

AUGUST 2021



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This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement no. 952930.

Project Acronym:	BECoop
Programme:	HORIZON2020
Topic:	LC-SC3-RES-28-2018-2019-2020
Type of Action:	Coordination and Support Action
Grant Agreement number:	952930
Start day:	01/11/2020
Duration:	36 months
Contact:	contact@becoop-project.eu

Document information

Document Factsheet	
Full title	D3.1. Stakeholders' perceptions, acceptance levels and needs on bioenergy heating
Work Package	WP1
Task(s)	T1.3. Identification of stakeholders' perceptions and needs
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Reviewers	
Date	August 2021

Document dissemination Level

Dissemination Level			
X PU - Public			
	PP - Restricted to other programme participants (including the EC)		
	RE - Restricted to a group specified by the consortium (including the EC)		
	CO - Confidential, only for members of the consortium (including the EC)		

Version	Date	Main modification	Entity
v0.1	30 July 2021	Draft version distributed for quality review	White Research
v0.2	20 August 2021	Internal quality review	CBS, Q-PLAN
v1.0	26 August 2021	Final version submitted to the EC	White Research

Document history

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About

Over the last years, the EU has witnessed some remarkable steps in Renewable Energy (RE) deployment. However, at the same time, we see an increasingly uneven penetration of RE across the different energy sectors, with the heating and cooling sector lagging behind. Community bioenergy schemes can play a catalytic role in the market uptake of bioenergy heating technologies and can strongly support the increase of renewables penetration in the heating and cooling sector, contributing to the EU target for increasing renewable heat within this next decade. However, compared to other RES, bioenergy has a remarkably slower development pace in the decentralised energy production which is a model that is set to play a crucial role in the future of the energy transition in the EU.

The ambition of the EU-funded BECoop project is **to provide the necessary conditions and technical as well as business support tools for unlocking the underlying market potential of community bioenergy.** The project's goal is to make community bioenergy projects more appealing to potential interested actors and to foster new links and partnerships among the international bioenergy community.

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Project partners

Table of Contents

Execut	ive Su	mmary.		8
1	Introd	luction.		9
2	Theor	etical Fr	amework	D
	2.1	Commu	unity energy: The EU roadmap1	D
		2.1.1	Policy frameworks and community energy definition 1	D
		2.1.2	Current state of play1	1
	2.2	Accept	ance around energy community projects1	1
		2.2.1	Factors affecting social acceptance of community energy 1	1
		2.2.2	From social acceptance to societal appropriation of energy 1	3
	2.3	Drivers	, barriers and attitudes around energy community projects 1	3
		2.3.1	Drivers encouraging involvement in energy communities 1	3
		2.3.2	Barriers that hinder participation in energy communities1	5
3	Pilot l	evel Cor	nsultation Workshops1	6
	3.1	Consult	tation workshops' methodological approach1	6
		3.1.1	Scope and objectives1	6
		3.1.2	Structure and types of invited stakeholders 1	6
		3.1.3	Metrics	7
	3.2	Consult	tation workshops' key findings1	8
		3.2.1	Spanish consultation workshop1	8
		3.2.2	Greek consultation workshop1	9
		3.2.3	Polish consultation workshop 24	D
		3.2.4	Italian consultation workshop 2	1
	3.3	Consult	tation workshops' identified drivers and barriers	3
4	EU an	d Pilot l	evel Perception Surveys	4
	4.1	Surveys	s methodological approach 24	4
		4.1.1	Sample	4
		4.1.2	Questionnaire structure	5
	4.2	EU leve	el survey analysis	6
	4.3 Pilot le		vel survey analysis	3
		4.3.1	Spanish perception survey	3
		4.3.2	Greek perception survey 4	D
		4.3.3	Polish perception survey	6
		4.3.4	Italian perception survey	3
5	Discus	ssion an	d Conclusions	9
Refere	ences			2

Annex		65
	Annex I: Methodological note on the statistical analysis	65
	Annex II: Perceptions Survey	71

List of Figures

Figure 1. The process of societal appropriation of energy. Adapted from "The trigger to shape the European Energy System", KIC InnoEnergy, 2016 ⁸
Figure 2. BECoop consultation workshops' structure
Figure 3. BECoop Pilot countries and number of workshops' participants
Figure 4. Familiarity with the terms related to bioenergy and energy communities at the EU level 27
Figure 5. Awareness of existing community energy projects (EU)
Figure 6. EU survey participants' perceptions around bioenergy community projects
Figure 7. Willingness to get involved to energy communities related activities (EU)
Figure 8. Intention to be involved in a community bioenergy heating project (EU)
Figure 9. Intention to adopt a bioenergy heating solution in household/business (EU)
Figure 10. Intention to invest in a bioenergy community (EU)
Figure 11. Drivers for participating in a bioenergy community heating project (EU)
Figure 12. Barriers for participating in a bioenergy community heating project (EU)
Figure 13. Home heating sources (Spain)
Figure 14. Familiarity with the terms related to bioenergy and energy communities (Spain)
Figure 15. Awareness of existing community energy projects (Spain)
Figure 16. Previous experience in energy community projects (Spain)
Figure 17. Perceptions around bioenergy community projects (Spain)
Figure 18. Participants' perceptions around bioenergy community projects (Spain)
Figure 19. Willingness to be involved in an energy community heating project (Spain)
Figure 20. Awareness-raising actions boosting the uptake of bioenergy community (Spain)
Figure 21. Drivers for participating in a bioenergy community heating project (Spain)
Figure 22. Barriers for participating in a bioenergy community heating project (Spain)
Figure 23. Home heating sources (Greece)
Figure 24. Familiarity with the terms related to bioenergy and energy communities (Greece)
Figure 25. Awareness of existing community energy projects (Greece)
Figure 26. Previous experience in energy community projects (Greece)
Figure 27. Perceptions around bioenergy community projects (Greece)
Figure 28. Greek participants' perceptions around bioenergy community projects
Figure 29. Willingness to be involved in an energy community heating project (Greece)
Figure 30. Awareness-raising actions boosting the uptake of bioenergy community (Greece)

Figure 31. Drivers for participating in a bioenergy community heating project (Greece)
Figure 32. Barriers for participating in a bioenergy community heating project (Greece)
Figure 33. Home heating sources (Poland) 47
Figure 34. Familiarity of survey participants with terms related to the project (Poland)
Figure 35. Awareness of existing community energy projects (Poland)
Figure 36. Previous experience in energy community projects (Poland)
Figure 37. Perceptions around bioenergy community projects (Poland)
Figure 38. Participants' perceptions around bioenergy community projects in Poland
Figure 39. Willingness to be involved in an energy community heating project (Poland)
Figure 40. Awareness-raising actions boosting the uptake of bioenergy community (Poland) 50
Figure 41. Drivers for participating in a bioenergy community heating project (Poland)
Figure 42. Barriers for participating in a bioenergy community heating project (Poland)
Figure 43. Home heating sources (Italy)
Figure 44. Familiarity with the terms related to bioenergy and energy communities (Italy)54
Figure 45. Awareness of existing community energy projects (Italy)
Figure 46. Previous experience in energy community projects (Italy)55
Figure 47. Perceptions around bioenergy community projects (Italy)
Figure 48. Participants' perceptions around bioenergy community projects (Italy)
Figure 49. Willingness to be involved in an energy community heating project (Italy)
Figure 50. Awareness-raising actions boosting the uptake of bioenergy community (Italy)
Figure 51. Drivers for participating in a bioenergy community heating project (Italy)
Figure 52.Barriers for participating in a bioenergy community heating project (Italy)

List of Tables

Table 1. Types of stakeholders invited at the consultation workshops 16
Table 2. Consultation workshops' identified drivers of community bioenergy uptake
Table 3. Consultation workshops' identified barriers of community bioenergy uptake
Table 4. EU sample distribution by individual characteristics
Table 5. Share of participants with previous experience in energy-related projects (EU)
Table 6. Drivers influencing perceptions and involvement in community (bio)energy (EU)
Table 7. Barriers influencing perceptions and involvement in community (bio)energy (EU)
Table 8. Spanish sample distribution by individual characteristics
Table 9. Energy rating of participants' buildings and estimated annual thermal expenditure (Spain). 34
Table 10. Drivers influencing perceptions and involvement in community (bio)energy in Spain 38
Table 11. Barriers influencing perceptions and involvement in community (bio)energy in Spain 39
Table 12. Greek sample distribution by individual characteristics 40
Table 13. Drivers influencing perceptions and involvement in community (bio)energy in Greece 44
Table 14. Barriers influencing perceptions and involvement in community (bio)energy in Greece 45
Table 15. Polish sample distribution by individual characteristics
Table 16. Drivers for overall perceptions and involvement in community (bio)energy in Poland 51
Table 17. Barriers for overall perceptions and involvement in community (bio)energy in Poland 52
Table 18. Italian sample distribution by individual characteristics. 53
Table 19. Drivers for overall perceptions and involvement in community (bio)energy in Italy
Table 20. Barriers for overall perceptions and involvement in community (bio)energy in Italy

Abbreviations

CEP	Clean Energy Package
CSA	Coordination and Support Action
ESCO	Energy Service Company
EU	European Union
IEMD	Internal Electricity Market Directive
MS	Member States
NECPs	National Climate and Energy plans
RE	Renewable Energy
RED	Renewable Energy Directive
RES	Renewable Energy Sources
RESCoops	Renewable Energy Cooperatives

Executive Summary

Energy communities can play a crucial role in Europe's energy transition from fossil fuels to renewable energy (RE). They represent an alternative type of market actor and a different way and philosophy to do business which is now acknowledged by European legislation. Over the last years, RE communities and, specifically, bioenergy communities are still hard to find, especially in Central, Eastern and Southern Europe. While Member States (MS) are called to transpose the European Directives and regulation into their national legislation that provide an enabling framework to put energy communities on equal footing with other market players, this study attempts to shed light on the **stakeholders' needs, perceptions and acceptance levels around community energy and community bioenergy heating aspects.**

Local consultation workshops' findings - collected at the project's pilots' level - signalled key dimensions that were further explored through local and EU-wide perception surveys. Through this market research approach, knowledge exchange on misconceptions was facilitated, while a solid understanding of factors that can hinder or facilitate people's involvement in community bioenergy was empowered.

Study results indicated that, even though EU citizens are strongly aware of the multiple benefits that RE projects may bring at the local and regional level, they still appear to be not quite familiar with the concept of energy community. It was acknowledged that the **support of local economy** and **climate protection** are considered as essential factors, driving people's engagement around bioenergy community heating projects. At the same time, the **lack of adequate structural and financial mechanisms** and the **absence of enabling legislative frameworks** can severely hinder citizens' participation and willingness to join such a mission. The study's outcomes confirm that having **more visible projects being supported and financed** - from which both communities and individuals profit both in returns and social rewards - would significantly help more citizens to be aware and supportive of RE community schemes.

Building upon the identified drivers, barriers, practices and support needs, presented herein, the BECoop consortium will be in a position to **better target and fine-tune the project's foreseen actions**.

The report is structured as follows:

- **Section 1** provides a short description of the context that motivated this study and introduces the main objectives of this research.
- **Section 2** presents a thorough literature review, including fundamental information around community energy. Under this section, literature-acknowledged factors influencing social acceptance as well as drivers and barriers of peoples' involvement in bioenergy community projects are examined.
- **Section 3** includes the organizational details and the main results produced during the implementation of the local (pilot level) consultation workshops.
- **Section 4** reflects the outcomes of the perceptions survey analysis employed at both pilot and EU level. Descriptive findings are enhanced by statistical analysis insights.
- Section 5 presents a summary of key findings, conclusions, and further discussion.

Finally, methodological details related to the statistical analysis performed (Annex I) and a copy of the perceptions survey (Annex II) can be found at the **Annex** section.

1 Introduction

Europe is currently in the process of shifting away from a fossil fuels-based energy system to a renewable one, placing the citizen at its core. Within the following decades, the EU energy sector aspires to be transformed into a decentralised market, fostering a deeper participation of individual consumers and citizens in community-based initiatives. In fact, by 2050, it is expected that 45% of Europe's electricity will be produced by energy citizens (cooperatives, households, public entities, micro and small businesses) while collective projects, such as energy communities, could produce 37% of this electricity (Vansintjan Dirk, 2019).

Various legal forms allow for community involvement in sustainable energy investments. Within such projects, initially set in motion over the late 90s, communities operate collectively or in local networks in the energy market producing RE, based on local collaborations. The most common legal structures of energy communities are cooperatives owned by citizens through shares¹. Varying ownership models (limited partnerships, foundations and others) now bear higher chances to flourish with the national transposition of the supportive frameworks set out in the latest EU legislative acts.

However, even though this is a business model bearing a potential now formally acknowledged by the European Commission, its development and uptake is still lagging behind. Vast differences are being observed with regard to communities' formulation and expansion across different European countries.

The establishment of energy communities relies on a broad variety of governance models that may encompass different patterns of organisational arrangements, local identities and common interests (Baigorrotegui and Lowitzsch, 2019). It is the blending of such factors, combined together in a particular scheme, that may eventually facilitate or hinder the successful creation of an energy community.

The organisational and contractual arrangements are, in fact, factors that can be adjusted. EU as well as policy at the national and regional level should be flexible to adapt to this clean-energy transitionera, establishing frameworks that empower the development of energy communities across Europe (Lowitzsch, Hoicka and van Tulder, 2020). At the same time, though, **the elements of identity and interest around such a mission are rooted in demographics and geography-specific cultures and need to be thoroughly researched and addressed**.

As frequently reported, energy projects' **implementation is facilitated only when local support is secured.** A pool of social aspects, such as citizens' awareness, acceptance and engagement constitute essential factors driving the uptake of such initiatives. It is therefore fundamental to **take into consideration and analyse not only the EU-level but also varying local perceptions and needs** to bear higher chances of establishing a successful energy community, or - in the context of BECoop - a **bioenergy community heating project thar reflects local aspirations**.

This is the very scope of BECoop Task 1.3. Through market research, the outcomes of which are presented herein, the task aims at **enabling a solid understanding of the project's stakeholders**, especially focusing on the general public's perceptions, preferences, acceptance levels and intentions around community energy and community bioenergy heating aspects. The understanding and classification of current attitudes and beliefs, derived through this report's analysis, **shed light on the main gaps and barriers as well as support needs upon which BECoop can better target and fine-tune foreseen activities**.

¹ JRC (2020). Energy communities: an overview of energy and social innovation. https://publications.jrc.ec.europa.eu/repository/handle/JRC119433

2 Theoretical Framework

2.1 Community energy: The EU roadmap

2.1.1 Policy frameworks and community energy definition

The energy sector in Europe has been under a transformation process during the last three decades. A major change over this period has been the energy market opening and eventual liberalisation. By mid 1980s, it was argued that the privatisation of energy companies and termination of State monopolies, would increase the energy market competition, leading to a reduction of the energy price for consumers and industry. Since the late 1990s, three legislative packages got into action (The 1st, 2nd and 3rd Energy Packages - introduced in 1996, 2003 and 2007 respectively²), aiming to open the market to new actors. At the same time, in 2007, EU leaders endorsed an integrated approach to climate and energy policy entitled as "2020 Climate and Energy Directive (RED, 2009/28/EC)³. RED contributed to boosting renewable energy (RE) development, empowering RE projects to be established and reducing the cost of RE technologies. The aforementioned evolving frameworks and the appearance of a number of regional policy initiatives, gave rise to the community energy scheme.

A Renewable Energy Cooperatives (RESCoops) scheme growth was initially detected, especially in countries of western Europe. Although the new legislative packages enabled citizens to participate in the energy sector, their role and involvement were not officially recognized; the concept of energy communities was not well defined or officially acknowledged. The majority of energy market rules was designed and adopted to the nature of traditional energy companies. Consequently, the emerging energy communities could not always take part in the market on fair terms.

In 2015, the EU announced its plans to establish an Energy Union where citizens would take ownership of the energy transition, benefiting from new technologies to reduce their energy bills, participating actively in the market, and where vulnerable consumers are protected (European Commission, 2015). Eventually, in 2016, the EU released 8 legislative acts entitled as the **Clean Energy Package (CEP)**¹. **The energy communities' concept was officially recognised** and addressed under these acts. In particular, the **revised Renewable Energy Directive**, **RED II**, **(EU) 2018/2001**⁴ describes the framework for energy communities to be developed and implemented while the **Internal Electricity Market Directive**, **IEMD (EU) 2019/944**⁵ defines the respective communities' roles and responsibilities (Caramizaru, A. and Uihlein, A., 2020). According to this latest policy framework, *energy community* is described as a legal entity that:

- a) is based on voluntary and open participation and is controlled by natural persons, local authorities, including municipalities, or small enterprises;
- b) has for its primary purpose to provide environmental, economic, or social community benefits 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.

² The Clean Energy for all Europeans Package <u>https://fsr.eui.eu/the-clean-energy-for-all-europeans-package/</u>

³ Directive (EU) 2009/28/EC https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:en:PDF

⁴ Directive (EU) 2018/2001 <u>https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2001</u>

⁵ Directive (EU) 2019/944 <u>https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019L0944</u>

As policy states, participation in energy communities should be open to all the consumers, especially those that belong to low-income and vulnerable households. Moreover, the right of every citizen to equally participate in the community should be secured (Directive (EU) 2018/2001-article 22).

Overall, CEP seeks to strengthen the rights of citizens to produce, sell, store and consume renewable energy with ease and support, and without discrimination (European Commission, 2019). This development could mark the beginning of a more supportive platform for citizen-led energy initiatives across the EU, giving energy communities the opportunity to be supported by national and local governments and ensuring that they can equally compete with other market actors and get financial support by schemes tailored to their specific characteristics. It can, therefore, encourage more citizens to actively participate as stakeholders in addressing the current energy challenges.

