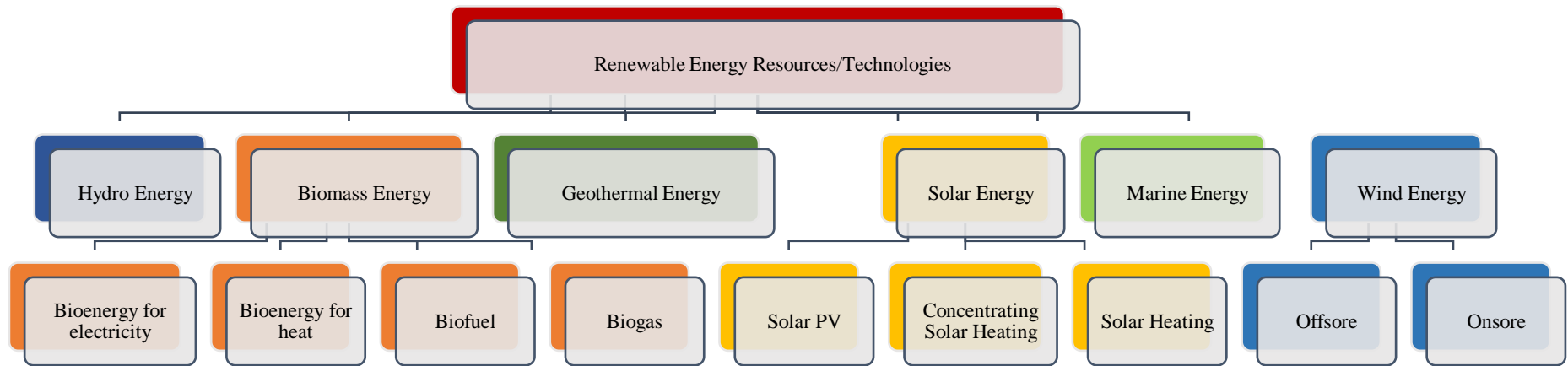
Annex II. Key literature on social dimension of REC

<i>Key literature on social dimension of CE</i>	Main classifiers	Key theme
<i>Maruyama et al., 2007</i>	Social innovation in energy	Wind farms as hubs for uniting like-minded people around a common interest. CE as an investment opportunity
<i>Walker, 2008</i>	Community-owned energy production	Communities of practice (or interest) vs. Communities of place (or locality)
<i>Walker and Devine-Wright, 2008</i>	Community energy	Citizen participation in project development (process), and/or sharing collective benefits (outcomes) Some definitions of CE not necessarily participatory or for civic benefit.
<i>Van der Horst, 2008</i>	Social Enterprise and Renewable energy	Social enterprise as a solution to an underperforming private sector. CE projects as Social Enterprises (SE) The beneficial role of, and need for, “bridging organizations” like Highlands and Islands Renewable Energy Company (HICEC, later Community Energy Scotland) in supporting SE in CE
<i>Seyfang et al., 2013</i>	Community energy	Communities (place or interest) have a high degree of ownership and control. Initiatives are very diverse. Community maybe more important than energy CE not a single, classifiable entity that can be “upscaled” or “outscaled”. Needs consistent policy support and funding
<i>Kunze and Becker, 2014</i>	Energy democracy	Energy democracy concept as a framework for analysing underlying motivations of CE cases. Power of energy oligopoly and the role of citizens’ movements
<i>Becker and Kunze, 2014</i>	Collective and politically motivated renewable energy (CPE)	Collective ownership and political motivation seen as more important than localism. Motivations of the original projects as a starting point for any definition. First Europe-wide perspective on CE
<i>Bauwens and Defourny, 2017</i>	Social capital	Social identification with the cooperative, generalized interpersonal trust and network structure. Public benefit vs. mutual benefit
<i>Becker et al., 2017</i>	Social entrepreneurship	Purpose of initiative Organizational form Community and wider social embeddedness
<i>Hiteva and Sovacool, 2017</i>	Social Innovation	Energy Justice Energy Service Companies Business models Supporting local conditions, not upscaling
<i>Szulecki, 2018</i>	Energy Democracy	Operationalization of the energy democracy ideal for policy on the basis of three elements or “levels”; democratic popular sovereignty; participatory governance; and civic ownership

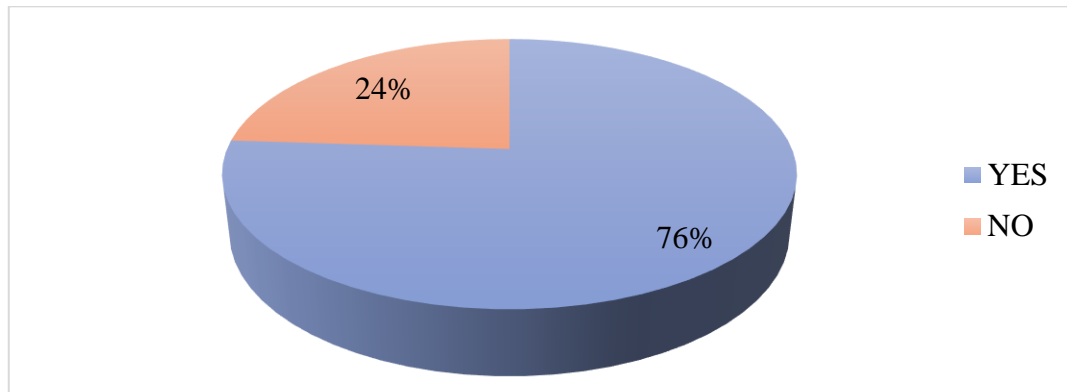
Annex III. Type of barrier

<i>Type of barrier</i>	Features	References
<i>Economic barriers</i>	<ul style="list-style-type: none"> ✖ Market fails to operate properly due to: imperfect information, incomplete markets (lack of knowledge, awareness, information), ✖ Imperfect competition and uncertainty ✖ Limited access to capital and hidden cost of negotiating and enforcing contracts (lack of appropriate long-lasting financial and legal support) ✖ Lack of appropriate market structure ✖ Difficulty in proper pricing of the services ✖ Financial cost (e.g., investment, service, and maintenance cost) 	(Ajzen and Fishbein, 2005; Baddeley, 2011; Bell et al., 2013; Bukarica and Tomšić, 2017; Good, Ellis and Mancarella, 2017; Gyamfi, Krumdieck and Urnee, 2013; Hobman and Frederiks, 2014; Karakaya, Hidalgo and Nuur, 2014, 2014; Negro, Alkemade and Hekkert, 2012; Ozaki, 2011; Perlaviciute and Steg, 2014; Pongiglione, 2011, 2011; Stern, 1999, 2014)
<i>Organizational barriers</i>	<ul style="list-style-type: none"> ✖ Lack of agreement how e.g., demand response should be measured and remunerated. ✖ Political and regulatory barriers ✖ Limited availability (e.g., program unavailability, inaccessibility) ✖ Misconception between consumers and energy service designers or suppliers ✖ Lack of supporting social structures. ✖ Lack of supply chains, services, and conventions 	(Darby, 2010; Frederiks, Stenner and Hobman, 2015; Gadenne et al., 2011; Gerpott and Paukert, 2013; Hu et al., 2015; Karakaya, Hidalgo and Nuur, 2014; Negro, Alkemade and Hekkert, 2012; Nygrén et al., 2015; Stenner et al., 2017)
<i>Technological barriers</i>	<ul style="list-style-type: none"> ✖ Limited supply of energy ✖ Technological ‘lock-in’ ✖ Integration of innovative energy services with the power grid ✖ Need of standardization (also in terms of metering) and computing the large amount of data. ✖ Communication and private data security 	(Darby and McKenna, 2012; Gans, Alberini and Longo, 2013; Good, Ellis and Mancarella, 2017; Negro, Alkemade and Hekkert, 2012; Nygrén et al., 2015; Sopha and Klöckner, 2011; Zhou and Yang, 2016)
<i>Behavioral barriers</i>	<ul style="list-style-type: none"> ✖ Cognitive biases & heuristics in decision-making process <ul style="list-style-type: none"> • Bounded rationality • Resistance to change. • Confusion of choice (lack of professional advice) ✖ Negative perceptions (negative values, not understanding) ✖ Negative word-of-mouth (i.e., negative information shared within a social network about the innovation) ✖ Credibility and trust (e.g., disbelief in climate change) ✖ No perceived responsibility (no moral obligation to subscribe, to participate or already existing another energy efficiency behaviour) ✖ Discomfort of usage 	(Abrahamse et al., 2005; Allcott, 2011; Frederiks, Stenner and Hobman, 2015; Gadenne et al., 2011; Hansla et al., 2008; Hobman and Frederiks, 2014, 2014; Khachatryan, Joireman and Casavant, 2013; Nolan et al., 2008; Perlaviciute and Steg, 2014; Stenner et al., 2017)

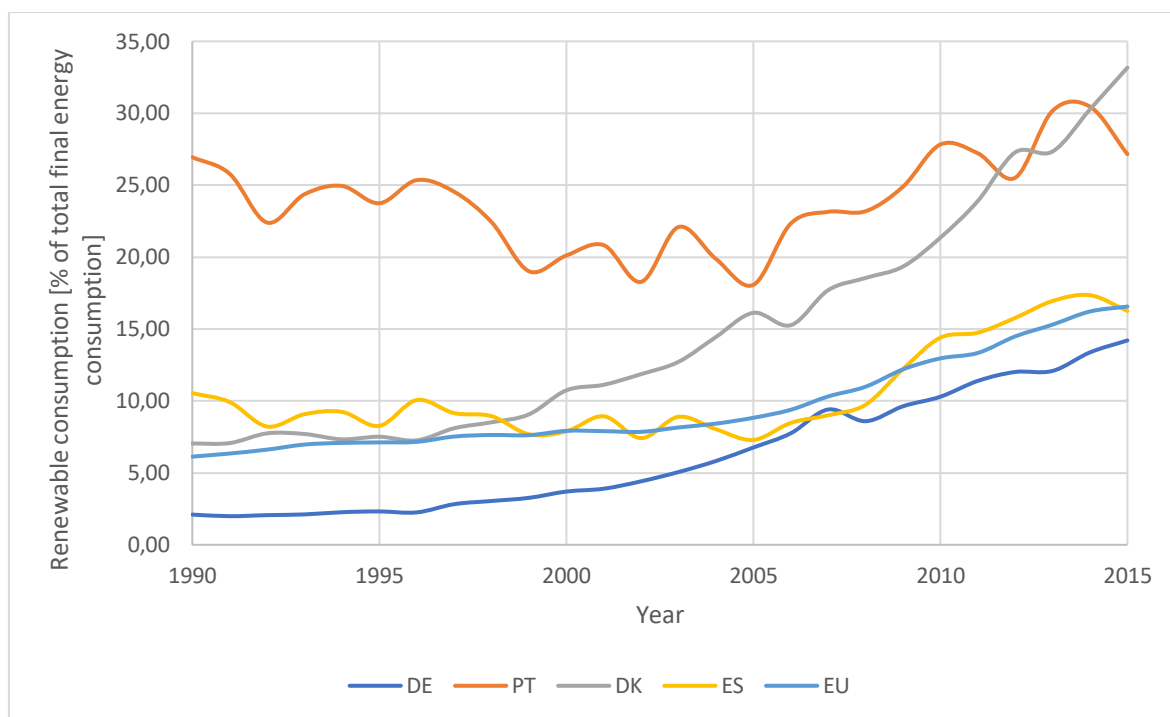
Annex IV. An overview of renewable energy sources (RES) and technologies



Annex V. REC provides non-monetary added value to the community, from the point of view of those who do not participate in an REC.