2.1.2 Current state of play

Ever since RED II and IEMD were published, EU Member States (MS) were called to transpose these directives into national law within a period of 2 years, that is by 2021. MS, through their **National Climate and Energy plans (NECPs)**, are called to support and legislate their own definition of community energy and further explain which already existing legal entities could fall under this definition, also putting in place participation mechanisms for energy poor and vulnerable populations. However, substantial room for manoeuvre is left to MS in accomplishing this task (Verde et al., 2020). **Currently, while there are numerous energy cooperatives established, their dispersion and range across Europe remains relatively constrained, being rather undeveloped in eastern, southern and central Europe**. 80% of RESCoops are located in either Germany or Denmark, whereas, in terms of RE sources being exploited, solar and wind energy take the lion's share, in contrast to bioenergy (Hewitt,R. et al., 2018; DGRV, 2018).

The future for renewable energy communities remains promising as long as the interest of citizens and local authorities for climate change and involvement in energy transition grows. Aside from governmental and organisation arrangements, there is a **dire need to acquire a deeper understanding of social aspects, such as awareness, acceptance and personal beliefs that constitute essential factors significantly influencing the wider uptake of energy or bioenergy communities.** What is for sure is that having more visible projects being supported and financed, from which both communities and individuals profit both in returns and social rewards, helps more citizens to be aware and supportive of renewable energy schemes.

2.2 Acceptance around energy community projects

2.2.1 Factors affecting social acceptance of community energy

This section elaborates on factors that can strongly influence social participation and acceptance around community energy. These factors should be thoroughly studied for the Clean Energy Package and its underlying targets to be achieved.

Ecological awareness, environmental beliefs and personality traits

Awareness around environmental issues and climate change is strongly related to the reported levels of social acceptance around RE/bioenergy projects and, in turn, influences public engagement and participation in them. Personality traits linked to pro-environmental beliefs and attitudes may also play a significant role in green decision-making and involvement as well as investment in energy projects (Busic-Sontic et al., 2017). Among the "big five" personality traits (*Neuroticism, Extraversion,*

Openness, Agreeableness and Consciousness) initially defined by Rothmann et al. (2003), there is clear evidence of a proportional connection between an individual's *openness*, featuring characteristics such as imagination and insight, and environmentalism/ecological awareness (Brick, C., & Lewis, G. J., 2014). At the same time, scholars confirm that the positive environmental impact that energy projects can bring can significantly boost social acceptance around such missions at the regional level (Radics et al.,2016; Fytili, D., & Zabaniotou, A.,2017).

Knowledge and awareness around renewables and RE technologies

Lack of knowledge and lack of understanding around renewable energies constitute factors significantly linked to low levels of acceptance and support of energy or bioenergy projects. In fact, bioenergy seems to be one of the "less recognisable" renewable energies by the general public (Rohracher et al., 2003; Upreti BR, van der Horst D, 2004; Radics et al., 2016;). Thus, more targeted communication strategies are needed in order to raise awareness and reduce misconceptions around RE, bioenergy, and community energy.

Are there bill savings involved? What about performance and efficiency of RE?

Economic motives play a fundamental role for the acceptance of energy projects. Citizens appear to be sceptical towards the introduction of renewables. They are not wholeheartedly willing to change their current source of energy, especially if they cannot acknowledge short-term economic benefits, such as energy bill reductions or local benefits such as the creation of new jobs. Other factors that citizens may consider before switching to another energy source and are indirectly connected to economic savings, are the performance and efficiency of the source employed (Rohracher et al., 2003).

Demographics play an important role in individuals' engagement in energy projects

It appears that a variety of demographic characteristics may also influence social acceptance around community energy and RE projects. With regard to gender, men appear to have higher levels of awareness about renewable energy projects while women, when compared to men, might appear to lack some knowledge. Despite this, women appear to be more optimistic with regard to the potential risks of such missions and more willing to engage or join them (Radics et al., 2015). At the same time, younger or highly educated people seem to be more supportive towards the uptake of bioenergy. People with a tertiary education also appear to be concerned about potential risks deriving from the application of varying RE technologies. In addition, residential location impacts citizens' beliefs; residents of rural areas are more open to renewable or bioenergy project, recognising the prospect of boosting local economy, e.g., creation of new jobs (Radics et al., 2015).

Level of public engagement in energy transition

Until recently, scholars have typically conceptualised the role of people in energy systems as "energy users", who are mainly customers, passively generating energy demand, as recipients at the margins of a centralized system. Publics have often been understood as a barrier to progress, either by failing to take up new technologies, or by responding with selfish criticism of new developments. They generally support the common good of clean-energy transition but may reject the technologies as soon as they are built near their homes. Such reactions are frequently referred as **NIMBY**-ism (*Not In My Backyard*) and stem from knowledge deficits about technological benefits (Armour, 1991; Heidenreich, 2015). In practice, these explanations are misleading and reductionist simplifications of people's potential engagement with new energy technologies, poorly anchored in empirical evidence (Haggett, 2011). Recent work illustrates how complex processes of identity formation and a tendency to implant values, such as prosperity and modernity in technologies, sometimes lead to the opposite phenomenon: **PIMBY** (*Please, In My Backyard*) (Brinkman and Hirsh, 2017). In reality, the understanding and engagement produced through encounters between RE technologies and public

can take many forms, of which active opposition and active promotion are two of many possibilities. Research confirms that top-down, centralised planning, without local participation and lack of clear local benefits, tends to generate opposition, **while shared ownership models are often thought to receive higher levels of acceptance** (Goedkoop and Devine-Wright, 2016).

2.2.2 From social acceptance to societal appropriation of energy

Over the last decade, a strong focus has been put on the notion of "acceptance" (analysed above), where an end-user or citizen is seen as either (i) a passive recipient or (ii) active opponent to RE or a RE project. There is a need to now move beyond this dichotomy and embrace the notion of **"societal appropriation of energy"**⁶ which, is not about imposing to people what they do not want but aims at looking for ways to co-create with end-users RE solutions and thus steer change. In short, the challenge is to enable a change from NIMBY to PIMBY. Societal appropriation of energy can be split into four levels, as depicted in Figure 1. The first two levels, *awareness* and *understanding*, are consistent with the general



Figure 1. The process of societal appropriation of energy. Adapted from "The trigger to shape the European Energy System", KIC InnoEnergy, 2016^s.

interest and can be endorsed by public authorities in different agglomerations, whereas the *involvement* and *steering* levels require the promotion of best examples, the emergence of initiatives at the local, regional and national level and a supportive policy framework.

Societal appropriation should be thought of as the process by which the citizen learns to consider energy as an essential part of everyday life, reflected in the integration of energy matters into daily decisions and resulting behaviours. That is, to **establish renewable energy as a new distinctive dimension of the social and personal identity**⁷.

2.3 Drivers, barriers and attitudes around energy community projects

2.3.1 Drivers encouraging involvement in energy communities

The motives behind the engagement and participation to community energy projects can be complex and multidimensional. Some major driving factors that can encourage social involvement into such missions are presented below.

Social identification, the feeling and perception of **belonging and being part of a group** of people, constitutes an important driver in the engagement of individuals in energy communities. People value the sentiment of **security** (Wüste, A., & Schmuck, P.,2012) while others want to set the right example.

⁶ Thomas Pellerin-Carlin and Pierre Serkine, "From Distraction to Action – towards a bold Energy Union Innovation Strategy", Policy Paper No. 167, Jacques Delors Institute, June 2016

⁷ The trigger to shape the European Energy System <u>https://www.innoenergy.com/media/3669/het16_societal_appropriation-final2.pdf</u>

(Ruggiero et al., 2019). They seek to getting engaged in cooperative group behaviours and be working for them in order to maintain a pride feeling and a good self-image (Tyler, 2001; Bauwens, 2016).

Participation in community energy projects is promoted by community identity and strengthens the cooperation/collaboration feeling among the residents of a region (Caramizaru, A. and Uihlein, A. ,2020). Citizens get more interested to participate in other nature community activities while RE project members are also possessed by **feelings of pride and satisfaction for their achievements**. Consequently, community's confidence increases and citizens believe that they can **bring a positive change** (Bere, J., Jones, C., Jones, S., 2015; Brummer, V., 2018).

Research also reveals relevance of community identity and trust, another element of energy community engagement (Kalkbrenner, B. J., & Roosen, J. ,2016). **Trust between local community and people leading the initiatives** is fundamental for the development of the project, the outcomes and, of course, for the involvement of the local society and their desire to get engaged in the process. There is also evidence that communities with trust result into strongly participatory processes and these processes, in turn, lead to a further **building of social capital** (Walker et al., 2010). Trust does not only serve as a requirement for the creation of a community but it is also an outcome of the community's establishment (Kalkbrenner, B. J., & Roosen, J.,2016).

Fairness is an additional factor boosting social acceptance around energy communities' projects. Such projects can develop **fair, open and transparent processes** as they are relying on **democratic practices**. Each participating individual (co-owner) should have the same participation rights and equal share in decision making. Employed procedures should also support the **integration of socially vulnerable groups**. The democratic participation in energy communities could overall lead to the democratisation of the energy industry as well as of other fields, such as politics and economics (Kunze, C., and S. Becker, 2014; Simcock, Willis, and Capener, 2016).

Promotion of the local economic development constitutes another key driving factor for participation in RE projects, especially in rural areas (Ruggiero et al., 2019). Additional economic drivers include the **reduction of energy bills**, the **creation of new jobs** to be occupied by local residents and direct creation of profit (Wüste, A., & Schmuck, P.,2012). The support of local economy is also linked with a socioeconomic regeneration.

RESCoops can also lead to **energy autonomy** by the centralised energy system and the large energy companies; they are self-sufficient as they can produce the energy that they consume (Gui, E. M., & MacGill, I.,2018). Therefore, the **willingness for energy independence**, away from large companies, could be a key driver for the engagement in such projects. In addition, energy communities can contribute to **alleviating energy poverty**. There are several examples of energy cooperatives that use their profits to help socially disadvantage populations (Slee, B., & Harnmeijer, J.,2017). In some cases, cooperative's members donate their surplus of energy in order to pay for the energy bills of the poorest or they even share their membership with other individuals (Caramizaru, A. and Uihlein, A. ,2020).

Of course, there is also a share of public for which the main motive for participation in energy communities is the **protection of the environment**. People find themselves worried about climate change and preservation of the resources and report a **sentiment of care and responsibility for the future generations**. (Caramizaru, A. and Uihlein,2020). There is also evidence that community energy projects can lead to a pro-environmental attitude and increased knowledge on renewable energy, energy security and energy consumption monitoring (Bere, J., Jones, C., Jones, S., 2015).

2.3.2 Barriers that hinder participation in energy communities

The public and interested actors often have many challenges to overcome before they engage in community energy. In the following section, we present a number of barriers hindering their involvement in renewable energy and bioenergy heating projects:

Lack of capital availability and investment risk constitute factors that can strongly influence willingness to be involved in community energy. Evidently, **citizens' income** plays a significant role in community energy development (Caramizaru, A. and Uihlein, A.,2020). It is observed that higher GDP countries have a bigger number of energy communities in their territory. This is also geographically depicted within the EU as northern countries are the leading actors in European community energy projects, while southern and eastern countries are lagging behind.

Furthermore, aside from the **time-consuming**, as often reported, procedures for RE project development, the existing policy framework in certain countries does not favour the community energy uptake. The **non-stable or ever-changing regulations** linked with **complex administrative procedures** and the **lack of adequate structural and financial mechanisms** often create an atmosphere of **uncertainty**, hindering long-term planning and investment. Such factors discourage citizens from getting involved or participating in energy communities, further claiming a **lack of local and national governance support** (Ruggiero et al., 2019).

Specifically focusing on bioenergy heating projects, research confirms that barriers negatively influencing participation in community energy missions include the **lack of public awareness and lack of technical knowledge on bioenergy heating solutions**. Concerns have also been reported with regard to the **aesthetics**, often linked to a feeling of unease about the **noise and the odour** that could potentially come from the project's installation.

In addition, there are still **misconceptions around biomass**. The public is often not familiar with the carbon-neutral nature of wood and ignores or disregards the advantages that biomass offers compared to fossil fuels (Plate, 2010). There are also those who do not oppose to the project installation yet they are not willing to take part in the community due to existing **fluctuations in energy markets** or fear with regard to the **risk and uncertainty of their potential investment** (Wüste, A., & Schmuck, P., 2012). Finally, one of the most important barriers related to involvement and investment in bioenergy communities is the **high cost of transporting biomass** as well as the **lack of infrastructure/logistics related to bioenergy production** (supply, storage etc.) (Sundstrom, S.,2012).

Another great challenge for taking part in energy communities relies on their **volunteering nature**. It is arguably hard for communities, solely relying on their members, to safeguard their rights compared to the means that a large, centralized energy company can employ (Vansintjan Dirk, 2019). With the introduction of new financial schemes such as auctions and tenders, it became evident that community energy projects face **difficulties competing over more experienced energy companies**, which might have a greater capacity to develop a project for the lowest amount of subsidies.

Finally, there are also **cultural differences and memories from the country's past** that can play a key role in shaping citizens' perceptions around (bio)energy community projects. In certain countries of western, central and northern Europe, with a tradition of social enterprise, acceptance around RE projects often ranks high. In eastern countries with a Soviet past, however, negative perceptions have been reported regarding cooperative structures. This is due to damaging memories from the past - the effects of which are still observed today - and are related to attempts at forced collectivisation of agricultural crops mandated by past communist authorities. **Reluctancy and lack of trust in the cooperative concept** is being observed, mostly in rural societies of such countries, **due to the historical/political background**. (Kania, J, 2013; Beckmann, 2016; Caramizaru, A. and Uihlein, A., 2020).

3 Pilot level Consultation Workshops

3.1 Consultation workshops' methodological approach

3.1.1 Scope and objectives

Four consultation workshops, one in each pilot country (Spain, Greece, Poland and Italy) were organised and carried out between the 4th and 18th of March 2021, aiming to examine the drivers, barriers and perceptions of local communities and varying types of stakeholders around bioenergy community and local bioenergy heating projects. Specifically, workshops' objectives were to:

- gather views and facilitate knowledge exchange on misconceptions, opportunities, barriers that may favour or hinder local bioenergy heating actions;
- communicate the BECoop vision to stakeholders and engage them in future project activities;
- signal key factors and dimensions to be further explored through the local perception surveys;
- understand and classify stakeholders' perceptions and reveal the major gaps as well as their support needs upon which the project will better target and fine-tune the foreseen activities.

3.1.2 Structure and types of invited stakeholders

Pilot partners, together with their national supporting partners, organised a series of **virtual**[®] **consultation workshops**, using online platforms along with e-tools and following the guidelines shared by White Research. These events were widely promoted and disseminated through the partners' and project's networks and social media accounts. Varying types of stakeholders, as indicatively enlisted in Table 1, were invited, further enabling the BECoop consortium to reflect on **personal or community beliefs and to identify drivers and barriers**, as reported by different actors, with regard to the uptake of community bioenergy heating in each pilot region.

Types of invited stakeholders
RESCoops
Local authorities/Municipalities
Energy associations
Energy market actors (energy suppliers, grid operators, commercial RE companies)
Biomass Producers
SMEs
NGOs
Potential investors
Policymakers
Citizens/General public (incl. disadvantaged and vulnerable groups)

Table 1. Types of stakeholders invited at the consultation workshops

⁸ Due to the limitations posed by the Covid-19 pandemic.

Workshops were structured in 3 stages, as depicted in Figure 2. Starting with an open/warming-up discussion, participants introduced themselves and facilitators presented an overview of the project's main goals as well as the workshops' scope. Over the core session, by posing a number of discussion-igniting questions and by using a series of brainstorming techniques, moderators were able to capture visions, opinions, and behaviours of workshops' participants around community bioenergy heating. A sum up of the main findings took place over the closing session. At the same time, organisers informed participants of upcoming events and encouraged them to follow the project's social media accounts to always be updated on follow up activities. It should be noted that all workshop participants filled out an Informed Consent From before taking part in these events.



Figure 2. BECoop consultation workshops' structure

3.1.3 Metrics

A total number of **103 participants** attended the BECoop pilot consultation workshops, confirming that the respective project KPI⁹ was reached.



Figure 3. BECoop Pilot countries and number of workshops' participants

Details on each pilot workshop's main findings are presented below.

⁹ BECoop KPI: Consultation workshops /participants: 4/ >100

3.2 Consultation workshops' key findings

3.2.1 Spanish consultation workshop

The Spanish workshop was organised by GOINER, together with the support of CIRCE, on the 18th of March 2021, addressing the Basque Country and Navarra, two autonomous communities in the North of Spain that strongly rely on fossil fuelled energy. The area has a great biomass potential; still it is currently exploited mostly for industrial purposes and not for residential heating. 28 participants of varied stakeholder groups attended the event, such as: biomass producers (3); energy market actors (5); local authorities/municipalities (10); policy makers (2); potential investors (2); RESCoops (2); SMEs (1) and citizens (3).

Identified social perceptions on community bioenergy heating projects

Among key findings was that there is a lack of information around energy communities among those who already use bioenergy while there appears to be a **lack of information around bioenergy among existing energy community actors**. Representatives of local bioenergy communities pointed out that, among their main objectives, the promotion of local energy production and **energy autonomy** are considered essential. As it was discussed, energy communities can be perceived as entities "*whose primary purpose is to provide local benefits, rather than financial gain*". Another significant observation was related to the different stakeholders' perceptions between rural and urban areas. More specifically, participants stated central heating in urban environments is considered as a step backwards. Moreover, it was mentioned that citizens prefer to switch from oil boilers to solid biomass fuels (pellets/chips) than from natural gas to biomass. This is something that could be explained as stakeholders do not have any significant economic benefit by such a transition, since natural gas and biomass have similar prices. These **different perceptions between urban and rural areas** indicate the need to follow a different communication strategy, tailored to the specificities of each area. The importance of **considering the entire life cycle of the product** (pellets, biogas, woodchips) in order to promote local circular economy was also highlighted.

Identified drivers that empower public acceptance of community bioenergy heating projects

According to all participants, the major driver for the development of bioenergy communities would be the general public's **ecological awareness**. The **growth of local economy**, followed by **increased job opportunities**, were also considered as popular drivers. The reduction of energy bills was not highlighted as one of the main drivers for the acceptance of bioenergy community projects. An overwhelming majority of the participants declared to value participating in an energy cooperative even if this would not be linked to any personal economic benefit. Citizens claimed they would switch to bioenergy if the cost were at the same or lower level in comparison to other energy sources.

Identified barriers hindering acceptance and uptake of community bioenergy heating projects

Several barriers towards the development of community bioenergy heating projects were also pointed out during the workshop. All invited stakeholders commonly claimed that the possiblu high initial investment, its associated risk, the lack of consumers' knowledge about RE solutions as well as the lack of infrastructure (storage/charging/discharging space, etc.) constitute serious barriers hindering community bioenergy uptake. Energy Service Companies (ESCOs) see the lack of institutional support and the lack of sustainability polices as the key barriers towards the development of RE projects. Participants also mentioned that administrative obstacles and the overall lack of knowledge on this concept are major barriers. Agricultural/livestock/forestry service companies claimed a lack of technical knowledge and stated that the process required for the installation of technical equipment into existing facilities appears to be complex.

The lack of society's knowledge was the most widespread barrier among the participants, it indicates the need for raising awareness around bioenergy community projects through education. Other hindering factors discussed among participants included the lack of variety of solid biomass resources in marketable quantities and, finally, the lack of biomass logistics centres that bring bioenergy (wood, pellets, chips, etc.) closer to the end user.

3.2.2 Greek consultation workshop

The Greek workshop was organized by ESEK, supported by CERTH and Q-PLAN, on the 4th of March 2021, in the region of Thessaly, an area with strong agricultural production. Nearly half of the Thessaly area is covered by 2.636 Km² of lowlands. The Regional Unit of Karditsa has a great potential of Renewable Energy Sources (RES); the natural resources of the area are rich and suitable to the energy production. 20 participants of various stakeholder groups attended the event, such as: energy community member (4); local authorities/municipalities (3); energy association (1); Re company (5); biomass producer/farmer (2); SMEs (1), citizens (3) and NGO (1).

Identified social perceptions on community bioenergy heating projects

During the workshop, a lot of social perceptions were highlighted. One main point was related to the **misconception on biomass combustion and the pollution it causes**. A lot of people believe that biomass combustion has a negative impact on air quality. As stated in the workshop, this misconception is due to the lack of knowledge of people around the biomass term (e.g., they think that biomass is something that is not suitable for combustion, such as burning old furniture or old particleboard, fiberboard (MDF), plywood or melamine products).

Participants proposed **that successful cases of bioenergy projects should be advertised** and disseminated more to inform people of the right applications of biomass and bioenergy. In addition, it was highlighted that people need further education and training about bioenergy.

Participants stated that most people are not aware of the existence of multiple technological solutions available in the market for the abatement of pollutants and emissions produced during biomass combustion. Moreover, it was highlighted that there are emission limits set for biomass plants in order to control air pollution (apart from the lack of emission limits for biomass boilers with a capacity of 500kW- 1MW). However, at domestic level, it is difficult to control the emissions as there is no institutionalised body to make such inspections. As proposed by the attendants, this could be performed by an inspection body of each municipality, after buying appropriate emission control equipment and/or by using certified biofuels (e.g., EN Plus label).

Overall, workshop participants expressed their interest for the development of community bioenergy projects in their area over other RES and highlighted their **benefits**, **such as rural development**, **heating cost reduction to consumers and the positive environmental impact**. In addition, the vast **majority of the attendants believe that energy communities are a suitable vehicle for** the development and promotion of bioenergy in Greece. Lastly, the attendants also expressed their belief that step-by-step, the bioenergy scene in Greece is improving during the last years.

Identified drivers that empower public acceptance of community bioenergy heating projects

Several factors driving the developing bioenergy community projects were brought into discussion. Firstly, the greatest driver mentioned is the significant amounts of **untapped biomass resources** in the local area, available for exploitation. Participants specifically highlighted the vast amounts of forestry residues, agricultural residues (prunings, plantation removals and residues from maize and cotton crops) and urban prunings (from city trees).

Secondly, another identified driver was the local development, with focus on the **creation of new jobs**. As mentioned in the workshop, a lot of unemployed citizens could be hired for the harvesting and transportation of biomass resources needed in the bioenergy community projects. Furthermore, participants expressed their point of view that other RES (wind turbines, solar panels), in comparison with bioenergy, are often linked with negative impacts to the natural and local landscape.

Identified barriers hindering acceptance and uptake of community bioenergy heating projects

Several barriers towards the development of community bioenergy heating projects were pointed out during the workshop. A lot of focus was put on the **lack of legislation and funding schemes on the exploitation of biomass and the development of energy communities**. Another barrier mentioned, mainly for the development of power generation energy communities, is the **bureaucracy** and time needed for the Electricity Distribution Network Operator to answer if there is enough space on the grid in order to connect with the power generation system of the energy community. Furthermore, the **unclear regulatory framework** for the exploitation of biomass is a significant barrier. From an example stated in the workshop, based on forestry legislation, it is illegal to take out of the forest all of the forest residues. On many occasions, they prefer to keep all the forestry biomass inside the forest and pay fines, as there is no exploitation method for the biomass. Another significant barrier mentioned, was the **complexity of the logistics and the lack of established value chain** for the harvesting and treatment of biomass (agricultural residues, forestry residues etc.). The logistics of biomass were pointed out as a significant challenge to deal with, for the successful development of community bioenergy projects.

A lot of conversation was also held over the **misconception that biomass combustion has a negative impact on the environment** due to the emissions produced. As many of the participants stated, this is one main reason that some bioenergy projects are not being developed, as there is a **negative social perception against biomass combustion due to lack of knowledge**. Moreover, participants added that citizens should be informed about the anti-pollution systems that can be applied in biomass plants that minimize the emissions produced and comply with the emission limits set by the national law.

3.2.3 Polish consultation workshop

The Polish workshop was organised by OBS, supported by WUELS, on the 10th of March 2021. The municipality of Oborniki Slaskie (OBS) is located near the city of Wrocław. OBS has numerous grasslands and forests indicating a large availability of biomass in the form of briquettes, wood chips, straw, wood but there is not an existing local energy cooperative yet. 15 participants of various stakeholder groups attended the event, such as: local authorities/municipality (3); citizens (9); potential investor/entrepreneur (1); farmer (1); forest association (1).

Identified social perceptions on community bioenergy heating projects

Several social perceptions and concerns on community bioenergy heating projects were identified during the Polish workshop. Local stakeholders acknowledged that bioenergy is an environmentally friendly source and they positively embraced its use for heating. Participants claimed that rural areas

have limited access to adequate information related to such concepts or with regard to the latest relevant regulations. This lack of information often leads to social conflicts and lack of trust in government and institutions. Moreover, they claimed they lack the technical knowledge, the capacity and the strategic planning skills to pursue such projects.

Often the largest part of the inhabitants is unaware of the substantial impact that their decisions can bring to society, and they also feel that global environmental problems do not affect them directly. However, participants believe that local associations could raise awareness around environmental issues in the local area.

Identified drivers that empower public acceptance of community bioenergy heating projects

The positive environmental impact, the reduction of emissions (such as carbon and nitrogen oxides) and the improvement of air quality were raised common beliefs among the participants. Additional identified drivers included the contribution to local development, the willingness to use local services and the creation of new jobs, also boosting local community. Participants also referred to their need for self-sufficiency and autonomy and noted that the use of biomass would empower a status of energy security in the local area.

Identified barriers hindering acceptance and uptake of community bioenergy heating projects

Participants claimed that RE projects and their benefits as well as the concept of energy community are not, or at least not adequately, communicated to the general public. Workshop attendants highlighted the **need for communication strategies** to be designed tailored to the specificities of these areas. It was also argued that promotion of lighthouse cases and best practice examples is clearly missing while **low levels of ecological awareness** still prevail.

Citizens in the rural areas are **hesitant** and resist to changes but they tend to follow their neighbours' examples. **Poor and false knowledge** about the impact of fossil fuels underline the need for better education, especially in the case of younger generations.

Another important barrier that was mentioned by participants is the **lack of trust** to the and government and foreign investors. In addition, the term "cooperative" is highly linked with negative memories from the soviet past of the country where everything was owned by the state.

Finally, other barriers that were highlighted by workshops' participants were the **lack of a well-established supply chain** in the area, the absence of biomass producers due to insufficient awareness of the local residents as well as the absence of a facility that could collect, assess and ensure biomass quality.

3.2.4 Italian consultation workshop

The Italian workshop was organised by FIPER in the Lombardy Region (Alps) on the 12th of March 2021. A renewable energy community represents a suitable option for the long-term energy sustainability goals of the region. 40 participants of a various stakeholder groups attended the event, such as: Potential investors (3); End users/ citizens (11); Biomass/ Bioenergy associations (2); Research institutions (4); Environmental association (1); Biomass supplier (3); Forest institutions (9); Agriculture institutions (2); Municipalities' representatives (2) and Energy associations (3).

Identified social perceptions on community bioenergy heating projects

The perceptions illustrated during the workshop outline a very strong awareness regarding the value of the biomass-energy chain as a driver for local development. There is a common perception that the

forest sector plays a very marginal role in Italy compared to its potential in terms of production, recreation, culture, and energy. Overall, participants agreed that a common desire is to better communicate that sustainable forest management represents an important driver of local development for the transition to a low-emission economy.

Identified drivers that empower public acceptance of community bioenergy heating projects

Different drivers that empower public acceptance of bioenergy communities were identified throughout the workshop. The first driver was the **sustainable forest management**. Bioenergy communities could start a supply chain of woody biomass in the local area that could guarantee protection and management of the territory, preventing hydrogeological risks, fires, plant care, etc.). Other important drivers were the **creation of long-term jobs** in the bioenergy supply chain and **reduction in heating energy bills** as the price of the district heating service is competitive compared to the other locally available heating systems. Finally, participants also mentioned the **positive environmental impact** in the local area and more specifically in the **improvement of the air quality**. The use of biomass is carbon neutral and therefore, compared to the use of fossil fuels (methane gas and / or heating oil), the CO₂ produced is equal to zero. In addition, the emission abatement systems allow to reduce the dust and NOx in the combustion of biomass, improving the quality of the air compared to domestic systems.

Identified barriers hindering acceptance and uptake of community bioenergy heating projects

First, a major barrier identified by participants is the **difficulty of local supply of woody biomass and the lack of network along the supply chain**. There is inadequate accessibility to wooded areas (in logistical terms) while there is also lack of network of companies' organization of the logistics' chain. Obstacles highlighted by workshop attendants further include the absence of a consistent supportive policy for the promotion of bioenergy, the changing regional policies for the prevention of hydrogeological risks and management of the territory as well as the shortage of specific financing schemes for starting up biomass district heating networks. The **lack of technical knowledge** and the difficulty to find trained technicians and installers constitute additional barriers.

Overall, although there is great potential for woody biomass in the region, regional actors are not empowered or in a position to exploit it. According to participants, the **lack of wide-ranging policies that favour the sustainable management of forest heritage** is one of the identified factors causing this. State intervention in the most underdeveloped areas is necessary in order to reactivate the wood economy by providing the infrastructure(road network) and services capable of making the supply of timber and its by-products competitive.

Second, another main barrier is linked to cultural and educational aspects. Local administrators and citizens **do not have adequate knowledge** of the advantages of biomass-energy chain to the local development. Traditional home heating systems are often preferred because they are considered more convenient. Furthermore, the link of the term "biomass" and "waste" is still connected under the public's beliefs with negative results in the social acceptance of bioenergy community projects. Citizens often associate the idea of using biomass with the concept of waste incineration.

3.3 Consultation workshops' identified drivers and barriers

The most important drivers and barriers identified throughout the pilots' consultation workshops are presented below:

Identified Drivers		Italy	Poland	Spain
Local development, creation of new jobs and social impact	х	х	х	х
Positive environmental impact/environmental awareness		х	х	х
Reduced energy bills		х		х
Energy security, fuel price stability and autonomy			х	х
Sustainable forest management and circular economy		х		х

Table 2. Consultation workshops' identified drivers of community bioenergy uptake

 Table 3. Consultation workshops' identified barriers of community bioenergy uptake

Identified barriers	Greece	Italy	Poland	Spain
Lack of legislative framework and political stability	х	х	х	х
lack of infrastructure/logistics related to bioenergy production	х	х	х	Х
Logistics complexity	х	х		х
Lack of funding schemes/financial support	х	х		
Unclear or lack of regulatory framework for the exploitation of biomass/forest biomass/forest management	х	х		
Misconceptions around the environmental impact of biomass	х	х	х	
Lack of knowledge about the development of bioenergy communities.		х		х
Lack of technical knowledge and trained technicians		х		х
Lack of targeted communication campaigns for rural areas - lighthouse cases and best examples not being promoted	х		х	
Lack of capital availability and investment risk		х		Х
Administrative obstacles			х	Х

Commonly identified or popular drivers (Table 2), as expressed through the pilots' consultation workshops, include the creation of new jobs, the promotion of the local economic development, the social and environmental impact at the regional level and the reduction of energy bills. Local communities at the pilot areas strongly believe that renewable energy projects can lead to a proenvironmental attitude, increased knowledge on renewable energy and energy security. The will for a more sustainable future characterised by energy autonomy and circular economy were also considered among popular drivers.

Popular barriers (Table 3), on the other hand, hindering the establishment of community bioenergy, constitute the lack of infrastructure/logistics related to bioenergy production, the complex specificities of existing value chains and the lack of a suitable legislative framework and governmental support. The latter factor is often reported in cases where transposition of REDII is still lagging behind. The lack of knowledge around energy community and the misconceptions around bioenergy and the environmental impact of biomass are strongly considered as additional hurdles, hindering the wider uptake of bioenergy heating projects.

4 EU and Pilot level Perception Surveys

4.1 Surveys methodological approach

4.1.1 Sample

The pilot workshops' findings signal key factors and dimensions which were further explored through the local and EU perception surveys. After a thorough literature research conducted by WR and in consultation with partners involved, a questionnaire was developed aiming to identify stakeholders' and general public's perceptions, needs, barriers and misconceptions affecting the market uptake of community bioenergy at the EU and pilots' levels. The final set of questions was implemented online and the respective survey was disseminated in two spatial levels, as explained below:

EU level: The English survey version was linked to a crowdsourcing campaign aiming to reach **5,000 responses** from stakeholders and the general public **across the EU**, a KPI that was reached¹⁰. Instead of resource-intensive methods such as computer-assisted-telephone-interviews (CATI) that would render data collection unduly expensive, to fill-in the quotas, crowdsourcing was selected as the most suitable option to generate a large number of responses in a time and cost-effective manner. Crowdsourcing platforms, such as Clickworker¹¹, that was employed during this activity, allow the recruitment of an independent global workforce for the objective of working on a specifically defined task or set of tasks and provide quick and easy access to data from a large number of participants spanning different geographies, age, sex, educational and professional background, interests etc. Administering and collecting such a vast number of responses through field research would have been prohibiting either due to logistical considerations such as time and monetary resources or participants' availability.

Data collection took place from mid-April to June 2021 through several waves, in order to monitor responses and ensure the structure and quality of the data. Findings presented under this chapter, based on the descriptive and statistical analysis, reveal citizens' perceptions and acceptance levels of biomass communities as well as the drivers and barriers for the uptake of community bioenergy.

Local level: At the same time, the questionnaire was translated into the pilots' languages (Greek, Italian, Polish, Spanish and Basque) before being implemented online through the GDPR–compliant EU survey platform. It was then disseminated by the pilot teams, addressing the general public and stakeholders of these regions, aiming to capture **100 responses per pilot case**, a KPI that was indeed reached¹². Survey promotion took place during April to June 2021 through the partners' and project's networks, social media accounts, websites and communication channels.

Pilot level survey findings, based on an extended descriptive and statistical analysis, are presented in sections below.

It is important to acknowledge that a fair share of the pool of pilot survey respondents is consisted of friends, colleagues and local stakeholders acquainted with the project's pilot partners. This local data collection process may have possibly yielded a sample that shares higher levels of understanding and awareness around renewables, compared to the general public views and perspectives. The reader is, therefore, asked to interpret the local-level results with care and should not extrapolate the pilot outcomes, presented herein, to country-level representative findings.