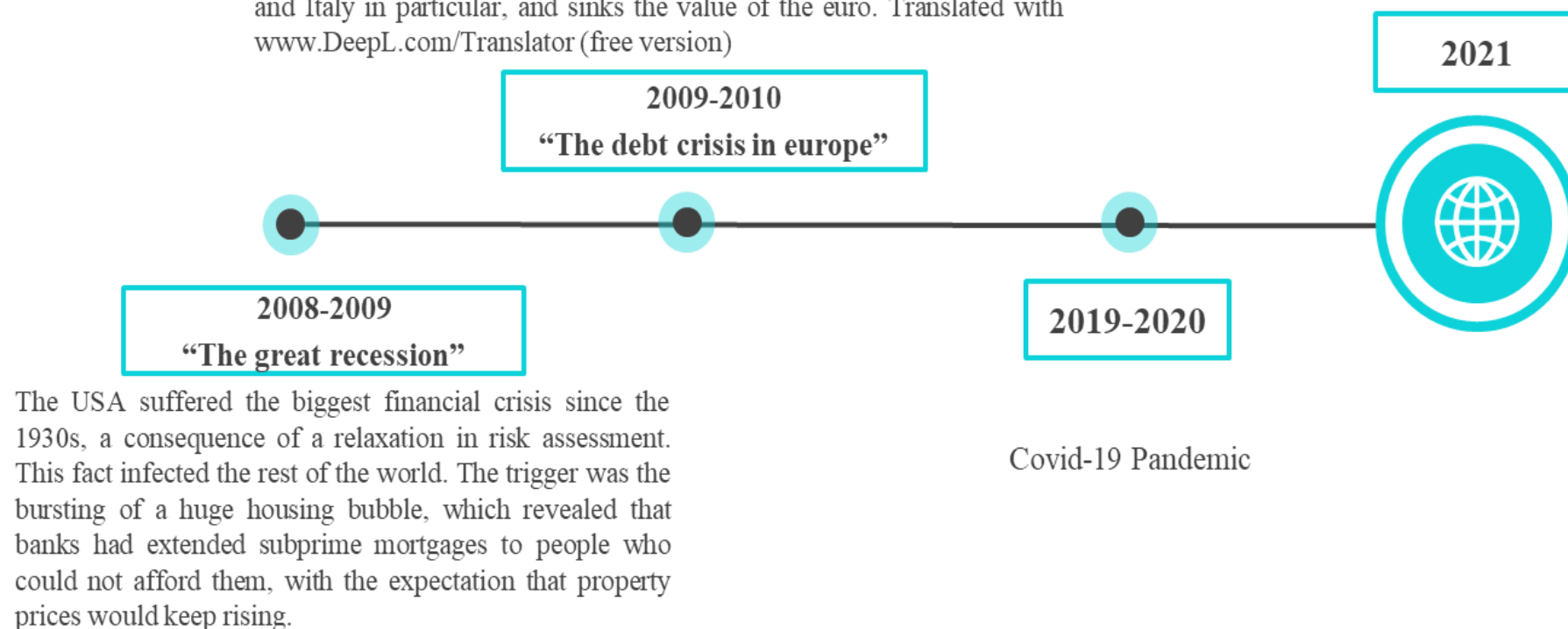
Annex VI. Share of renewable energy in total final energy consumption for Germany, Portugal, Denmark, Spain, and the European Union, 1998 to 2016,



(Based on The World Bank Data Bank (The World Bank Data Bank , [s.d.])))

Annex VII. Chronology of crises over the last 15 years

Greece's new government acknowledges that the country's deficit is much higher than previously revealed. The European Union and the IMF have been negotiating a bailout programme for months. So, the markets are already beginning to doubt the ability of other European countries to pay their debt. The contagion of anxiety affects Portugal, Spain, Ireland and Italy in particular, and sinks the value of the euro. Translated with www.DeepL.com/Translator (free version)



Annex VIII. Renewable Energy Cooperative/Community Survey

Welcome!

My name is Susana Soeiro and currently I am a PhD student in Business and Economics of the University of Aveiro

My PhD thesis focus on renewable energy cooperatives and/or renewable energy communities across Europe. A lot of research has been conducted on other cooperatives, but just little on renewable energy cooperatives/community. With this survey I intend to better understand of what renewable energy communities are, the main characteristics, the motivations that lead a person to participate in a renewable energy community and the performance in several European countries, as well as the real benefits and challenges.

This questionnaire only fit those who have already used this type of accommodation in the last three years and are 18 years of age or older. If you fit this profile, your collaboration will be extremely helpful for the success of this research. Please complete this questionnaire consciously.

This project respects the privacy rules of the respondents, guaranteeing the security and confidentiality of the information collected, in strict compliance with the General Regulation on Data Protection. The access and processing of the data are only authorized to the investigators of the project, according to its purpose. After collection, the data is anonymized and stored during the project implementation period. Respondents are entitled to:

- Accessing their data and receiving information about the processing of their personal data.
- To rectify any inaccuracies about their personal data during the collection period.
- To delete their personal data.
- To file a complaint with a Control Authority.