¹⁰ BECoop KPI: EU level perceptions survey (EU-level)> 5000 participants

¹¹ Clickworker Crowdsourcing platform <u>https://www.clickworker.com/clickworker-job/</u>

¹² BECoop KPI: Local perception survey: 400 participants (100 per pilot)

4.1.2 Questionnaire structure

The survey's questions were clustered in 7 main sections, each of which corresponds to a series of dedicated research questions. With the exception of incorporating only a couple of specific questions, tailored to the needs of the Spanish pilot (See section 4.3.1), the survey follows an identical structure in all cases (EU and pilot level. Survey sections and their rationale are briefly presented below:

- *Introduction to the topic:* this introductory, warm-up section, inquires participants about their knowledge on terms related to bioenergy and energy communities.
- **Perceptions and awareness:** this section aims to examine the level of awareness and perceptions around bioenergy heating projects.
- **Drivers:** this section aims to explore the facilitating factors that would empower participation in community energy
- *Willingness to join:* this section aims to examine why and under which circumstances respondents would be willing to join a bioenergy community project.
- **Barriers:** this section examines the barriers for participating in a bioenergy heating project.
- **Personality traits:** this section aims to analyse the personality traits that may contribute to participating in bioenergy community projects.
- **General information Demographics:** this section includes basic demographic information such as gender, age, type of residential area, educational background etc.

All demographic information was collected in compliance with the general data protection regulation (GDPR) of the European Union and was used solely for research and statistical reasons. No natural person can be identified through their demographic information. In addition, to take part in the survey, all research subjects had to agree to the terms and conditions set out to a dedicated consent form that was included in the online survey session. Finally, the management of datasets including such information adheres to the project's data management plan.

The survey is presented in Annex II, whereas references to specific questions within the report are cited as "QXX_Y", where "XX_Y" corresponds to the respective question's number.

4.2 EU level survey analysis

The EU level survey, analysed herein, gathered **5,022 responses** in total from **27 countries across Europe**. Data cleansing was then conducted routing out speed responses, straightlining (when a respondent consistently chooses similar answer options, such as always first or last option etc.) as well as fake or manipulated answers. The validated captured quota eventually included **4,906 responses**.

Sample distribution by individual characteristics

Table 4 presents the breakdown of responses based on demographic characteristics. Regarding gender, we see that the sample is balanced between women and men (47.06% and 52.94% respectively). In the case of age, education, typology and type of stakeholders, the EU sample is not balanced or representative of all subcategories examined. The readers should, therefore, carefully interpret results, avoiding generalisations. Persons between 25-34 years old are highly present (34.22%), together with individuals with a higher education (64.33% - including all three tertiary education levels: Bachelor's degree, MSc, PhD). We further notice that the largest share of respondents lives in urban (44.86%) or semi-urban areas (36.93%). In addition, when decomposing our sample based on the different stakeholder groups examined, we see that citizens (general public), cover 80.35% of our total sample.

Gender	Responses	Percentage
Male	2,597	52.94%
Female	2,309	47.06%
Total	4,906	100%
Age	Responses	Percentage
18-24	1,470	29.96%
25-34	1,679	34.22%
35-44	1,059	21.59%
45-54	469	9.56%
55-64	200	4.08%
65+	29	0.59%
Total	4,906	100%
Education	Responses	Percentage
None	23	0.47%
Primary	111	2.26%
Secondary	1,616	32.94%
Bachelor's degree	1,922	39.18%
Master's degree	1,143	23.30%
PhD	91	1.85%
Total	4,906	100%
Туроlоду	Responses	Percentage
Rural	832	16.96%
Semi-urban	1,812	36.93%
Urban	2,201	44.86%
Island	61	1.24%
Total	4,906	100%
Type of stakeholders	Responses	Percentage
Biomass Producer	49	1.00%
Citizen	3,942	80.35%
Energy Association	95	1.94%
Farmer	170	3.47%
Grid Operator	59	1.20%
Local Authorities	139	2.83%
Other	221	4.50%
Policymaker	35	0.71%
Renewable Energy Company	177	3.61%
RESCoop	19	0.39%
Total	4,906	100%

Table 4. EU sample distribution by individual characteristics.

Source: Authors' elaborations

Familiarity with given terminology around renewable energy and energy communities

Regarding the familiarity of survey participants with the terms "Renewable energy", "Clean and fair energy transition", "Energy justice", "Energy poverty", "Bioenergy", and "Energy communities" (Q1_1 – Q1_6), results indicate that many respondents are acquainted with some of the provided terminology, as shown in Figure 4. The most well-known term is "Renewable energy", as almost 70% of our EU sample appears to be familiar or very familiar with it. "Bioenergy" is the second most well-known term among respondents (52.9% being familiar or very familiar). "Energy communities" and "energy justice" constitute the less-known terms with only 21.95% and 25.97%. of participants, being acquainted with these concepts. Overall, participants seem to be familiar with renewable energy justice.



Figure 4. Familiarity with the terms related to bioenergy and energy communities at the EU level.

Previous experience in a cooperative or a RE project

Participants were also asked to indicate whether they have either had previous experience in (i) a regional cooperative/community project (not necessarily related to RE); (ii) a renewable energy community project; (iii) a bioenergy community project or (iv) an energy-related or energy efficiency project. Results indicate that a rather small share of the EU sample has taken part in a regional cooperative or a RE community project (Table 5). This share seems to be slightly higher in the case of energy-related or energy efficiency projects, whilst the lowest participation shares are marked in the case of bioenergy community projects. Our descriptive analysis interestingly indicates that people with none or primary education appear to have a higher participation share in energy-related projects than people with tertiary education. Moreover, with regards to participants' spatial typology, we notice that there are not significant differences except for people living in islands. This is where we see the largest share of community energy (16.39%) or community bioenergy (11.48%) members is observed. This is probably due to the facts that citizens often develop stronger relationships and connections with their neighbourhood and community in relatively isolated places, such as islands.

Member of:	regional cooperative	RE community project	bioenergy community project	energy-related or energy efficiency project
Gender				
Male	11.63%	10.86%	7.39%	12.78%
Female	11.39%	8.19%	6.54%	10.05%

Table 5. Share of participants with previous experience in energy-related projects (EU).

Member of:	regional cooperative	RE community project	bioenergy community project	energy-related or energy efficiency project
Age				p. 0,000
18-24	13.40%	12.11%	7.55%	13.95%
25-34	13.04%	10.30%	8.34%	12.92%
35-44	8.50%	6.99%	5.38%	8.03%
45-54	8.10%	7.04%	4.69%	7.46%
55-64	8.50%	5.50%	6.00%	9.00%
65+	13.79%	6.90%	3.45%	13.79%
Education				
None	34.78%	26.09%	17.39%	26.09%
Primary	18.02%	15.32%	15.32%	15.32%
Secondary	11.08%	8.85%	6.44%	9.78%
Bachelor's degree	10.98%	10.56%	6.82%	12.64%
Master's degree	11.90%	8.31%	6.65%	11.20%
PhD	12.09%	7.69%	12.09%	13.19%
Typology				
Rural	13.34%	8.05%	5.65%	12.02%
Semi-urban	10.98%	9.66%	7.67%	10.87%
Urban	11.13%	9.95%	6.82%	11.63%
Island	16.39%	16.39%	11.48%	18.03%

Source: Authors' elaborations

Levels of awareness and perceptions around community (bio)energy

Our survey confirms that the largest share of participants (81.19%) is, in fact, not aware of any energy community project in the area where they live (Figure 5). This large percentage shows that there is still a great lack of knowledge and awareness around RE community projects.

To further examine perceptions around bioenergy heating projects we provided respondents with a list of statements inviting them to indicate their level of agreement (Figure 6).



Figure 5. Awareness of existing community energy projects (EU).



Figure 6. EU survey participants' perceptions around bioenergy community projects.

As we can see in Figure 6, a cumulative share of 59.13% of the EU survey participants agrees (36.32%) or strongly agrees (22.81%) with the fact that a bioenergy community project would have a positive impact in their region, while 58.11% (40.40% agrees and 17.71% strongly agrees) think that energy communities can empower a fair and more-clean energy transition. Moreover, a share of 55.2% agrees or strongly agrees that bioenergy communities facilitate the wider uptake of renewable energies. At the same time, a lot of participants think that there is lack of awareness regarding bioenergy as well as around the concept of energy communities. A lot of respondents further believe that it is difficult to develop a bioenergy community project form a technical and administrative perspective, while also that there is a lack of initiatives to support the establishment of energy communities. Overall, we notice that **people are aware of renewable energy, including the benefits that the new technologies can bring, yet there is still a significant lack of awareness around renewable as well as, specifically, bioenergy communities.**

Willingness to join a (bio)energy community project

Participants were further asked to indicate their willingness to be involved in activities related to bioenergy heating projects (we consider agree and strongly agree statements as a positive attitude towards RESCoops and as a sign of willingness to join them). In Figure 7, we notice that most of respondents were more positive (38.22% agreed and 25.07% strongly agreed) towards adopting a bioenergy heating solution in their household/business. Although a fair share appears **sceptical towards a potential investment in bioenergy community**, almost half of the studied sample (a cumulative share of 49.75%) was **positive towards their involvement in a community bioenergy project**. In addition, 48.31% were interested in participating in workshops or trainings around biomass and clean energy transition (31.66% agreed and 16.65% strongly agreed).



Figure 7. Willingness to get involved to energy communities related activities (EU).

To further examine respondents' willingness to join energy community projects, we also clustered results per type of stakeholder. Based on our findings, as also depicted below, it appears that policy makers followed by biomass producers are the stakeholders that seem to be more positive towards the adoption of bioenergy heating solutions. Survey findings further reveal that respondents - although positive towards the adoption of a new source of energy in their home or office - are still hesitant towards collaborative projects (Figure 9). In fact, it appears that all types of stakeholders are more willing to adopt a bioenergy solution in their homes rather than participating in a bioenergy community.



Figure 8. Intention to be involved in a community bioenergy heating project (EU)



Figure 9. Intention to adopt a bioenergy heating solution in household/business (EU)

In addition, several respondents appear sceptical when it comes to investing in a community bioenergy heating project. As presented in Figure 10, **biomass producers are the ones more positively supporting investments in bioenergy community**, compared to the rest of stakeholders, intentions of which are found to be significantly lower. In this context, it is worth noting that intentions of members of existing RESCoops' to invest in bioenergy heating projects was remarkably low, especially given the fact that this type of stakeholder is already highly familiar with (and a part of) community energy. This probably indicates that bioenergy is not as popular among existing energy communities, compared to the other RES, as also reported in literature.



Figure 10. Intention to invest in a bioenergy community (EU).

Drivers of community (bio)energy

Drivers that could potentially incentivise stakeholders' participation in a community bioenergy heating project were also explored. From the descriptive results depicted in Figure 11, it appears that **energy bill reduction, climate protection, energy autonomy and support of local economy constitute**

important drivers towards participating in a bioenergy community project. Participation in decision making, involvement of trusted organisations and the possibility to get more involved with the local community seem to be less popular driving factors. Environmental and economic issues are very popular drivers among survey participants as well as among workshop's respondents. These findings indicate that people believe that energy communities could bring a positive environmental impact in their area while at the same time contribute to boosting local economy.



Figure 11. Drivers for participating in a bioenergy community heating project (EU).

Through our statistical analysis, details of which are annexed (Annex I), we were further able to spot a set of statistically significant factors acting as drivers for energy community projects. As presented in Table 6, almost all identified factors, in the case of the EU sample, are statistically significant in terms of positively influencing both perceptions and involvement in community (bio)energy. It is interesting to notice that even though reduction of energy bills for heating and creation of profit were highly popular drivers over the pilot consultation workshops, they do not seem to be statistically significant in our EU level model.

Identified Factors	Perceptions	Involvement
Climate protection, circular economy and waste management	\checkmark	\checkmark
Reduction of energy bills for heating and creation of profit		
Support of local economy	\checkmark	\checkmark
Alleviation of energy poverty	\checkmark	
Support of the integration of socially vulnerable groups		\checkmark
Creation of social motives	\checkmark	
Initiated by the local community - citizens in decision making	\checkmark	\checkmark
Help to get more involved with the local community		\checkmark
Local trusted organisations are participating in the project	\checkmark	\checkmark
Being autonomous and not rely on energy companies	\checkmark	\checkmark
Set the right example for community and influence others to follow	\checkmark	\checkmark
Open and transparent procedures	\checkmark	\checkmark

Table 6. Drivers influencing perceptions and involvement in	community (bio)energy (EU)
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Source: Authors' elaboration (see Annex I for detailed statistical results)

Barriers of community (bio)energy

To understand respondents' hesitation towards their involvement in a bioenergy community project, different barriers were examined. Figure 12 shows that **bureaucracy, lack of governance support**,

complex regulatory and administrative procedures, risk of investment and lack of financial mechanisms constitute important drivers towards participating in a bioenergy community project. Aesthetics (e.g. odour, landscape) and lack of community acceptance where some of the least highlighted barriers. Results indicate that financial and regulatory aspects might act as key factors for discouraging citizens' participation in bioenergy community projects, as people appear to be concerned about the long-term sustainability of such projects. At the same time, common misconceptions regarding biomass while also aesthetics and lack of trust, are not considered as equally popular barriers for bioenergy community projects' acceptance.



Figure 12. Barriers for participating in a bioenergy community heating project (EU).

For investigating the significance of identified barriers, Table 7 presents our statistical analysis results. A set of barriers appears to be statistically significant in both perception and involvement cases including **complex regulatory and administrative procedures, lack of governance support, aesthetics as well as lack of public awareness, participation and engagement**. Risk of investment, bureaucracy and time required to develop an energy community, lack of infrastructure/logistics and lack of trust in the cooperative schemes constitute significant barriers only in the case of overall perceptions. At the same time, lack of appropriate financial mechanisms and community acceptance constitute barriers that can significantly influence participants' involvement in energy community projects. Details on the statistical analysis employed can be found in Annex I.

Table 7. Bar	riers influencing	perceptions and	involvement in	community	(bio)energy	(EU).
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Identified Factors	Perceptions	Involvement
Risk of investment	\checkmark	
Lack of appropriate financial mechanisms		\checkmark
Complex regulatory and administrative procedures	\checkmark	\checkmark
Lack of governance support (local and state authorities)	\checkmark	\checkmark
Complex project ownership issues in energy community		
Bureaucracy and time required to develop an energy community	\checkmark	
Lack of technical knowledge on bioenergy heating options		
Lack of community acceptance		\checkmark
Environmental impact		
Aesthetics	\checkmark	\checkmark
Lack of public awareness, participation and engagement	\checkmark	\checkmark
Lack of infrastructure/ logistics related to bioenergy production	\checkmark	
Lack of trust in the cooperative schemes and their efficiency	\checkmark	
Source: Authors' elaboration (see Annex I for the detailed statistical results)		

4.3 Pilot level survey analysis

A detailed analysis, shedding light in the specificities of the pilot cases is presented under this section.

4.3.1 Spanish perception survey

Note: in the case of the Spanish survey, two additional questions were incorporated in the core questionnaire, further exploring (i) the energy rating of respondents' buildings and (ii) the specific region where survey participants live. Moreover, an additional option was added under the willingness to join question (Q11). In this context, Spanish respondents were also called to express their willingness to "*use of a possible bioenergy supply service to supply thermal demand*". The survey was available in both Spanish (Castilian) and Basque languages.

Sample distribution by individual characteristics

Most Spanish survey respondents were male (67.27%) and most of the captured sample is aged between 35-54 years old. In terms of education, the vast majority of respondents (86.37%) have a tertiary education and more than 84% live in urban or semi-urban areas. Moreover, regarding the type of stakeholders, most of the survey participants were citizens (61.82%), followed by energy associations (12.73%) and RE companies (10.00%). We can also see that most of the participants reside in Bizkaia (33.64%) and Gipuzkoa (37.27%), followed by Navarre (10%) and Alava (7%) Together these 4 provinces represent 88% of all respondents. This is not surprising, as these 4 provinces make up the catchment area of GoiEner. This means that the results of the survey should be highly representative for this pilot area largely situated in the Basque Country, part of the Atlantic climate zone, and not so much for the continental and Mediterranean climate zones of Spain. Care should be taken not to extrapolate the results to the entire Spanish territory.

Gender	Responses	Percentage
Male	74	67.27%
Female	36	32.73%
Total	110	100%
Age	Responses	Percentage
18-24	1	0.91%
25-34	13	11.82%
35-44	34	30.91%
45-54	35	31.82%
55-64	18	16.36%
65+	9	8.18%
Total	110	100%
Education	Responses	Percentage
None	0	0.00%
Primary	1	0.91%
Secondary	14	12.73%
Bachelor's degree	49	44.55%
Master's degree	38	34.55%
PhD	8	7.27%
Total	110	100%
Typology	Responses	Percentage
Rural	17	15.45%
Semi-urban	38	34.55%
Urban	55	50.00%
Island	0	0.00%
Total	110	100%
Type of stakeholders	Responses	Percentage
Biomass Producer	1	0.91%
Citizen	68	61.82%
Energy Association	14	12.73%
Farmer	0	0.00%

Table 8. Spanish sample distribution by individual characteristics.

Grid Operator	0	0.00%
Local Authorities	2	1.82%
Other	5	4.55%
Policymaker	0	0.00%
Renewable Energy Company	11	10.00%
RESCoop	9	8.18%
Total	110	100%
Region	Responses	Percentage
Alava	8	7.27%
Andalucía	1	0.91%
Asturies	1	0.91%
Barcelona	2	1.82%
Bizkaia	37	33.64%
Gipuzkoa	41	37.27%
Illes Balears	1	0.91%
Madrid	3	2.73%
Murcia	1	0.91%
Navarre	11	10.00%
Saragossa	2	1.82%
The Rioja	2	1.82%
Total	110	100%

Source: Authors' elaborations

Figure 13 presents the main home heating sources as indicated by Spanish participants. As we can see, **electricity and natural gas** constitute the core heating sources in the Spanish case (58.43% and 44.75%, respectively). Butane, propane bottled gas (12.62%) and fuel oil/heating oil (8.10%) are two additional heating sources being used. Geothermal heat pumps (1.59%) and coal (1.20%) are the least popular options. Solutions related to biomass are ranked in the middle, popularity-wise, including standard and other biomass fuels (4.78% and 6.64% respectively).