I have become aware of the aims and purposes of the study as well as how the collected data will be processed.

Most of the questions are multiple choice, while those that require a written input are simple questions. Therefore, completing the survey should take no longer than 10 minutes of your time.

Do bear in mind though the information that you can provide is very important, and that the aggregated results of this survey will be used to develop recommendations for new RE co-ops/REC.

Should you have any questions or doubts, please do not hesitate to contact us at ssoeiro@ua.pt.

At the end of the survey a box for additional comment appears.

Thank you very much for answer the survey.

1. Choose one of the following answers: *

- ☐ I agree to participate in the questionnaire
- ☐ I don't agree to participate in the questionnaire

2. Gender: *

- ☐ F
- ☐ M

3. How old are you? *

Age: Years

4. What is your role in the cooperative/community? *

(one choice)

- ☐ Management
- ☐ Member
- ☐ None

Page 3

5. Do you know what energy cooperatives/community are? *

- ☐ yes
- ☐ no

6. Do you want to belong to an energy cooperative/community? *

- ☐ yes
- ☐ no

7. Why do you want to belong to an energy cooperative/community?

Page 5

8. Cooperative/Community Name? *

9. If you participate in more than one cooperative/community, please indicate here, Which are the cooperatives/community?

If you may, Fill out one survey for each cooperatives/community you belong as we need specific information for each of them.

Page 6

10. Country *

- ☐ Austria
- ☐ Belgium
- ☐ Bulgaria
- ☐ Croatia

- ☐ Cyprus
- ☐ Czechia
- ☐ Denmark
- ☐ Estonia
- ☐ Finland
- ☐ France
- ☐ Germany
- ☐ Greece
- ☐ Hungary
- ☐ Ireland
- ☐ Italy
- ☐ Latvia
- ☐ Lithuania
- ☐ Luxembourg
- ☐ Malta
- ☐ Netherlands
- ☐ Poland
- ☐ Portugal
- ☐ Romania
- ☐ Slovakia
- ☐ Slovenia
- ☐ Spain
- ☐ Sweden
- ☐ United Kingdom
- ☐

Page 7

11. When was your cooperative/community founded? *

Years

12. When did your cooperative/community initiate its primary activities? *

Years

13. How many members does the cooperative/community have? *

[one choice]

- ☐ 1-10
- ☐ 11-20
- ☐ 21-50
- ☐ 51-100
- ☐ 101-200
- ☐ 201-500
- ☐ 501-1000
- ☐ 1001 and above
- ☐ Don't know

14. What is your cooperative's/community's membership geographic reach? *

- ☐ Local or Regional
- ☐ Nacional
- ☐ Other

Page 8

15. Does your cooperative/community observe the one member one vote principle? *

- ☐ yes
- ☐ no

16. Do you incorporate the seven ICA cooperative principles in your activities? *

[multiple choice]

- ☐ Voluntary and open membership
- ☐ Democratic member control
- ☐ Member economic participation
- ☐ Autonomy and independence
- ☐ Education, training and information
- ☐ Co-operation among co-operatives
- ☐ Concern for community

17. To which of the following categories does your cooperative/community belong to? *

[select multiples if applicable]

- ☐ Generation/production
- ☐ Distribution/transmission
- ☐ Trading/green power purchasing
- ☐ Services in RES (i.e. Consultancy, engineering, legal services, certification, etc)
- ☐ Other (please specify)

18. Which technologies does your cooperative/community employ for electricity generation? *

[multiselect]

- ☐ Hydro power
- ☐ Wind power
- ☐ Solar PV
- ☐ Solar thermal
- ☐ Geothermal
- ☐ Biomass, Liquid biofuels
- ☐ Wave/tidal
- ☐ District heating cooperative
- ☐ Other [specify]

Page 9

19. Please provide further information about your renewable electricity generation

	What is your installed capacity? (please indicate in MW)	Do you benefit from feed-in contracts? (please answer yes or no)	Is renewable electricity generation economically viable without a feed-in contract? (please answer yes or no)
Hydro power	<input type="text"/>	<input type="text"/>	<input type="text"/>

20. Comments

21. Please provide further information about your renewable electricity generation

	What is your installed capacity? (please indicate in MW)	Do you benefit from feed-in contracts? (please answer yes or no)	Is renewable electricity generation economically viable without a feed-in contract? (please answer yes or no)
Wind power	<input type="text"/>	<input type="text"/>	<input type="text"/>

22. Comments

23. Please provide further information about your renewable electricity generation

	What is your installed capacity? (please indicate in MW)	Do you benefit from feed-in contracts? (please answer yes or no)	Is renewable electricity generation economically viable without a feed-in contract? (please answer yes or no)
Solar PV	<input type="text"/>	<input type="text"/>	<input type="text"/>

24. Comments

25. Please provide further information about your renewable electricity generation

	What is your installed capacity? (please indicate in MW)	Do you benefit from feed-in contracts? (please answer yes or no)	Is renewable electricity generation economically viable without a feed-in contract? (please answer yes or no)
Solar Thermal	<input type="text"/>	<input type="text"/>	<input type="text"/>

26. Comments

27. Please provide further information about your renewable electricity generation

	What is your installed capacity? (please indicate in MW)	Do you benefit from feed-in contracts? (please answer yes or no)	Is renewable electricity generation economically viable without a feed-in contract? (please answer yes or no)
Geothermal	<input type="text"/>	<input type="text"/>	<input type="text"/>

28. Comments

29. Please provide further information about your renewable electricity generation

	What is your installed capacity? (please indicate in MW)	Do you benefit from feed-in contracts? (please answer yes or no)	Is renewable electricity generation economically viable without a feed-in contract? (please answer yes or no)
Biomass, Liquid biofuels	<input type="text"/>	<input type="text"/>	<input type="text"/>

30. Comments

31. Please provide further information about your renewable electricity generation

	What is your installed capacity? (please indicate in MW)	Do you benefit from feed-in contracts? (please answer yes or no)	Is renewable electricity generation economically viable without a feed-in contract? (please answer yes or no)
Wave/Tidal	<input type="text"/>	<input type="text"/>	<input type="text"/>

32. Comments

33. Please provide further information about your renewable electricity generation

	What is your installed capacity? (please indicate in MW)	Do you benefit from feed-in contracts? (please answer yes or no)	Is renewable electricity generation economically viable without a feed-in contract? (please answer yes or no)
District heating cooperative	<input type="text"/>	<input type="text"/>	<input type="text"/>

34. Comments

35. Please provide further information about your renewable electricity generation

	What is your installed capacity? (please indicate in MW)	Do you benefit from feed-in contracts? (please answer yes or no)	Is renewable electricity generation economically viable without a feed-in contract? (please answer yes or no)
Other	<input type="text"/>	<input type="text"/>	<input type="text"/>

36. Comments

37. What is the cooperative's/community's yearly production (in kWh)? *

Please enter a number.

in kWh

38. What was the overall investment in all of your energy production facilities? *

[in euros]

€

Page 10

39. What motivates your members to join the cooperative/community? Please select one or more responses from the list below, and indicate in the adjacent field the on the scale of 1 to 7 how important it is (1=not important; 7=very important). *

[If not listed, please indicate further reasons why your members join the cooperative/community in the empty field at the end of the question. You may add as many as necessary by clicking on "+1" at the end of the multiple choice list.]

	1	2	3	4	5	6	7	Not relevant
Concerns about environmental and climate impacts of traditional energy technologies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Influence of the community and trust	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local income generation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local investment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lower energy costs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Participating in the energy transition	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reliable local energy supply	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be independent of the energy producers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local interaction within in the community, bring people together	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Change role of consumers in society	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increase local acceptance for renewable energies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

40. Would you say that the motivations to become a member of the cooperative/community were different for founding members compared to those joining later and new members, and of so how do they differ?

Page 11

41. Have you been satisfied with historical support policies for renewable energy deployment in your country? *

[1=not satisfied at all; 7=absolutely satisfied]

Please choose...

42. In your country, have there been recent changes in renewable energy policies? *

- ☐ yes
☐ no

43. How do you expect the new support schemes to impact your cooperative's/community's activities? *

[1=very negatively; 7=very positively]

Please choose...

44. Have these changes had any impact on the cooperative's/community activities? *

- ☐ yes
☐ no

45. Do you expect any adjustments in the policies to be enacted in the next future? *

- ☐ yes
☐ no

46. Have you, or do you plan to adjust, broaden or narrow your activities as a result of changes in the renewable support policies and general legislative environment for your field of activities? *

- ☐ yes
☐ no

Page 12

47. Please provide a description of the actions you are taking or which you plan to take?

48. Do the support policies in your country provide equivalent conditions for all actors in the renewable energy sector? *

[1=quite favorable for large scale corporate actors; 7=quite favorable for small scale community energy solutions, including cooperatives]

Please choose... ▼

49. As a cooperative/community, does your national legislation allow preferential tax treatment stemming from your activities and revenues? (thanks to regional or national laws on taxation of cooperatives) *

- ☐ yes
☐ no

50. Please indicate how important the preferential tax treatment is for your continued work and competitiveness with private and public energy producers. *

[1= not important; 7=highly important]

Please choose... ▼

51. Does your cooperative/community provide non-monetary added value to your community? (region and members) *

- ☐ yes
☐ no

Page 13

52. 10) Please describe if and which kind of non-monetary added value your cooperative/community provides to your community? (region and members) *

[Region/Local and Members]

53. Do you agree with a new definition of "Renewable Energy Community" in the Renewable Energy Directive (RED), Article 22, p.28? *

"... shall be an SME or not-for-profit organization, the shareholders or members of which cooperate in the generation, distribution, storage or supply of energy from renewable sources..."

- ☐ yes
☐ no

54. Do you agree with a new definition of "Local Renewable Energy" in the Internal Energy Market Directive for electricity (IEM for electricity), Article 2, p. 52? *

"... means: an association, a cooperative, a partnership, a non-profit organization or other legal entity which is effectively controlled by local shareholders or members, generally value rather than profit-driven, involved in distribution system operator, supplier or aggregator at the local level, including across borders ... "

- ☐ yes
☐ no

Page 14

55. What is the minimum financial commitment of one member? *

[in euros]

€

56. Is there a maximum capital contribution? *

[one choice]

- ☐ yes
☐ no
☐ don't know

57. How did you finance the membership? *

[multiselect]

- ☐ Saved capital
☐ Bank loan
☐ Don't know
☐ Other

58. Are you selling the electricity only to your members? *

[one choice]

- ☐ yes
☐ no
☐ don't know

59. Does the price of one share compared to a particular energy consumption? *

[one choice]

- ☐ yes
☐ no
☐ don't know

60. What is the price of one generated kWh? *

[in euro]

€

Page 15

61. Does your cooperative/community have members from other countries? *

[one choice]

- ☐ yes
☐ no
☐ don't know

62. Does your cooperative/community issue different classes of membership shares, such as investor shares? *

[if share classes that you issue are not listed please indicate in the "other" field. You may add as many as necessary by clicking on (+1) at the end of the multiple-choice list.]

	yes	no
Investor shares	<input type="radio"/>	<input type="radio"/>
Preferential shares	<input type="radio"/>	<input type="radio"/>
Other <input type="text"/>	<input type="radio"/>	<input type="radio"/>

63. Please describe the rights and responsibilities of investor members, where they differ from regular members (share price and minimal volume, voting rights, etc.).