Figure 13. Home heating sources (Spain).

Table 9 depicts the energy rating of participants' buildings and the estimation of their annual thermal expenditure. Less than a third of respondents were able to declare the energy rating of their buildings, therefore it is reasonable to assume that most of the people are not familiar with this type of rating. As we can see, half of participants (49.09%) declared spending between 400-800 \in for heating and domestic water per year. A 10% share of Spanish survey participants tends to spend more than 1000 \in in terms of annual expenditure.

Energy rating of the building	Responses	Percentage
A	5	4.55%
В	4	3.64%
С	4	3.64%
D	7	6.36%
E	7	6.36%
G	6	5.45%

Table 9. Energy rating of participants' buildings and estimated annual thermal expenditure (Spain).

Estimated annual expenditure	Responses	Percentage
<100€	1	0.91%
100-300€	11	10.00%
400-800€	54	49.09%
>1,000€	11	10.00%
Total	110	100%

Source: Authors' elaborations

Familiarity with given terminology around renewable energy and energy communities

Spanish respondents appear to be familiar or very familiar with terms such as *"renewable energy*", with a cumulative share of respondents stating familiarity and strong familiarity with the given term reaching 87.27%. They also appear acquainted with *"energy poverty*" (86.37%) as well as with *"clean and fair energy transition*" (78.19%) and *"energy justice"* (65.45%). *"Bioenergy*" (62.61%) and *"energy communities*" (64.55%) constitute the least familiar terms (Figure 14). Results indicate that there is a great level of familiarity around RE terms in this sample. Although bioenergy and energy communities where the least popular, they are still recognised by the vast majority.



Figure 14. Familiarity with the terms related to bioenergy and energy communities (Spain).

Levels of awareness and previous experience around community energy

Half of Spanish participants responded negatively when asked if they are aware of existing energy communities in their area (Figure 15).

At the same time, as we can see in Figure 16, a large percentage of participants (41.82%) has been or is a member of a regional cooperative or community project while 35.45% and 30.91% of survey participants claimed to be members of a renewable energy community or an energy-related or energy efficiency project, respectively.



Figure 15. Awareness of existing community energy projects (Spain).





Figure 16. Previous experience in energy community projects (Spain).
Only a 3.64% share of participants has been or is a member of a bioenergy community project. Overall Spanish respondents are highly engaged in community or energy community projects. Community bioenergy heating projects are way less popular, currently reflecting the limited uptake of bioenergy communities in comparison with other renewable energy communities.

Perceptions and willingness to join an energy community project

As we can see in Figure 17, the majority of Spanish respondents is fully positive (41.82%) or positive (46.36%) towards getting involved in a bioenergy community project.

When it comes to perceptions around bioenergy heating projects, as presented in Figure 18, a large share of participants (cumulative share of 70.09%) agreed (40%) or strongly agreed (30.09%) that a bioenergy community project

would have a positive impact at the regional level. The *Figure 17. Perceptions around bioenergy* majority (cumulative share of 94.54 %) thinks that energy communities can empower a fairer and cleaner energy transition.

A share of 85.45% (56.30% agreed and 29.09% strongly agreed) indicates that bioenergy communities could facilitate a wider uptake of RE. At the same time, a fair share (78.18%) believes or strongly believes that the current awareness levels around bioenergy in Spain are not satisfactory. Similarly, a large share (74.54%) agrees or strongly agrees that there is a lack of knowledge around RESCoops. Moreover, 46.36% of the respondents seem unable to identify if it is difficult to develop a bioenergy community project from a technical and administrative perspective, which indicates the lack of knowledge about technical issues and energy communities. Furthermore, 72.73% of the respondents think that there is a lack of initiatives supporting the establishment of energy communities. Finally, half of the participants (a cumulative share of 52.73%) believe that their area has bioenergy potential that could be used for heating purposes (e.g., forests, agricultural resources).



Figure 18. Participants' perceptions around bioenergy community projects (Spain).



Regarding respondents' willingness to adopt a bioenergy heating solution in their household/business, the majority (80%) expressed a positive attitude (34.55% and 45.45% agree and strongly agree, respectively), as presented in Figure 19. A large share (cumulative share of 69.09%) was interested in getting involved in a community bioenergy project, but this interest was slightly reduced (61.82%) in the case of investing in such a mission. Results further indicate that the majority of participants, 79.09% (33.64% agreed and 45.45% strongly agreed), would accept a bioenergy service offered by a cooperative while a cumulative share of 58.63% would participate in a workshop or training activity around biomass and clean energy transition.



Identified aspects where awareness raising is needed

Survey participants were further asked to identify awareness-raising actions that could boost the development of bioenergy community in their region. Spanish sample results, as depicted in Figure 20, reflect that focus should be given to actions related to economic, environmental, and social benefits of community bioenergy heating projects (90%). At the same time, it was highlighted that people should be better informed about current state/public financial support mechanisms (67.27%). A large share of the respondents (54.55%) thinks that awareness-raising activities should be orientated towards acknowledging the available/untapped biomass resources and getting better acquainted with bioenergy heating technologies (53.64%).



Figure 20. Awareness-raising actions boosting the uptake of bioenergy community (Spain).

Drivers of community (bio)energy

Spanish participants referred to climate protection as their main motive while other very popular motives include the support of local economy, energy autonomy, followed by more social factors such as the alleviation of energy poverty and integration of socially vulnerable groups.



Figure 21. Drivers for participating in a bioenergy community heating project (Spain).

Results presented in Table 10 show that our statistical analysis has also spotted a set of significant factors acting as drivers for energy community projects in the case of Spain. We can see that (i) reduction of energy bills for heating and creation of profit, (ii) citizens participating in decision making, as well as (iii) open and transparent procedures constitute drivers that are statistically significant, positively affecting both individual perception and willingness to get involved in community bioenergy. Climate protection, circular economy and waste management are factored as significant drivers for improving perceptions. Being autonomous and not relying on energy companies as well as setting the right example for community constitute aspects that significantly affect individuals' involvement in energy community projects. Details on the statistical analysis employed can be found in Annex I.

Identified Factors	Perceptions	Involvement
Climate protection, circular economy and waste management	\checkmark	
Reduction of energy bills for heating and creation of profit	\checkmark	\checkmark
Support of local economy		
Alleviation of energy poverty		
Support of the integration of socially vulnerable groups		
Creation of social motives		
Initiated by the local community - citizens in decision making	\checkmark	\checkmark
Help to get more involved with the local community		
Local trusted organisations are participating in the project		
Being autonomous and not rely on energy companies		\checkmark
Set the right example for community and influence others to follow		\checkmark
Open and transparent procedures	\checkmark	\checkmark
Source: Authors' elaboration (see Annex I for detailed statistical results)		

Table 10. Drivers influencing perceptions and involvement in community (bio)energy in Spain.

Barriers to community (bio)energy

Figure 22 presents the descriptive analysis' outcomes of selected questions related to issues that can raise concerns with regard to respondents' participation in bioenergy community projects. As depicted below, the main identified drivers include (i) the complex regulatory and administrative procedures, (ii) the lack of public awareness and (iii) the lack of governance support. As we can see in the Spanish region, besides the regulatory concerns that were also present at the European level analysis, there are also concerns regarding the levels of public awareness around energy communities.



Figure 22. Barriers for participating in a bioenergy community heating project (Spain).

Table 11 presents the results coming from our statistical analysis referring to the barriers for Spanish participants. As we can see, the lack of appropriate financial mechanisms is statistically significant in both cases of involvement and perceptions around RESCoops. Lack of governance support, referring to local and state authorities, bureaucracy and time required to develop an energy community as well as aesthetics are significant barriers only in the case of overall perceptions. At the same time, lack of technical knowledge on bioenergy heating options acts as a barrier for participants' involvement in energy community projects.

Identified Factors	Perceptions	Involvement
Risk of investment		
Lack of appropriate financial mechanisms	\checkmark	\checkmark
Complex regulatory and administrative procedures		
Lack of governance support (local and state authorities)	\checkmark	
Complex project ownership issues in energy community		
Bureaucracy and time required to develop an energy community	\checkmark	
Lack of technical knowledge on bioenergy heating options		\checkmark
Lack of community acceptance		
Environmental impact		
Aesthetics	\checkmark	
Lack of public awareness, participation and engagement		
Lack of infrastructure/ logistics related to bioenergy production		
Lack of trust in the cooperative schemes and their efficiency		
Source: Authors' elaboration (see Anney I for the detailed statistical results)		

Table 11. Barriers influencing perceptions and involvement in community (bio)energy in Spain.

Source: Authors' elaboration (see Annex I for the detailed statistical results)

4.3.2 Greek perception survey

Sample distribution by individual characteristics

As presented in Table 12, the majority of the Greek survey participants are male (69.16%) while most of respondents are aged between 25 - 34 years old. Most of the Greek survey population (88.79%) has a tertiary education and more than 80.38 % live in urban or semi-urban areas. Moreover, the largest share of participants are citizens (58.88%) and local authorities (17.76%).

Gender	Responses	Percentage
Male	74	69.16%
Female	33	30.84%
Total	107	100%
Age	Responses	Percentage
18-24	5	4.67%
25-34	46	42.99%
35-44	16	14.95%
45-54	26	24.30%
55-64	12	11.21%
65+	2	1.87%
Total	107	100%
Education	Responses	Percentage
None	0	0.00%
Primary	0	0.00%
Secondary	12	11.21%
Bachelor's degree	35	32.71%
Master's degree	47	43.93%
PhD	13	12.15%
Total	107	100%
Туроlоду	Responses	Percentage
Rural	19	17.76%
Semi-urban	28	26.17%
Urban	58	54.21%
Island	2	1.87%
Total	107	100%
Type of stakeholders	Responses	Percentage
Biomass Producer	2	1.87%
Citizen	63	58.88%
Energy Association	2	1.87%
Farmer	7	6.54%
Grid Operator	4	3.74%
Local Authorities	19	17.76%
Other	2	1.87%
Policymaker	0	0.00%
Renewable Energy Company	3	2.80%
RESCoop	7	6.54%
Total	107	100%

Table	12.	Greek	sample	distribution	bv	individual	characteristics
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Source: Authors' elaborations



Figure 23. Home heating sources (Greece).

Figure 23, depicted above, presents the main home heating sources as indicated by the Greek survey participants. As we can see, **electricity** is the main heating source in the Greek case (72.88%), followed by fuel/heating oil (37.71%) and natural gas (35.17%). District heating (1.27%), geothermal heat pumps (1.69%), and coal (1.69%) are the less popular heating sources being used in Greece. Solutions related to biomass can be found in the middle, popularity – wise, including standard and other biomass fuels (7.63% and 11.02% respectively).

Familiarity with given terminology around renewable energy and energy communities

The familiarity of Greek participants with terms related to RE, bioenergy and energy communities is showcased in Figure 24. Greek respondents are acquainted (we are referring to a cumulative share of being familiar and very familiar with the terms) with *"renewable energy"* (70.1%) followed by *"bioenergy"* (63.01%) and *"clean and fair energy transition"* (58.88%). *"Energy justice"* (38.32%) and *"energy poverty"* (44.86%) appear to be the terms Greeks are less familiar with. It is interesting to observe that, almost half of respondents (25.23% familiar and 23.36% very familiar) seem to be acquainted with the *"energy communities"* term.



Figure 24. Familiarity with the terms related to bioenergy and energy communities (Greece)

Levels of awareness and previous experience around community energy

Even though half of the Greek sample claims to be acquainted with the concept of energy community, as showcased in the previous figure, our analysis reflects, at the same time, that a fair share (63.55%) is not aware of any existing energy or bioenergy community projects in their area (Figure 25). This result indicates the need for better promotion of such initiatives as well as the dissemination of best examples at a regional level.



Figure 25. Awareness of existing community energy projects (Greece).

Survey participants were further asked about their potential experience with community initiatives or energy community projects. As we can see in Figure 26, most of participants have never taken part in initiatives of such nature. More specifically, the lowest participation percentage was recorded for bioenergy communities (8.41%), showcasing that there is a lack of experience with bioenergy community projects in Greece. The largest participation share was witnessed in the case of energy-related or energy efficiency projects (28.04%).



Figure 26. Previous experience in energy community projects (Greece).

Perceptions and willingness to join an energy community project

As presented in Figure 27, Greek participants' overall perception of bioenergy community projects is fully positive (27.10%) or positive (42.99%).

As we can see in Figure 28, a large percentage of survey participants (75.7%) agrees or strongly agrees with the fact that a bioenergy community project would have a positive impact at the regional level. In addition, a cumulative share of 69.15% thinks that energy communities can empower a



Figure 27. Perceptions around bioenergy community projects (Greece).

fair and more-clean energy transition and 70.09% agreed and strongly agreed that bioenergy communities could facilitate the wider uptake of renewable energies. Furthermore, a large share of participants claimed that there is a lack of awareness around bioenergy and energy communities in Greece. A 39.25% share appears not having a solid opinion on whether it is difficult to develop a bioenergy community project from a technical and administrative perspective. At the same time, 35.51% of participants neither agree nor disagree on whether there are sufficient initiatives supporting the establishment of energy communities. Finally, a 57.01% of Greek sample believes or strongly believes that their region has a bioenergy potential.

Overall Greeks acknowledge the role that community energy can play in their country's energy transition process, yet they do appear uncertain, declaring a lack of information regarding current supportive mechanisms and applied practices for the establishment of such projects.



Figure 28. Greek participants' perceptions around bioenergy community projects.

As depicted in Figure 29, a large share of Greek participants showed a strong interest towards their potential involvement in a community bioenergy heating project (44.86% and 22.91% agree and strongly agree with this statement, respectively leading to a cumulative share of 74.77%). In addition, a total of 76.64% appeared positive or strongly positive with regard to adopting a bioenergy heating solution in their household/business. Willingness shares were significantly reduced in the case of investing in a bioenergy community, as Greek participants appear to be more hesitant towards this prospect; this identified concern is further linked to the fear of taking such a risk. Finally, most of the Greek participants (66.35%) were positive or strongly positive towards their participation in workshops and training activities around biomass and clean energy transition.



Figure 29. Willingness to be involved in an energy community heating project (Greece).

Identified aspects where awareness - raising is needed

When it comes to the respondents'-identified awareness-raising actions that could potentially boost the uptake of bioenergy communities in Greece, results are depicted in Figure 30. It is clear that focus should be given on aspects related to economic, environmental, and social benefits of community bioenergy heating projects (86.92%). In addition, survey participants indicated that it is also important to inform local stakeholders around the available untapped biomass resources (70.09%). Being better informed on the state/public financial support mechanisms was also identified as a need by a large sample share (63.55%), while campaigns that provide information on the required steps to establish an energy community project were also mentioned by almost half of the participants (46.73%).



Figure 30. Awareness-raising actions boosting the uptake of bioenergy community (Greece).

Drivers of community (bio)energy

Figure 31 presents the main drivers for potential engagement and participation in bioenergy community projects, as expressed by Greek respondents. The most important driver among all is the support of the local economy while other important drivers include climate protection, reduction of energy bills, open and transparent procedures, as well as the alleviation of energy poverty. Identified drivers here are in line with the facilitating factors highlighted at the European level survey.



Figure 31. Drivers for participating in a bioenergy community heating project (Greece).

We further employed a statistical analysis to elaborate on the significance of the identified drivers (Table 13). Alleviation of energy poverty has been found to be a statistically significant driver, positively influencing both perception and willingness to be involved in community bioenergy. Climate protection, circular economy and waste management, alongside the support of the integration of socially vulnerable groups are two significant drivers for boosting overall perceptions around community energy projects. The (i) promotion of citizens' participation in decision making, (ii) getting more involved with the local community, (iii) the participation of local trusted organisations in such projects and (iv) setting the right example for community are considered as essential factors driving the will to get involved in projects of such a nature.

Identified Factors	Perceptions	Involvement
Climate protection, circular economy and waste management	\checkmark	
Reduction of energy bills for heating and creation of profit		
Support of local economy		
Alleviation of energy poverty	\checkmark	\checkmark
Support of the integration of socially vulnerable groups	\checkmark	
Creation of social motives		
Initiated by the local community - citizens in decision making		\checkmark
Help to get more involved with the local community		\checkmark
Local trusted organisations are participating in the project		\checkmark
Being autonomous and not rely on energy companies		
Set the right example for community and influence others to follow		\checkmark
Open and transparent procedures		
Source: Authors' elaboration (see Annex I for the detailed statistical results)		

Table 13. Drivers influencing perceptions and involvement in community (bio)energy in Greece.

Barriers to community (bio)energy

When examining potential barriers for participation in bioenergy community projects, our sample descriptive analysis has revealed that bureaucracy is considered as a crucially hindering factor, followed by complex regulatory and administrative procedures, lack of governance support and financial mechanisms. These results are in line with the EU level findings and suggest that financial and regulatory aspects constitute serious concerns for potentially taking part in a bioenergy community project. Aesthetics and the environmental impact represent less popular barriers among participants.



Our statistical analysis further revealed the significance of identified hindering factors. Table 14 indicates that, apart from the lack of governance support (local and state authorities) and aesthetics, all other barriers are not statistically significant. This is an interesting finding, as it shows that even though factors such as bureaucracy and complex regulatory and administrative procedures are strongly voted by Greek survey participants (as barriers for energy community heating projects), they do not seem to strongly influence perceptions and involvement in such initiatives.