64. Which of the following would you designate as your major sources of project financing? Please select from the list as many answers as necessary, and there indicate importance on a scale of 1 (minor) to 7 (major). *

Please use the "other" field to add sources of financing that are not listed. You can add as many additional responses as necessary by clicking on "+1" at the bottom of the multiple choice list.

	1	2	3	4	5	6	7	Not relevant
Commercial bank loans	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cooperative/community revenue	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cooperative/community bank loans	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Member equity financing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other renewable energy cooperatives/community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Public financing (e.g. municipal, national, EU project financing)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Green bank loans	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page 16

65. Does your cooperative/community work with local/cooperative banks? *

	yes	no
Local banks	<input type="radio"/>	<input type="radio"/>
Cooperatives banks	<input type="radio"/>	<input type="radio"/>

66. Do you establish partnerships with other local entities, private or public? (businesses, municipality, public services, etc.) *

Please use the "other" field to add entities you establish partnerships with that are not listed. You can add as many additional responses as necessary by clicking on "+1" at the bottom of the multiple choice list.

	yes	no
Local private businesses	<input type="radio"/>	<input type="radio"/>
Municipality	<input type="radio"/>	<input type="radio"/>
Local public utilities	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>
<input type="text"/>		

67. What was your average revenue during the last three years? *

 €

68. What is the cooperative's/community's debt to equity ratio? *

This question is formulated because Cooperatives have been the organizational model that has been least exposed to debt and loan related challenges during the ongoing recession.

 €

Page 17

69. How many customers outside the cooperative/community do you have?

Please enter a number.

70. One share equals how many kWh?

Please enter a number.

 kWh

71. What is the maximum capital contribution?

Please enter a number.

 €

Page 18

72. What is the exact legal person form of your cooperative/community, used in the appropriate registry? *

Please provide the answer in your language.

73. Does your cooperative/community have employees? *

- ☐ yes
☐ no

Page 19

74. Please indicate how many.

75. Is your cooperative/community a member of a second-tier cooperative/community or any other association of cooperatives/community or renewable energy support organizations (national, regional, European)? *

- ☐ yes
☐ no

76. Does your cooperative/community actively pursue lobbying with local, national or supranational (e.g. European Commission) authorities? *

- ☐ yes
☐ no

77. Does your cooperative/community have a management board? *

- ☐ yes
☐ no

78. Does your cooperative/community have a supervisory board? *

- ☐ yes
☐ no

79. Does your cooperative/community have a general assembly? *

- ☐ yes
☐ no

80. How many members does your management board have?

[each number is an individual option]

- ☐ 1-9
☐ 10 and above
☐ Don't know

81. Are your management board members being paid for fulfilling that function?

[one choice]

- ☐ yes
☐ yes, but they only receive an expense allowance
☐ no
☐ I do not want to answer
☐ don't know

82. How often do the management board members meet?

[one choice]

- ☐ Weekly
☐ Monthly
☐ Bimonthly
☐ Semiannually
☐ Annually
☐ don't know

83. The management board members are chosen by?

[one choice]

- ☐ The general assembly
- ☐ The supervisory board
- ☐ They are not chosen, but have constituted themselves naturally
- ☐ Not applicable
- ☐ Don't know

Page 22

84. How many members does your supervisory board have?

[one choice; each number is an individual option]

- ☐ 1-9
- ☐ 10 and above
- ☐ Don't know

85. Are your supervisory board members being paid for fulfilling that function?

[one choice]

- ☐ Yes
- ☐ Yes, but they only receive an expense allowance
- ☐ No
- ☐ I do not want to answer
- ☐ Don't know

86. How often do the supervisory board members meet?

[one choice]

- ☐ Weekly
- ☐ Monthly
- ☐ Bimonthly
- ☐ Semiannually
- ☐ Annually
- ☐ Don't know

87. The supervisory board members are chosen by?

[one choice]

- ☐ The general assembly
- ☐ The management board
- ☐ They are not chose, but have constituted themselves naturally
- ☐ Not applicable
- ☐ Don't know

88. How often does your general assembly take place per year?

[one choice]

- ☐ 1
- ☐ 2
- ☐ 3 and above
- ☐ don't know
- ☐

89. Which percentage of all cooperative's/community's members takes part in the general assembly?

1 100

90. Please indicate the main barriers for development of renewable energy cooperative/community in your region and country by selecting one or more responses from the list below, and indicate in the adjacent field in the scale of 1 to 7 how important it is (1=not a barrier; 7= strong barrier). *

If not listed, please use the empty fields to indicate other barriers for renewable energy cooperative/community that you are facing. You can add extra fields if necessary by clicking on "+1" at the bottom of the multiple choice list.

	1	2	3	4	5	6	7	Not relevant
Bad image due to harmful environmental impact (such as impact of wind turbines on bats and birds)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Barriers to market entry and network connection such as lack of incentive for network operators to connect to small generators	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Difficulty to obtain bank loans	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
High operations and maintenance cost of employed technologies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
High upfront costs, such as purchasing and installing RE generation facilities, licensing for RE generation, land use taxes, grid connection, etc.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of familiarity with RE technology	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of local participation in community groups	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Land use conflicts (energy, agriculture, forestry)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Missing regional institutional support and networking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
No feasible location to install systems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Non-supportive policy environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unfavorable changes in RE policy framework for the cooperative/community enterprise model	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Weak capacities of the community to persevere in carrying out the project and keep systems maintained and operating efficiently	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

91. What measures, if any do you take towards addressing the barriers that you indicated as barriers in the previous questions?

Page 24

92. Please indicate the main drivers for development of renewable energy cooperatives/community in your region and country by selecting one or more responses from the list below, and indicate in the adjacent field on the scale of 1 to 7 how important it is (1=not driver; 7=Strong driver). *

If not listed, please use the empty fields to indicate other conditions that you consider to be drivers for renewable energy cooperatives/community. You can add extra fields if necessary by clicking on "+1" at the bottom of the multiple choice list.

	1	2	3	4	5	6	7	Not relevant
Ethical and environment commitment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Influencing local energy policy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local control of resources and load management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local investment and income generation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lower energy costs and reliable supply	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strong cooperative/community enterprise history and tradition in your region	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sufficient average regional personal income and/or wealth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Supportive policy environment for cooperative/community enterprise	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Supportive policy environment for renewable energy systems deployment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

93. Please state whether you agree or disagree with the following statements. *

	Strongly Disagree	disagree	Undecided	Agree	Strongly agree	Not applicable
Trust plays a crucial role in our cooperative/community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Due to the democratic structure, it is sometimes difficult to make decisions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There can be conflicts between older and newer members of the cooperative/community because they have taken own different risks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page 25

94. Please rate your views on the impact of the following cost items on your cooperative/community. *

	Very little	Little	Moderate	Strong	Very strong	Not applicable
Costs of the energy facilities (incl. installation)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
investigating potential sites	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Maintenance of the equipment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Administrative expenses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Auditing costs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Costs for licenses or permits (e.g. building permits)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Supervision of the cooperative/community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

95. Please rate your views on the impact of the following items on the future of your cooperative/community. *

	Very low	Low	Medium	High	Very high	Not applicable
Ability to find new projects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Development of number of members	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Members' demand for high dividends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Political decisions on regulatory frame conditions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page 26

96. The following items are generally considered benefits of a cooperative/community. Please value them with respect to your cooperative/community. *

	Very unimportant	Unimportant	Moderately Important	Important	Very important	Not applicable
Creating an income for members	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cooperatives/community are easy to establish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Limited liability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Positive environmental impact	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local value creation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Being an owner of a renewable energy facility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Equality of members	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Democratic structure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tax advantages when it comes to the financial payoffs (dividends)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

97. The following items are generally considered challenges of cooperatives/community. Please value them with respect to your cooperative/community. *

	Very unimportant	Unimportant	Moderately important	Important	Very important	Not applicable
Insecurity towards the development of regulatory frame conditions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Costs of administration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Difficulty for decision-making (one member-one vote)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Costs of supervision	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lacking of expertise in the cooperative/community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dependent on members' commitment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Insecurity towards the development of electricity prices	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page 27

98. Is there a difference between renewable energy cooperatives/community in northern Europe (e.g. Germany) and southern Europe (Portugal, Italy, Spain and Greece)? *

- ☐ yes
☐ no

99. What factors contribute most to this difference? *

Please use the "other" field to add entities you establish partnerships with that are not listed. You can add as many additional responses as necessary by clicking "+1" at the bottom of the multiple choice list.

- ☐ Legislative framework
☐ Policy environment
☐ Financial support
☐ Other

100. If you want to indicate any more difference.

101. Do you have any additional comments?

Page 29

Thank you very much.

Best wishes
Susana Soeiro

» Redirection to final page of SurveyHero (formerly eSurveyCreator)

Annex IX. Renewable Energy Community Survey

Welcome!

My name is Susana Soeiro and currently I am a PhD student in Business and Economics of the University of Aveiro

My PhD thesis focus on renewable energy cooperatives and/or renewable energy communities across Europe. A lot of research has been conducted on other cooperatives, but just little on renewable energy cooperatives/community. With this survey I intend to better understand of what renewable energy communities are, the main characteristics, the motivations that lead a person to participate in a renewable energy community and the performance in several European countries, as well as the real benefits and challenges.

This questionnaire only fit those who have already used this type of accommodation in the last three years and are 18 years of age or older. If you fit this profile, your collaboration will be extremely helpful for the success of this research. Please complete this questionnaire consciously.

This project respects the privacy rules of the respondents, guaranteeing the security and confidentiality of the information collected, in strict compliance with the General Regulation on Data Protection. The access and processing of the data are only authorized to the investigators of the project, according to its purpose. After collection, the data is anonymized and stored during the project implementation period.

Respondents are entitled to:

- Accessing their data and receiving information about the processing of their personal data.
- To rectify any inaccuracies about their personal data during the collection period.
- To delete their personal data.
- To file a complaint with a Control Authority.

I have become aware of the aims and purposes of the study as well as how the collected data will be processed.

Most of the questions are multiple choice, while those that require a written input are simple questions. Therefore, completing the survey should take no longer than 10 minutes of your time.

Do bear in mind though the information that you can provide is very important, and that the aggregated results of this survey will be used to develop recommendations for new RE co-ops/REC.

Should you have any questions or doubts, please do not hesitate to contact us at ssoeiro@ua.pt.

At the end of the survey a box for additional comment appears.

Thank you very much for answer the survey.