Identified Factors	Perceptions	Involvement
Risk of investment		
Lack of appropriate financial mechanisms		
Complex regulatory and administrative procedures		
Lack of governance support (local and state authorities)	\checkmark	\checkmark
Complex project ownership issues in energy community		
Bureaucracy and time required to develop an energy community		
Lack of technical knowledge on bioenergy heating options		
Lack of community acceptance		
Environmental impact		
Aesthetics	\checkmark	
Lack of public awareness, participation and engagement		
Lack of infrastructure/ logistics related to bioenergy production		
Lack of trust in the cooperative schemes and their efficiency		
Source: Authors' elaboration (see Annex I for the detailed statistical results)		

Table 14. Barriers influencing perceptions and involvement in community (bio)energy in Greece.

4.3.3 Polish perception survey

Sample distribution by individual characteristics

As we can see in Table 15, the Polish sample is quite balanced in terms of gender participation with female respondents claiming a 47.17% share. Most of the survey participants are between 18-24 years old (55.66%). The vast majority of the sample (71.71%) has a tertiary education. Almost half of the Polish respondents (49.06%) live in urban areas while a significant share (33.02%) lives in rural areas. Moreover, regarding the type of stakeholders, the polish survey sample mostly included citizens (67.92%) and members renewable energy companies (15.09%).

Gender	Responses	Percentage
Male	56	52.83%
Female	50	47.17%
Total	106	100%
Age	Responses	Percentage
18-24	59	55.66%
25-34	13	12.26%
35-44	19	17.92%
45-54	11	10.38%
55-64	3	2.83%
65+	1	0.94%
Total	106	100%
Education	Responses	Percentage
None	0	0.00%
Primary	0	0.00%
Secondary	30	28.30%
Bachelor's degree	40	37.74%
Master's degree	28	26.42%
PhD	8	7.55%
Total	106	100%
Typology	Responses	Percentage
Rural	35	33.02%
Semi-urban	19	17.92%
Urban	52	49.06%
Island	0	0.00%
Total	106	100%
Type of stakeholders	Responses	Percentage
Biomass Producer	72	0.00%
Citizen	2	67.92%
Energy Association	2	1.89%
Farmer	1	1.89%
Grid Operator	1	210070
1	3	0.94%
Local Authorities	3	0.94%
Local Authorities Other	3 5 3	0.94% 2.83% 4.72%
Local Authorities Other Policymaker	3 5 3 16	0.94% 2.83% 4.72% 2.83%
Local Authorities Other Policymaker Renewable Energy Company	3 5 3 16 2	0.94% 2.83% 4.72% 2.83% 15.09%
Local Authorities Other Policymaker Renewable Energy Company RESCoop	3 5 3 16 2 72	0.94% 2.83% 4.72% 2.83% 15.09% 1.89%

Table 15. Polish sample distribution by individual characteristics

Source: Authors' elaborations

Figure 33 presents the main home heating sources as indicated by Polish participants. Like in other pilot cases, **electricity** is the main heating source in Poland (40.72%), followed by natural gas (31.92%), district heating (24.43%), and coal (1.27%). Geothermal heat pumps (2.61%) and butane and propane bottle gas (3.91%) are the less popular heating options. Solutions related to biomass can be ranked in the middle, popularity-wise, including standard and other biomass fuels (8.47% and 10.75%, respectively).



Familiarity with given terminology around renewable energy and energy communities

Polish respondents appear to be acquainted (adding up familiar and very familiar statement) with "*renewable energy*" (cumulative share of 72.65%) and "*bioenergy*" (58.49%) terms, as depicted in Figure 34. In addition, a large part of the studied sample (cumulative share of 41.51%) are considered to be informed around "*energy poverty*" as well as around "*clean and fair energy transition*" (47.17%) and "*energy justice*" (46.23%). "Energy communities" constitutes by far the less-known term, with only a 18.87% and a 3.77% share of Polish respondents being familiar or very familiar with this concept, respectively (cumulative share of 22.64%).This is the lowest familiarity score, concerning this term, compared to the rest of the examined pilot cases.



Figure 34. Familiarity of survey participants with terms related to the project (Poland).

Levels of awareness and previous experience around community energy

As showcased in Figure 35, more than 80% of the studied Polish sample appears to be not aware of any existing energy community project in their area. While this is the highest share among the pilot cases examined it is, in fact, aligned with insights retrieved at the EU-level, where lack of awareness around local initiatives is also clearly reflected.



Figure 35. Awareness of existing community energy projects (Poland).

Results presented in Figure 36, further reveal that only a very small percentage (4.72%) of participants in Poland, has taken or still is part of a regional community/cooperative. According to literature

findings, this could be explained by the negative connotations around cooperative schemes in countries with a soviet past. Equally low experience shares are observed with regard to being part of a bioenergy community project (4.72%). Thus, participation in a bioenergy or non-energy-related cooperatives seems remarkably low, as depicted in the chart below. However, a large share of Polish respondents has, in fact, claimed previous experience in either RE community projects (49.06%) or energy-related/ energy efficiency initiatives (27.36%). Results here appear to be contradictory, considering the fact that, as previously examined, half of the studied sample claims to be unfamiliar with the "energy community" term (Figure 34).

Our assumption is that the survey question exploring previous experience has been misread or misinterpreted by Polish respondents who appear sceptical towards cooperatives yet have a strong interest in having RE projects established in their area. Our assumption is backed by the insights retrieved from the Polish consultation workshops. It is overall observed that Polish citizens do not feel part of a decentralised, clean-energy transition process, denoting a lack of experience or even absence of RE or bioenergy community initiatives in their regions.



Figure 36. Previous experience in energy community projects (Poland).

Perceptions and willingness to join an energy community project

Polish participants are fully positive (41.51%) or positive 0.00% (43.40%) towards bioenergy community projects (Figure 37). At the same time, the share of those who had a negative attitude towards this concept appear to be significantly low. Specifically, only a less that 1% appears to have negative perceptions, while no fully negative reactions where observed whatsoever. This confirms the strong desire of Polish survey



participants to get more involved in the clean-energy transition process and to support local community initiatives. *community projects (Poland).*

Our survey further examined targeted perceptions around bioenergy community. As depicted in Figure 38, a cumulative percentage of participants believes or strongly believes (79.25% in total) that bioenergy community projects would have a positive impact in their region. An equally big part of the studied sample claims that their area has a bioenergy potential that should be explored. A large share (64.15%) further claims that energy communities can empower a fair and more-clean energy

transition. Moreover, 72.64% agreed/strongly agreed that bioenergy communities could facilitate a wider uptake of renewable energies in Poland. It is observed that most of participants recognise that energy communities could bring a very positive environmental impact. At the same time though, the majority clearly believes that there is a lack of awareness around energy communities while there are not sufficient initiatives supporting the establishment of such projects.



Regarding respondents' willingness to potentially adopt a bioenergy heating solution in their

household/business, the majority (76.42%) expressed a positive attitude (37.74% and 38.68% agree and strongly agree, respectively), as presented in Figure 39. An equally big share (71.70% in total) appears positive or strongly positive with regard to their personal involvement in a community bioenergy heating project near their place of living. A much lower share of respondents would be willing to invest in bioenergy community (a cumulative 46.23% share appears positive towards this prospect). These results are in agreement with our findings in other pilot cases and reflect citizens' concerns regarding non supportive regulatory mechanisms and fear of investment risk. Finally, most of the Polish survey participants (78.30%) agreed or strongly agreed that participation in workshops and training activities would positively influence their willingness to take part in bioenergy community.



Figure 39. Willingness to be involved in an energy community heating project (Poland).

Identified aspects where awareness raising is needed

Polish participants were further asked to identify awareness-raising actions that could boost the development of bioenergy community in their region. Results, as depicted in Figure 40, indicate that focus should be given to actions related to economic, environmental, and social benefits of community

bioenergy heating projects (90.57%). It was highlighted that people should be better informed about current state/public financial support mechanisms (76.42%). In addition, better knowledge of the available bioenergy heating technologies is considered equally essential (75.47%). Finally, Polish respondents indicated that awareness-raising actions around the available untapped biomass (60.38%), and further elaborating and clarifying the process required for the development of an energy community project (50%) would be also fundamental for the uptake of such a concept in their region.



Figure 40. Awareness-raising actions boosting the uptake of bioenergy community (Poland).

Drivers of community (bio)energy

Regarding identified drivers, energy bills reduction and climate protection constitute the most important facilitating factors for the majority of Polish survey participants, followed by the support of the local economy and energy autonomy. Less popular drivers include the participation of local trusted organisations and the involvement with local community.



Figure 41. Drivers for participating in a bioenergy community heating project (Poland)

Using statistical analysis, we were further able to investigate the statistical significance of identified drivers (Table 16). Climate protection, circular economy and waste management, alongside support of the local economy and alleviation of energy poverty are found to be the significant drivers for boosting

overall perceptions around community energy projects. Moreover, the creation of social motives, getting more involved with the local community as well as open and transparent procedures seem to be the main drivers positively affecting participants' will to get involved in energy community projects in Poland.

Identified Factors	Perceptions	Involvement
Climate protection, circular economy and waste management	\checkmark	
Reduction of energy bills for heating and creation of profit		
Support of local economy	\checkmark	
Alleviation of energy poverty	\checkmark	
Support of the integration of socially vulnerable groups		
Creation of social motives		\checkmark
Initiated by the local community - citizens in decision making		
Help to get more involved with the local community		\checkmark
Local trusted organisations are participating in the project		
Being autonomous and not rely on energy companies		
Set the right example for community and influence others to follow		
Open and transparent procedures		\checkmark
Source: Authors' elaboration (see Annex I for the detailed statistical results)		

Barriers of community (bio)energy

Our analysis further investigated the main barriers hindering Polish participants from participating in a bioenergy community project. A we can see in Figure 42, the most popular barriers include the complex regulatory and administrative procedures along with the lack of financial mechanisms. Additional important barriers, also related to economic and policy aspects, constitute the risk of investment and lack of governance support.



Figure 42. Barriers for participating in a bioenergy community heating project (Poland).

However, our statistical analysis has only revealed two barriers being significantly related to overall perceptions and involvement in community bioenergy (Table 17). These include (i) the lack of public

awareness, participation and engagement which negatively influence Polish citizens' perceptions towards energy community heating projects and (ii) the potential risks of investment, discouraging their willingness to get involved.

Factors Identified	Perceptions	Involvement
Risk of investment		~
Lack of appropriate financial mechanisms		
Complex regulatory and administrative procedures		
Lack of governance support (local and state authorities)		
Complex project ownership issues in energy community		
Bureaucracy and time required to develop an energy community		
Lack of technical knowledge on bioenergy heating options		
Lack of community acceptance		
Environmental impact		
Aesthetics		
Lack of public awareness, participation and engagement	\checkmark	
Lack of infrastructure/ logistics related to bioenergy production		
Lack of trust in the cooperative schemes and their efficiency		
Source: Authors' elaboration (see Annex I for the detailed statistical results)		

Table 17. Barriers for overall perceptions and involvement in community (bio)energy in Pola	for overall perceptions and inv	olvement in community (bio)en	ergy in Poland
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4.3.4 Italian perception survey

Sample distribution by individual characteristics

As we can see in Table 18, the Italian sample is quite balanced with almost an equal male-female participation while most respondents belong to the age groups of 25- 34 (27.97%) and 45-54 (28.81%) years old. The vast majority of the Italian survey participants (76.27%) has a tertiary education and most part of this studied sample lives in urban (43.22%) or semi-urban (36.44%) areas. Moreover, in terms of stakeholder types, most of survey participants were citizens (72.03%).

Gender	Responses	Percentage
Male	61	51.69%
Female	57	48.31%
Total	118	100%
Age	Responses	Percentage
18-24	9	7.63%
25-34	33	27.97%
35-44	17	14.41%
45-54	34	28.81%
55-64	16	13.56%
65+	9	7.63%
Total	118	100%
Education	Responses	Percentage
None	0	0.00%
Primary	0	0.00%
Secondary	28	23.73%
Bachelor's degree	19	16.10%
Master's degree	51	43.22%
PhD	20	16.95%
Total	118	100%
Typology	Responses	Percentage
Rural	24	20.34%
Semi-urban	43	36.44%
Urban	51	43.22%
Island	0	0.00%
Total	118	100%
Type of stakeholders	Responses	Percentage
Biomass Producer	1	0.85%
Citizen	85	72.03%
Energy Association	3	2.54%
Farmer	1	0.85%
Grid Operator	0	0.00%
Local Authorities	7	5.93%
Other	10	8.47%
Policymaker	2	1.69%
Renewable Energy Company	8	6.78%
RESCoop	1	0.85%
Total	118	100%

Table 18. Itali	an sample	distribution	by individua	l characteristics
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Source: Authors' elaborations

Figure 43 below indicates the two most popular home heating sources, as identified by Italian survey respondents. **Electricity** (58.90%) together with **natural gas** (55.50%) constitute the main heating sources. Standard and other biomass fuels follow next in terms of popularity, claiming, though, a much lower share (9.69% and 9.55% respectively). Coal (1.05%), geothermal heat pumps (2.36%) and district heating (5.76%) are the less popular heating sources in the case of Italy.



Figure 43. Home heating sources (Italy).

Familiarity with given terminology around renewable energy and energy communities

Italian respondents appear to be familiar (27.12%) or very familiar (50.85%) with the term "renewable energy", with a cumulative share of respondents reaching 77.97%. They also appear acquainted with "bioenergy" (58.48%) as well as with "clean and fair energy transition" (58.47%). They are relatively familiar with the terms "energy poverty" (44.09%) and "energy justice" (39.83%). "Energy communities" (33.05%) represents the least familiar term (Figure 44).



Figure 44. Familiarity with the terms related to bioenergy and energy communities (Italy).

Levels of awareness and previous experience around community energy

As depicted in Figure 45, most of Italian participants (73.73%) are not aware of any existing energy community in their area. This indicates the need for a better promotion of the local existing initiatives.

In addition, in Figure 46 we observe that Italian respondents are overall not very active around cooperatives or energy community projects. As reported, 25.42% of survey participants claimed experience an energy related/efficiency project, while 17.80% and 15.25% have taken part in a regional cooperative project and a renewable energy community project, respectively. Finally, only a share of 9.32% has reported previous experience around bioenergy community projects.



Figure 45. Awareness of existing community energy projects (Italy).



Figure 46. Previous experience in energy community projects (Italy).

Perceptions and willingness to join an energy community project

The Italian survey findings indicate that the majority of respondents has overall positive (39.83%) or strongly positive (18.64%) perceptions around bioenergy community projects (Figure 47). Compared, though, to the rest of the examined pilot cases, negative population shares appear to be higher.



As depicted in Figure 48, a large part of this sample believes *Figure 47. Perceptions around bioenergy* or strongly believes (cumulative share of 77.96%) that a *community projects (Italy).*

bioenergy community project would have a positive impact at the regional level. Moreover, a cumulative share of 72.03% thinks that energy communities can empower a fair and more-clean energy transition. 74.57% agrees and strongly agrees that (bio)energy communities could potentially facilitate the wider uptake of renewable energies at the local level. At the same time, most of participants appear to be concerned about the lack of awareness around bioenergy as well as energy communities in Italy. Nonetheless, a cumulative share of 49.15% acknowledges a bioenergy potential in the areas where respondents live. The majority of the Italian sample believes that it is difficult to develop a bioenergy community project, from both a technical and administrative perspective, while they report a lack of initiatives supporting the establishment of this concept in Italy



Figure 48. Participants' perceptions around bioenergy community projects (Italy)

Findings regarding the willingness of Italian survey participants to potentially join a bioenergy community project are presented in Figure 49. It appears than more than half of the examined sample is positive towards such a prospect (a cumulative share of 55.09%; 33.90% and 21.19% of Italians being positive or strongly positive about joining such a mission, respectively). In addition, a total of 66.11% appeared positive or strongly positive with regard to adopting a bioenergy heating solution in their household/business. Willingness shares were significantly reduced in the case of investing in a bioenergy community. Finally, most of the Italian respondents (55.93%) were positive or strongly positive towards their participation in workshops and training activities around biomass and clean energy transition.



Figure 49. Willingness to be involved in an energy community heating project (Italy).

Identified aspects where awareness raising is needed

When it comes to the respondents'-identified awareness-raising actions that could potentially boost the uptake of bioenergy communities in Italy, results are depicted in Figure 50. As in the case of all pilot cases examined, it is clear that focus should be given to aspects related to economic, environmental and social benefits of community bioenergy heating projects (83.90%). At the same time, it was highlighted that people should get better informed about current state/public financial support mechanisms (52.54%). A fair share of the respondents (53.59%) thinks that awareness-raising activities should be orientated towards acknowledging the available/untapped biomass resources and getting better acquainted with bioenergy heating technologies (37.29%).



Figure 50. Awareness-raising actions boosting the uptake of bioenergy community (Italy).

Drivers of community (bio)energy

Regarding the main identified drivers, the vast majority of Italian participants referred to climate protection as an essential motivation while, at the same time, the support of the local economy and reduction of energy bills appear to be equally important.



Results deriving from our statistical analysis (Table 19) further indicate that there is a set of statistically significant factors, in the case of Italy, acting as drivers of energy community projects uptake. Climate protection, circular economy and waste management are factored as a driving force positively affecting both the increase of positive perceptions and the will to get involved. At the same time, projects initiated by the local community, encouraging citizens to participate in decision making, participation of local trusted organisations, as well as being energy self-dependent constitute significant factors for overall perceptions. Helping citizens to get more involved, setting the right example for community, as well as providing open and transparent procedures constitute the main drivers for increasing involvement in such initiatives.