1. Choose one of the following answers: *

- ☐ I agree to participate in the questionnaire
- ☐ I don't agree to participate in the questionnaire

2. Gender: *

- ☐ F
- ☐ M

Page 3

3. How old are you? *

Age: Years

Page 4

4. Country *

Page 5

5. Do you take part in a Renewable Energy Community/Cooperative? *

- ☐ yes
- ☐ no

Page 6

6. What is your role? *

(one choice)

- ☐ Management
- ☐ Member

7. How do you classify your knowledge about energy communities? *

1 - none 5 - very good

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5

Page 8

8. Do you intend to participate as member in a Renewable Energy Community? *

- ☐ yes
- ☐ no

Page 9

9. Does a cooperative/community provide non-monetary added value to your community? *

- ☐ yes
- ☐ no

10. Rate the following added-value provided by on Renewable Energy Community / Cooperative? *

1=not important; 7=very important

	1	2	3	4	5	6	7	not applicable
involvement in social activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
dissemination of the new energy model	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
collaboration with social organizations in the dissemination	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
energy guidance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
social and green action activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
awareness, promotion, and information on renewable energies.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
increased local employment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
improvements in education	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
a pathway to collective participation in the transition to a just and carbon-free economy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
social integration (library creation)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
financial (for example, possibilities for local artists to display their works at the CE facility) with the local community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

11. What do you think it is motivates members to join in a cooperative/community? Please select one or more responses from the list below, and indicate in the adjacent field the on the scale of 1 to 7 how important it is (1=not important; 7=very important). *

[If not listed, please indicate further reasons why your members join the cooperative/community in the empty field at the end of the question. You may add as many as necessary by clicking on "+1" at the end of the multiple choice list.]

	1	2	3	4	5	6	7	Not relevant
Concerns about environmental and climate impacts of traditional energy technologies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Influence of the community and trust	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local income generation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local investment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lower energy costs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Participating in the energy transition	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reliable local energy supply	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be independent of the energy producers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local interaction within in the community, bring people together	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Change role of consumers in society	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increase local acceptance for renewable energies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

12. What do you think are the benefits of a cooperative/community. Please value them. *

	Very unimportant	Unimportant	Moderately Important	Important	Very important	Not applicable
Creating an income for members	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cooperatives/community are easy to establish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Limited liability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Positive environmental impact	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local value creation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Being an owner of a renewable energy facility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Equality of members	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Democratic structure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tax advantages when it comes to the financial payoffs (dividends)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

13. What do you think are the main barriers for development of renewable energy cooperative/community in your region and country by selecting one or more responses from the list below, and indicate in the adjacent field in the scale of 1 to 7 how important it is (1=not a barrier; 7= strong barrier). *

If not listed, please use the empty fields to indicate other barriers for renewable energy cooperative/community that you are facing. You can add extra fields if necessary by clicking on "+1" at the bottom of the multiple choice list.

	1	2	3	4	5	6	7	Not relevant
Bad image due to harmful environmental impact (such as impact of wind turbines on bats and birds)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Barriers to market entry and network connection such as lack of incentive for network operators to connect to small generators	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Difficulty to obtain bank loans	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
High operations and maintenance cost of employed technologies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
High upfront costs, such as purchasing and installing RE generation facilities, licensing for RE generation, land use taxes, grid connection, etc.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of familiarity with RE technology	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of local participation in community groups	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Land use conflicts (energy, agriculture, forestry)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Missing regional institutional support and networking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
No feasible location to install systems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Non-supportive policy environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unfavorable changes in RE policy framework for the cooperative enterprise model	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Weak capacities of the community to persevere in carrying out the project and keep systems maintained and operating efficiently	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

14. What do you think are the main drivers for development of renewable energy cooperatives/community in your region and country by selecting one or more responses from the list below, and indicate in the adjacent field on the scale of 1 to 7 how important it is (1=not driver; 7=Strong driver). *

If not listed, please use the empty fields to indicate other conditions that you consider to be drivers for renewable energy cooperatives/community. You can add extra fields if necessary by clicking on "+1" at the bottom of the multiple choice list.

	1	2	3	4	5	6	7	Not relevant
Ethical and environment commitment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Influencing local energy policy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local control of resources and load management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local investment and income generation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lower energy costs and reliable supply	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strong cooperative/community enterprise history and tradition in your region	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sufficient average regional personal income and/or wealth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Supportive policy environment for cooperative/community enterprise	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Supportive policy environment for renewable energy systems deployment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

15. What do you think are the challenges of cooperatives/community. Please value them. *

	Very unimportant	Unimportant	Moderately important	Important	Very important	Not applicable
Insecurity towards the development of regulatory frame conditions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Costs of administration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Difficulty for decision-making (one member-one vote)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Costs of supervision	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lacking of expertise in the cooperative/community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dependent on members' commitment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Insecurity towards the development of electricity prices	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page 16

16. Please state whether you agree or disagree with the following statements. *

	Strongly Disagree	disagree	Undecided	Agree	Strongly agree	Not applicable
Trust plays a crucial role in our cooperative/community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Due to the democratic structure, it is sometimes difficult to make decisions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There can be conflicts between older and newer members of the cooperative/community because they have taken own different risks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

17. Do you think there a difference between renewable energy cooperatives/community in northern Europe (e.g. Germany) and southern Europe (Portugal, Italy, Spain and Greece)? *

- ☐ yes
- ☐ no

Page 18

18. Which factor do you think contributes for this difference? *

Please use the "other" field to add entities you establish partnerships with that are not listed. You can add as many additional responses as necessary by clicking "+1" at the bottom of the multiple choice list

1=not important; 7=very important

	1	2	3	4	5	6	7	Not applicable
Legislative framework	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Policy environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Financial support	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page 19

19. Do you have any additional comments?