Identified Factors	Perceptions	Involvement
Climate protection, circular economy and waste management	~	\checkmark
Reduction of energy bills for heating and creation of profit		
Support of local economy		
Alleviation of energy poverty		
Support of the integration of socially vulnerable groups		
Creation of social motives		
Initiated by the local community - citizens in decision making	\checkmark	
Help to get more involved with the local community		\checkmark
Local trusted organisations are participating in the project	\checkmark	
Being autonomous and not rely on energy companies	\checkmark	
Set the right example for community and influence others to follow		\checkmark
Open and transparent procedures		~

Table 19. Drivers for overall perceptions and involvement in community (bio)energy in Italy.

Source: Authors' elaboration (see Annex I for the detailed statistical results)

Barriers to community (bio)energy

When examining potential barriers for participation in bioenergy community projects (Figure 52), our Italian sample descriptive analysis has revealed that bureaucracy is considered as a crucial hindering factor, followed by the lack of governance support and complex regulatory and administrative procedures. These results are in line with the EU level findings and suggest that financial and regulatory aspects constitute serious concerns for potentially taking part in a bioenergy community project. Aesthetics and the environmental impact represent less popular barriers among participants.



In relation to our previous findings, statistical analysis has revealed the statistical significance of the, identified by the Italian sample, barriers (Table 20). It appears that aesthetics, lack of public awareness, participation and engagement, lack of infrastructure/logistics related to bioenergy production and lack of trust in the cooperative schemes constitute significant barriers hindering the emergence of positive perceptions around energy community heating projects. At the same time, the risk of investment, lack of governance support coming from local and state authorities, lack of technical knowledge on bioenergy heating options and lack of public awareness constitute barriers that can significantly hinder involvement in such projects.

Identified Factors	Perceptions	Involvement
Risk of investment		~
Lack of appropriate financial mechanisms		
Complex regulatory and administrative procedures		
Lack of governance support (local and state authorities)		\checkmark
Complex project ownership issues in energy community		
Bureaucracy and time required to develop an energy community		
Lack of technical knowledge on bioenergy heating options		\checkmark
Lack of community acceptance		
Environmental impact		
Aesthetics	\checkmark	
Lack of public awareness, participation and engagement	\checkmark	\checkmark
Lack of infrastructure/ logistics related to bioenergy production	\checkmark	
Lack of trust in the cooperative schemes and their efficiency	\checkmark	
Source: Authors' elaboration (see Annex I for the detailed statistical results)		

Table 20. Barriers for overall perceptions and involven	ment in community (bio)energy in Italy.
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5 Discussion and Conclusions

Through market research, based on the BECoop pilot level consultation workshops and perception surveys, employed both at the pilot and EU level, this report empowers a better understanding of the stakeholders' perceptions around community energy and community bioenergy heating aspects. This section concludes on the main study's findings.

Familiarity with renewable energy and bioenergy communities

Survey respondents from all around Europe, as well as stakeholders from our pilot countries, seem to be quite acquainted with terms such as *renewable energy* or *bioenergy*. There is, however, still a lack of knowledge around the notions of *energy justice* and *community energy*. Specifically, **familiarity levels with the concept of renewable energy cooperatives remain relatively low, signalling that this concept is not widespread among European citizens.**

Awareness around local RE and bioenergy initiatives.

Most of the study participants have highlighted the **lack of awareness around energy communities** in their countries. Interestingly enough, in most cases, even the ones who claimed familiarity with the concept of energy or bioenergy communities, were **not aware of the existence** of any of such kind of initiative in their surrounding area. According to the studied beliefs, lighthouse cases of local energy community projects have not been sufficiently disseminated both at the pilots' and EU level. Results overall confirm the **need for having more visible projects being supported and financed** - from which both communities and individuals profit both in returns and social rewards. This would significantly help more citizens to be aware and supportive of RE community schemes. Local awareness campaigns, open days and field visits to energy communities' installations would constitute an important forward step towards this direction.

Previous experience, perceptions and willingness to join a bioenergy community

Despite the lack of previous experience with RE or, specifically, bioenergy heating projects, as reported by the majority of our studied sample, people do recognise the benefits that community energy may bring at the local and regional level. They appear to acknowledge that, unlike in a commercial energy enterprise, collective bioenergy initiatives' goal is to maximise community benefits rather than profits. Overall, a large share of our sample did indeed express a **positive attitude towards the uptake of community bioenergy**, recognising that such projects can empower a fair and cleaner energy transition. At the same time, additional positive perceptions around community bioenergy heating projects were expressed, in terms of their contribution in boosting local economy and reaching the RE penetration targets set out at a national and EU level.

The great majority of study participants further expressed a willingness to adopt a renewable solution for household heating. A fair share also appears interested in joining an energy community. At the same time, though, more than a third of our EU sample appears to be relatively reluctant towards the option of being personally involved in bioenergy community heating projects. Financial and regulatory hurdles, fear of investment risk and concerns about the long-term sustainability of such projects seem to prevail. Hesitancy shares are relatively decreased when focusing on the pilot samples.

Among the varying types of stakeholders examined, biomass producers are the ones more eagerly supporting investments in bioenergy community, while existing RESCoops members appear to be sceptical towards financing bioenergy heating projects. This implies that, as also indicated by literature, bioenergy remains less popular among existing energy communities, compared to other RE sources.

Drivers of community (bio)energy

Participation in an energy community is developed by the identity of the community, as well as, by the community collaboration. As observed in literature and confirmed by our findings, **citizens are willing to participate in a community (bio)energy, as long as they recognize that it brings both (i) an added value and tangible benefits to the community itself where the RE project will be established, as well as (ii) a positive environmental impact. Local and individual economic motives and climate protection, therefore, constitute major drivers for the general public's involvement. Trust between local community and people leading the initiatives is also considered fundamental for the uptake of such schemes. Reduced energy bills, a desire to be energy independent and the alleviation of energy poverty further represented strong drivers boosting engagement around community bioenergy.**

Barriers to community (bio)energy

As our EU and pilot level research confirms, major factors that stand in the way of citizen engagement in the energy transition include the **lack of adequate structural and financial mechanisms and governmental support, as well as the complex regulatory and the often-disproportionate long and complex administrative procedures**, exacerbated by **bureaucracy**. The **low availability of information on support measures** to renewable energy is identified as another major barrier, especially by workshops' participants, hindering their will to get involved in RE community projects.

Popular barriers specifically hindering the uptake of community bioenergy heating projects, constitute the **lack of infrastructure/logistics related to bioenergy production**, the **complex specificities of existing value chains** and the **misconceptions** around the usage and impact of biomass.

BECoop Pilot counties investigation

Our study offered the opportunity to separately investigate perceptions and beliefs of each BECoop pilot case region. Results indicate that electricity prevails as the main heating source with bioenergy heating solutions being less popular across all pilot countries. The **Spanish sample appears to be the one most familiar with RE terminology also claiming the highest share of previous experience with community energy activities**. Spain indeed has a higher record of RE initiatives; this notion, therefore, appears to be more visible there. Half of the Greek sample claims to be acquainted with the energy community concept, yet **Greeks are not informed about existing energy or bioenergy community projects** in their area. **The Polish sample scores the lowest familiarity with the concept and the highest share of people not being aware of existing RE projects** in their area. As reported in literature, clean-energy transition appears to be lagging behind in Poland and the potential of community energy remains untapped. **An overall positive attitude towards engaging in community bioenergy heating projects was observed across pilots, while Italians appear slightly less positive to join such a mission.**

No major variations or heterogeneities have been detected among pilots, with regard to the identification of major facilitating and hindering factors for taking part in such projects. Pilot-popular drivers and barriers remain aligned with the ones identified by the EU survey sample. Pilot survey respondents unanimously agree that simplifying the complex logistics behind biomass procurement and storage while establishing rules for the standardisation of its quality and quantity in deliveries could lead to a popularity increase of bioenergy heating solutions. It was also strongly argued that being exposed to more awareness-raising activities about the economic, environmental and social benefits of such initiatives would further boost the uptake of community bioenergy.

It should be noted that readers should carefully interpret the local-level results avoiding generalisations and extrapolations of pilot outcomes, as presented herein, to country-level representative findings. The crowdsourcing-retrieved EU level insights facilitated a better sample randomisation, capturing a more unbiased perspective regarding common beliefs around community

bioenergy, compared to the pilot-level responses which were mostly collected through the pilot partners communication channels.

General remarks

Retrieved insights around European citizens' preferences, acceptance levels, perceptions and willingness to join a community bioenergy can help us to better comprehend the main facilitators and hindering factors in this area, and what needs to be communicated in order to build awareness and increase people's interest around community bioenergy.

Citizens' and stakeholders' beliefs identified through this study confirm that - taking the opportunity of the new EU legislation - further steps need to be made by MS to integrate energy communities in their energy systems. **MS are called to draw on the experiences of existing energy community initiatives or create a temporary space for them to emerge in.**

EU citizens recognise that the role of political support to the development of community energy is a fundamental criterion for the efficiency of such schemes on local and national scales. Our findings further indicate that **fear of investment risk** can strongly hinder the general public's engagement. Energy communities, by their value-based investment, have specific needs for financing which are often not met. Traditional financing solutions, at the same time, appear out of reach for projects with limited equity and portfolios.

Several MS are still experimenting with supports and administrative mechanisms, some of which together with existing market imbalances - currently foster an inequitable situation, often damaging the level playing field for community energy. As our research study confirms, enabling frameworks should be introduced to safeguard the rights of energy communities, recognise their unique nature as entities distinct from standard energy organizations, increase flexibility in their founding process, and boost their development across Europe. **Further light needs to be shed in existing supportive legal frameworks and financial mechanisms** that can further facilitate the uptake of such schemes.

Our captured findings provide evidence that **tailored information and awareness-raising campaigns need to be put in place to fill in knowledge gaps**, emphasizing on the opportunities and benefits for citizens and local authorities to get actively involved and play a leading role in community bioenergy matters.

The report's main outcomes will serve as valuable input on how to better engage with project's stakeholders and foster participation in and uptake of the BECoop activities, facilitating, at the same time, a wider boost of community bioenergy heating projects establishment.

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Annex

Annex I: Methodological note on the statistical analysis

In this section we present the methodological details related to the statistical analysis we performed for identifying the main drivers, barriers and benefits related to positive perceptions and increased involvement to community bioenergy projects.

To estimate the effects of selected parameters on general public perceptions and willingness to participate in community bioenergy projects, measured in a 5-point likert scale, we developed the model presented below:

$$y_i = \alpha_0 + \beta_1 X_i + \beta_2 Z_i + \beta_3 DEMO_i + \varepsilon_i$$
(1)

Where Xi refers to a set of general individual characteristics related to familiarity with terms relevant to community bioenergy (FAM), previous experience (PREV_EXP) and educational and/or professional background (BACKGROUND); Zi includes a set of independent variables related to potential factors that can act as barriers (BAR_X) and drivers (DR_X) for community bioenergy initiatives, whereas DEMOi controls for a set of demographic characteristics related to each individual. We use the Ordinary Least Squares (OLS) estimator to estimate the above model.

In our case, we choose to use a set of two dependent variables including aspects of perceptions related to community bioenergy and willingness to join that type of initiatives. Below, **Table A1** presents the main variables used for our analysis. As we can see, we have a set of variables referring to general background and demographic information for each individual, together with three different groups of variables capturing aspects related to benefits, barriers and drivers for community bioenergy perceptions and involvement.

Name	Short description	Related
	Familiarity with terms related to community biconergy	question
FAIVI	Familianty with terms related to community bioenergy	QI
PREV_EXP	Previous experience with community bioenergy	Q4
BACKGROUND	Dummy variable for an academic background or professional experience in an energy - related field	Q19
DR_CLIMA	Climate protection, circular economy and waste management	Q10_1
DR_COST	Reduction of energy bills for heating and creation of profit	Q10_2
DR_LOCAL	Support of local economy	Q10_3
DR_POV	Alleviation of energy poverty	Q10_4
DR_INCL	Support of the integration of socially vulnerable groups	Q10_5
DR_MOTIV	Creation of social motives	Q10_6
DR_PART	Initiated by the local community - citizens in decision making	Q10_7
DR_COMM	Help to get more involved with the local community	Q10_8
DR_TRUST	Local trusted organisations are participating in the project	Q10_9
DR_AUTO	Being autonomous and not rely on energy companies	Q10_10
DR_EXAM	Set the right example for community and influence others to follow	Q10_11
DR_TRANSP	Open and transparent procedures	Q10_12
BAR_INVEST	Risk of investment	Q12_1
BAR_FIN	Lack of appropriate financial mechanisms	Q12_2

Table A1: N	Main variab	les used j	for our	analysis.
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BECoop – D3.1. Stakeholders'	perceptions, acceptance	levels and needs on bioenergy h	neating
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Name	Short description	Related question
BAR_ADMIN	Complex regulatory and administrative procedures	Q12_3
BAR_GOV	Lack of governance support (local and state authorities)	Q12_4
BAR_OWN	Complex project ownership issues in energy community	Q12_5
BAR_TIME	Bureaucracy and time required to develop an energy community	Q12_6
BAR_TECHN	Lack of technical knowledge on bioenergy heating options	Q12_7
BAR_ACCEPT	Lack of community acceptance	Q12_8
BAR_ENV	Environmental impact	Q12_9
BAR_AESTH	Aesthetics	Q12_10
BAR_AWARE	Lack of public awareness, participation and engagement	Q12_11
BAR_INFRA	Lack of infrastructure/ logistics related to bioenergy production	Q12_12
BAR_TRUST	Lack of trust in the cooperative schemes and their efficiency	Q12_13
AGE	Age group	Q16
GENDER	Dummy variable for gender (1 if female, 0 otherwise)	Q17
EDU	Educational level	Q18
INCOME	Income level	Q21
URBAN	Dummy variable for place of residence (1 if urban, 0 otherwise)	Q15
ISLAND	Dummy variable for place of residence (1 if island, 0 otherwise)	Q15

The analysis that follows tries to shed light on the specific factors that are significant for general public perceptions and willingness to participate in community bioenergy projects. In this Annex, we present the detail findings of our analysis in the form of tables, indicating the significance of each factor. Five different groups of models have been estimated, focusing on the barriers and drivers for community bioenergy perceptions and involvement. In the first four cases, we have performed the analysis at a pilot level to investigate differences between our four pilot countries, whilst the identification of these factors at the EU-level has been explored using our full dataset.

DV	Overall perception							Willingness to be involved								
IVs	Italy		Greece	2	Polan	d	Spai	n	Ital	у	Gree	ce	Pola	nd	Spa	in
FAM	0.146	* * *	0.150	**	0.205	* * *	0.026		0.216	* * *	0.183	***	0.156	* *	0.136	***
PREV_EXP	-0.025		0.036		0.031		-0.008		0.082	*	0.045		-0.016		0.107	***
BACKGROUND	-0.105		-0.068		0.217		-0.022		0.213	*	-0.026		0.265	*	0.054	
DR_CLIMA	0.150	***	0.185	* *	0.256	***	0.177	***	0.124	* * *	-0.005		0.060		0.027	
DR_COST	-0.020		0.036		-0.051		0.023		-0.044		-0.054		0.095		-0.017	
DR_LOCAL	0.063		-0.018		0.160	**	0.124	***	0.018		0.129		0.049		0.082	*
DR_POV	-0.008		0.166	*	-0.139	*	0.054		0.031		0.171	**	-0.052		0.041	
DR_INCL	-0.029		-0.194	* *	-0.013		-0.021		0.038		-0.109		-0.024		0.001	
DR_MOTIV	0.007		0.116		0.067		0.025		0.039		0.062		0.220	* * *	0.020	
DR_PART	0.091	* *	0.054		-0.034		0.022		0.000		0.184	**	-0.081		0.022	
DR_COMM	-0.023		-0.016		0.100		0.085	* *	0.229	* * *	0.280	* * *	0.214	* * *	0.205	***
DR_TRUST	0.102	***	0.139		-0.066		-0.019		0.000		-0.204	**	-0.066		0.011	
DR_AUTO	0.076	* *	0.057		0.034		0.034		0.045		0.010		-0.035		0.005	
DR_EXAM	0.056		0.103		0.005		0.011		0.078	*	0.197	**	0.056		0.118	***
DR_TRANSP	-0.001		-0.125		0.061		0.064		0.122	* *	0.035		0.180	**	0.202	***
AGE	-0.052	**	-0.057		-0.024		-0.022		-0.016		-0.033		0.012		-0.062	**
GENDER	-0.082		0.027		0.046		-0.069		0.029		0.076		0.136		0.063	
EDU	0.098	***	0.048		0.068		0.034		0.032		0.139	**	0.019		-0.023	
INCOME	-0.087		0.176		0.113		0.054		-0.240	* * *	0.083		0.029		-0.054	
URBAN	0.028		0.168		-0.011		0.059		0.043		-0.278	**	-0.065		-0.043	
ISLAND	-0.560		0.231				-0.263		-0.192		-0.117				0.080	
CONST	1.506	***	0.992	* *	1.274	* * *	1.262	***	0.540	*	0.117		0.549		0.702	***
Observations	731		222		285		730	(733	1	222		28	5	73	C
Prob.	0.000		0.000		0.000)	0.00	0	0.00	00	0.00	0	0.0	00	0.00	00
Adj-R2	0.1460	C	0.1889		0.240	0	0.169	96	0.28	53	0.461	0	0.29	33	0.31	65

Table A2: OLS results for the factors acting as significant drivers for community bioenergy overall perception and willingness to participate in community bioenergy initiatives (per pilot country).

Note: Level of significance: * p < 0.10, ** p < 0.05, *** p < 0.01

DV	Overall perception							Willingness to be involved								
IVs	Italy	/	Greed	e	Polan	k	Spair	ı	Ital	у	Gree	се	Pol	and	Spa	in
FAM	0.236	***	0.230	***	0.297	***	0.139	***	0.378	* * *	0.379	***	0.287	***	0.281	***
PREV_EXP	0.003		0.041		0.045		0.006		0.109	* *	0.211	* * *	-0.006		0.148	* * *
BACKGROUND	-0.089		-0.069		0.260	*	-0.040		0.153		0.149		0.326	*	-0.020	
BAR_INVEST	0.017		-0.054		0.049		-0.015		0.093	* *	0.059		0.119	*	-0.039	
BAR_FIN	-0.001		0.116		0.003		0.077	*	-0.026		-0.113		0.057		0.154	* * *
BAR_ADMIN	0.029		-0.018		0.054		0.021		0.023		-0.004		-0.060		0.035	
BAR_GOV	-0.033		0.206	**	-0.035		0.069	*	0.162	* * *	0.256	* * *	-0.044		0.059	
BAR_OWN	-0.017		-0.127		-0.052		0.009		-0.030		-0.020		-0.016		0.051	
BAR_TIME	0.044		0.085		0.087		0.076	*	0.026		0.020		0.102		0.000	
BAR_TECHN	0.046		-0.087		0.049		0.026		-0.076	*	0.043		0.038		0.105	* * *
BAR_ACCEPT	-0.051		0.069		0.013		-0.033		0.016		0.043		-0.003		0.054	
BAR_ENV	-0.016		0.004		-0.041		0.026		0.025		-0.010		-0.022		0.031	
BAR_AESTH	-0.072	* *	-0.106	*	-0.073		-0.086	* * *	-0.022		0.039		0.000		-0.049	
BAR_AWARE	0.141	* * *	0.019		0.138	**	0.067		0.139	***	-0.067		0.116		-0.002	
BAR_INFRA	0.127	* * *	0.087		0.037		-0.046		-0.026		-0.069		0.000		0.033	
BAR_TRUST	-0.127	* * *	-0.100		-0.006		0.065		-0.006		0.023		-0.027		0.003	
AGE	-0.068	* *	-0.023		-0.038		-0.004		-0.021		-0.051		0.007		-0.049	
GENDER	-0.001		0.008		0.008		0.004		0.150	*	0.205		0.081		0.136	*
EDU	0.088	* *	0.027		0.079		0.044		0.025		0.153	*	0.031		-0.034	
INCOME	-0.105		0.214	*	0.129		0.040		-0.248	* * *	0.041		0.049		-0.070	
URBAN	-0.011		0.135		0.035		0.029		0.006		-0.300	* *	-0.065		-0.097	
ISLAND	-0.652		0.394				-0.196		-0.510		-0.070				0.119	
CONST	2.600	***	1.982	***	1.492	* * *	1.962	***	1.374	* * *	1.155	**	1.398	* * *	1.188	* * *
Observations	731		222		285		730		731		222	2	28	35	73	0
Prob.	0.00	0	0.000)	0.000		0.000)	0.00	0	0.00	0	0.0	000	0.00	00
Adj-R2	0.095	57	0.142	7	0.1766	5	0.075	1	0.160	04	0.23	83	0.0	992	0.15	93

Table A3: OLS results for the factors acting as significant barriers for community bioenergy overall perception and willingness to participate in community bioenergy initiatives (per pilot country).

Note: Level of significance: * p < 0.10, ** p < 0.05, *** p < 0.01

		EU-level
IVs	Overall perception	Willingness to be involved
FAM	0.129 ***	0.173 ***
PREV_EXP	0.017	0.084 ***
BACKGROUND	-0.023	0.057
DR_CLIMA	0.167 ***	0.083 ***
DR_COST	0.023	-0.003
DR_LOCAL	0.055 ***	0.042 **
DR_POV	0.041 ***	0.021
DR_INCL	-0.004	0.034 **
DR_MOTIV	0.037 **	0.024
DR_PART	0.055 ***	0.044 ***
DR_COMM	0.018	0.170 ***
DR_TRUST	0.031 **	0.031 **
DR_AUTO	0.042 ***	0.024 *
DR_EXAM	0.029 **	0.100 ***
DR_TRANSP	0.044 ***	0.183 ***
AGE	-0.038 ***	-0.014
GENDER	-0.005	-0.014
EDU	0.040 ***	0.035 **
INCOME	0.024	-0.013
URBAN	0.036	-0.051 **
ISLAND	-0.009	-0.132
CONST	1.153 ***	0.092
Observations	5144	5144
Prob.	0.000	0.000
Adj-R2	0.1996	0.3214

 Table A4: OLS results for the factors acting as significant drivers for community bioenergy overall perception and willingness to participate in community bioenergy

 initiatives (European level).

Note: Level of significance: * p < 0.10, ** p < 0.05, *** p < 0.01

		EU-level		
IVs	Overall perception	Wi	llingness to be	involved
FAM	0.255 **	:	0.348	***
PREV_EXP	0.018		0.105	***
BACKGROUND	-0.024		0.053	
BAR_INVEST	0.029 **		0.023	
BAR_FIN	0.023		0.047	**
BAR_ADMIN	0.027 *		0.030	*
BAR_GOV	0.041 **	:	0.086	***
BAR_OWN	0.003		0.029	
BAR_TIME	0.061 **	:	0.021	
BAR_TECHN	0.019		-0.013	
BAR_ACCEPT	-0.015		0.042	***
BAR_ENV	-0.010		0.017	
BAR_AESTH	-0.065 **	:	-0.033	**
BAR_AWARE	0.072 **	:	0.095	***
BAR_INFRA	0.032 **		0.022	
BAR_TRUST	-0.029 **		0.006	
AGE	-0.030 **	:	-0.011	
GENDER	0.056 **		0.046	
EDU	0.038 **	:	0.027	
INCOME	0.022		-0.012	
URBAN	0.043 *		-0.040	
ISLAND	0.001		-0.147	
CONST	1.958 **	:	0.870	***
Observations	5144		5144	
Prob.	0.000		0.000	
Adi-R2	0.1139		0.1652	

Table A5: OLS results for the factors acting as significant barriers for community bioenergy overall perception and willingness to participate in community bioenergy initiatives (European level).

Note: Level of significance: * p < 0.10, ** p < 0.05, *** p < 0.01

Annex II: Perceptions Survey



T1.3 Survey: Identification of stakeholders' perception and needs

English Version

Welcome note

Dear participant, welcome to our survey! We would like to know what you think about community bioenergy heating. The survey lasts **no more than 10 minutes**. There are no right or wrong answers, this is about your views. All data is anonymised, and your privacy is guaranteed. Thank you for helping us gather relevant information!

What is the BECoop project?

Over the last years, the EU has witnessed some remarkable steps in Renewable Energy (RE) deployment. However, at the same time, we see an increasingly uneven penetration of RE across the different energy sectors, with the heating and cooling sector lagging behind. The ambition of the EU-funded BECoop project is **to provide the necessary conditions and technical as well as business support tools for unlocking the underlying market potential of community bioenergy.** The project's goal is to make community bioenergy projects more appealing to potential interested actors and to foster new links and partnerships among the international bioenergy community
Introduction to the topic

We would like to know if you have experience with community bioenergy projects.

Q1. To what extent are you currently familiar with the following terms? Please use a scale from 1 to 5 [1 - Not at all familiar; 2 – Not very familiar; 3 – Somewhat familiar; 4 – familiar; 5-very familiar]

4 1 2 3 5 Q1_1. Renewable energy energy that has been derived from earth's natural resources that are not finite or exhaustible, such as wind and sunlight Q1_2. Clean and fair energy transition Shifting energy production away from using fossil fuels towards an efficient system based on renewable energy sources that encourages the involvement of society in the decision-making process Q1_3. Energy justice achieving equity in both the social and economic participation in the energy system. Q1_4. Energy poverty The inabiliy to access adequate energy services at home. Energy poor households experience inadequate levels of essential energy services, due to a combination of high energy expenditure, specific household energy needs, low household incomes and inefficient buildings and appliances. Q1_5. Bioenergy refers to all types of energy derived from the conversion of natural, biological sources (referred to as biomass) available on a renewable basis, such as agricultural biomass, biofuels, waste etc. Q1_6. Energy communities refer to a type of organising collective citizen actions in the energy system. A business model where citizens jointly own and participate in renewable energy or energy efficiency projects. Different organisational forms of energy communities (association, cooperative and others) may be established as a legal entity - Directives (EU) 2018/2001 and 2019/944.

Q2. What type of energy do you use for heating your home? (Please select all that apply)

- □ Fuel oil Heating oil
- Electricity (e.g., air-conditioning units, electric heaters, electric radiators, electric heat pumps)
- Natural gas
- □ Standard biomass fuels (e.g., pellets, wood briquettes)
- □ Other biomass fuels (e.g., firewood, olive stone, etc.)
- □ Geothermal heat pumps
- District heating
- Coal
- □ Butane, propane bottled gas
- Other (please specify)

Q3. Are you aware of any energy community projects (or energy cooperatives) established in your area?

- Yes
- No
- I do not know

Q4. Have you ever been involved or been a member of:

	Yes	No
Q4_1. a regional cooperative/community project?		
Q4_2. a renewable energy community project?		
Q4_3. a bioenergy community project?		
Q4_4. an energy-related or energy efficiency project		

Perceptions and awareness

We would like to examine your level of awareness and your perceptions around bioenergy heating projects.

Q5. Please indicate your agreement with the following statements using a scale from 1 to 5 [1=Strongly disagree; 2=Disagree; 3=Neither agree nor disagree; 4=Agree; 5=Strongly agree]

I would consider using bioenergy for:

	1	2	3	4	5
Q5_1. Heating/Cooling					
Q5_2. Transport					
Q5_3. Electricity					

Q6. How much do you feel you know about the following topics? Please use a scale from 1 to 5 [1=not at all; 2= a little; 3=To some extent; 4=Much; 5= Very much]

	1	2	3	4	5
Q6_1. Biomass and its use for heating					
Q6_2. Specific bioenergy community projects					
Q6_3. Renewable energy technologies					
Q6_4. Available bioenergy heating technologies					
Q6_5. Benefits that bioenergy community projects may bring at a					
local/regional level					
Q6_6. Financing schemes and incentives for biomass heating					
Q6_7. Framework regulations around community energy solutions					

Q7. Please indicate your agreement with the following statements using a scale from 1 to 5 [1=Strongly disagree; 2=Disagree; 3=Neither agree nor disagree; 4=Agree; 5=Strongly agree]

I believe that:

	1	2	3	4	5
Q7_1. My area has bioenergy potential that could be used for heating					
purposes (e.g., forests, agricultural resources)					
Q7_2. A bioenergy community project would have a positive local					
impact in my region					
Q7_3. There is a satisfactory level of awareness around energy					
communities in my country					
Q7_4. There is a satisfactory level of awareness around bioenergy in					
my country					
Q7_5. Energy communities can empower a fair and more clean-					
energy transition					
Q7_6. The development of bioenergy communities would facilitate					
the wider uptake of renewable energies in my country					
Q7_7. It is generally easy to develop a bioenergy community project					
from a technical and administrative perspective in my country					
Q7_8. There are sufficient initiatives supporting the establishment of					
energy communities.					

Q8. Please indicate your agreement with the following statement using a scale from 1 to 5 [1=Fully negative; 2=Negative; 3=Neutral; 4=Positive; 5=Fully positive]

	1	2	3	4	5
My overall perception for bioenergy					
community projects is:					

Q9. Which of the following awareness raising you think could boost the uptake of bioenergy community? (Please select all that apply)

- Awareness raising about the economic, environmental and social benefits of community bioenergy heating projects
- □ Awareness raising about the available bionergy heating technologies
- Awareness raising on the untapped biomass resource available
- Awareness raising on the required steps to establish an energy community project
- □ Awareness raising on state/public financial support
- □ Other (please specify)

Drivers

We would like to examine the drivers for participating in a bioenergy heating project.

Q10. Please indicate your agreement with the following statements using a scale from 1 to 5 [1=Strongly disagree; 2=Disagree; 3=Neither agree nor disagree; 4=Agree; 5=Strongly agree]

The following aspects would be important for my participation in a bioenergy community project:

	1	2	3	4	5
Q10_1. Climate protection, motives for circular economy and waste					
management					
Q10_2. The reduction of energy bills for heating and creation of profit					
Q10_3. The support of local economy (labour, biomass sourced locally,					
bioenergy produced locally, socioeconomic regeneration)					
Q10_4. The alleviation of energy poverty					
Q10_5. Supporting the integration of socially vulnerable groups					
Q10_6. The creation of social motives: give individuals the confidence to invest					
in collective activities, knowing that others will also do so (goals sharing, trust					ĺ
and action capability)					
Q10_7. The project is initiated by the local community - local citizens					
participate in decision making					
Q10_8. The project can help me get more involved with the local community					
Q10_9. Local trusted organisations are participating in the project					
Q10_10. Being autonomous and not rely on energy companies					
Q10_11. Set the right example for my community and influence others to					
follow me					ĺ
Q10_12. The opportunity to participate in a community project with open and					
transparent procedures					

Willingness to join

We would like to examine your willingness to join in a bioenergy community project

Q11. Please indicate your agreement with the following statement using a scale from 1 to 5 [1=Strongly disagree; 2=Disagree; 3=Neither agree nor disagree; 4=Agree; 5=Strongly agree] I would:

	1	2	3	4	5
Q11_1. be interested in participating in workshops and training activities					
around biomass and clean energy transition.					
Q11_2. like to be involved in a community bioenergy heating project near my					
place of living					
Q11_3. be interested to invest in a bioenergy community					
Q11_4. be interested to adopt a bioenergy heating solution in my					
household/business.					

Barriers

We would like to examine the barriers for participating in a bioenergy heating project.

Q12. Please indicate your agreement with the following statements using a scale from 1 to 5 [1=Strongly disagree; 2=Disagree; 3=Neither agree nor disagree; 4=Agree; 5=Strongly agree]

Regarding my support towards or participation in community bioenergy heating projects, I am concerned about the following aspects:

	1	2	3	4	5
Q12_1. The risk of investment					
Q12_2. The lack of appropriate financial mechanisms					
Q12_3. The complex regulatory and administrative procedures / frequent					
changes in the institutional framework around renewable energy sources.					
Q12_4. The lack of governance support (local and state authorities)					
Q12_5. Complex project ownership issues in energy community					
Q12_6. The bureaucracy and time required to develop an energy community					
project.					
Q12_7. The lack of technical knowledge on bioenergy heating options					
Q12_8. The lack of community acceptance					
Q12_9. The environmental impact.					
Q12_10. The aesthetics					
Q12_11. Lack of public awareness, participation and engagement					
Q12_12. Lack of infrastructure/ logistics related to bioenergy production					
(supply of biomass, storage areas etc.)					
Q12_13. The lack of trust in the cooperative schemes and their efficiency					

Personality traits

We would like to analyse your personality traits that may contribute to participating in bioenergy community projects.

Q13. Please indicate your agreement with the following statements using a scale from 1 to 5 [1=Strongly disagree; 2=Disagree; 3=Neither agree nor disagree; 4=Agree; 5=Strongly agree]

I see myself as someone who:

	1	2	3	4	5
Q13_1. comes up with new ideas.					
Q13_2. is curious about many different things.					
Q13_3. has an active imagination.					
Q13_4. prefers work that is routine.					
Q13_5. likes to reflect and play with ideas.					
Q13_6. is reserved, introverted.					
Q13_7. generates a lot of enthusiasm.					
Q13_8. is outgoing, sociable.					
Q13_9. has an assertive personality.					

General information - Demographics

We would like to learn some additional information about you.

Q14. Which country do you live in?

- Austria
- Belgium
- Bulgaria
- Croatia
- Cyprus
- Czechia
- Denmark
- Estonia
- □ Finland
- France
- Germany
- Greece
- Hungary
- Ireland
- Italy
- Latvia
- Lithuania
- Luxembourg
- Malta
- Netherlands
- Poland
- Portugal
- Romania
- Slovak Republic
- Slovenia
- Spain
- Sweden
- Other

Q15. Do you live in a?

- Densely populated area (urban)
- □ Intermediate area (semi-urban)
- □ Thinly populated area (rural)
- Island

Q16. What is your age?

- 18-24
- 25-34

- 35-44
- 45-54
- 55-64
- 65+

Q17. Gender:

- Male
- Female
- Other
- Prefer not to say

Q18. What is the highest level of education you have attended?

- None
- Primary
- Secondary
- Bachelor's Degree
- Master's Degree
- PhD

Q19. Do you have an academic background or professional experience in an energy -related field?

- Yes
- No

Q20. Please indicate the type of stakeholder you identify yourselves with:

- □ RESCoop
- Local Authorities
- Energy Association
- □ Renewable Energy Company
- Grid Operator
- Biomass Producer
- Farmer
- Policymaker
- Citizen
- Other

Q21. How would you classify the net household income of your family, compared to the average in your country of residence? (*non-mandatory question*)

- Low income
- Medium income
- □ High income

Informed Consent

By participating in the survey, you **voluntarily consent** to the collection and use of your information by BECoop as set forth in the **BECoop Privacy Policy**. If you have any questions concerning this privacy policy or the project's data collection practices, you may contact us at <u>contact@becoop-project.eu</u>.

- * I have read the **<u>BECoop Privacy Policy</u>**, and I agree to the terms and conditions
 - o Yes
 - o No

Survey End

Thank you for taking part into this survey and contributing to our understanding of what people think of community bioenergy heating projects!

Your input will help us a great deal to identify the current social perception and understanding about community energy for heat that should be taken into account during the development of such a project.

Feel free to follow BECoop's social media accounts to stay in touch and check our website for more information!

Website: www.becoop-project.eu Facebook: /becoop-h2020 LinkedIn: /BECoop-H2020 Twitter: @BecoopH2020