



D3.4 Deployment of the BECoop capacity building program - Final

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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.

The project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 952930.

Project partners



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Abbreviations

CAPEX	Capital Expenditures
CHP	Combined Heat and Power
CPC	Community Power Corporation
DH	District Heating
EED	Energy Efficiency Directive
EPBD	Energy Performance of Building Directive
ESCO	Energy Service Company
EU	European Union
GHG	Greenhouse Gas Emission
MCPD	Medium Combustion Plant Directive
OPEX	Operating Expenses
ORC	Organic Rankine Cycle
RED	Renewable Energy Directive
SPBT	Simple Payback Period

Executive summary

The BECoop project is dedicated to unlocking the potential of bioenergy communities across the EU. To achieve this, the project has supported specific initiatives, addressing identified needs and challenges, while also developing tools and services to promote the adoption of community bioenergy. Alongside these efforts, the project has organized webinars and workshops covering various topics, including bioenergy, policy frameworks, and community engagement. BECoop focuses on providing technical and business support to stakeholders and key actors who may lack prior experience in the sector. This support has generated valuable resources, effectively reducing information gaps related to community energy and bioenergy initiatives. In Task 3.2, professionals with extensive expertise in areas like biomass properties and applications, CHP design and operation, biogas plant design and operation, as well as financial support for future investors, conducted ten webinars and nine pilot-based training workshops (over 2 per pilot case).

This report highlights the key outcomes of the BECoop capacity building activities (training workshops and webinars) that took place in the framework of Task 3.2. These actions significantly **enhanced knowledge and filled crucial skill gaps** for stakeholders and key actors involved in establishing new RESCoops. Participants gained insights into the formal definitions and roles of energy communities, as provided by RED directives, and the legal frameworks specific to their respective countries that influence the local and national RESCoop landscape. Furthermore, activities' attendants acquired a **comprehensive understanding of biomass as a biofuel, considering its current availability and future potential**. They also learned about proper biomass storage and cost-effective valorisation methods. Additionally, participants gained **new insights into the economic aspects of biomass use as a biofuel, particularly in terms of harvesting, storage, and transport logistics**.

The report addresses raised and identified barriers to adopting biomass as a replacement for fossil fuels like coal and underscores the advantages of various biomass valorisation techniques, including drying, fermentation, carbonization (torrefaction and pyrolysis), gasification, and combustion. Finally, the report delves into the social aspects, including skills and barriers, related to the creation of renewable energy communities.

In comparison to the previous version D3.3 this final version of the Deployment of the BECoop capacity building program includes:

- a description of the organised **external training workshops** at each pilot case and their outcomes (*chapter 2*)
- a presentation of the organised **training webinars**, their key findings and added value (*chapter 3*)
- the contribution of the training workshops and webinars to capacity building, the challenges met and a set of recommendations for facilitating community engagement and capacity building (*chapter 4*)

1. Introduction

This deliverable summarises the main results of the work performed within Task 3.2 of BECoop. The task focused on empowering various stakeholders with skills and knowledge related to the design and implementation of community bioenergy heating projects. The knowledge transfer primarily took place through **10 thematic webinars and several dedicated technical workshops** conducted in the four pilot countries: Poland, Italy, Greece, and Spain. Task 3.2 aimed to empower bioenergy heating actors, RESCoops, policy makers with skills and knowledge that could support them in designing and deploying community bioenergy heating projects and solutions.

The task started with an analysis of the training needs (based on previous results and complemented with desk research) of: (i) RESCoops seeking to develop bioenergy heating projects (e.g. technical, supply chain, business, financial, legal aspects); (ii) authorities aiming at stimulating the adoption of bioenergy community heating (e.g. training on local planning, financial policies, public procurement, etc. aspects that can promote community energy); and (iii) various actors of the bioenergy heating supply chain (e.g. energy grid operators, community initiatives, citizens, feedstock providers, farmers, fuel processing companies, technicians, etc.).

Based on the identified needs, a set of training modules was developed. The training content was elaborated by the task leader (WUELS) and WP leader (CBS) in cooperation with other partners of the task, based on the expertise of each partner of the consortium.

The capacity building program was deployed through dedicated **training workshops**. The workshops covered important aspects related to energy community creation, including legal, formal, technical, environmental, business, and social aspects. The local stakeholders were trained on how to utilize the developed BECoop tools, services, and the knowledge exchange platform, while also addressing their skills, perceptions, and knowledge gaps.

The training workshops were organised by the local pilot partners in close collaboration with their supporting partners. Before conducting these workshops, the local partners received training from BECoop expert partners in each training field. They then adapted the training materials to align with the local/national strategy, needs of the stakeholders, and the logistics chain in the respective regions.

In addition to the training workshops, **10 webinars** were organised targeting to attract an international audience of RESCoops and authorities. Calls for participation were launched well in advance for both the workshops and webinars. The physical and online training activities were supported by the BECoop Knowledge Exchange Platform (T5.1) and its “Expert Panels” through peer-to-peer learning activities.

This document has been divided into 5 chapters:

- Chapter 1: Description of the applied strategy aiming to enhance capacity building amongst stakeholders interested in bioenergy communities' creation.
- Chapter 2: In this section, the training workshops conducted at the pilot level are presented. It offers a concise description of the topics covered, the main knowledge gained from these workshops, and the conclusions drawn from the conducted activities. Moreover, it highlights the main factors (skills and barriers) influencing the capacity building in the given local area.
- Chapter 3: This chapter presents the main information about the ten webinars that were conducted. It covers a short description of the topics discussed, the main findings and outcomes, as well as the webinars' added value.
- Chapter 4: This chapter summarises the contribution of the webinars and training workshops to capacity building, identifies the challenges met and offers a set of recommendations.

2. Training workshops

2.1 Training material

Complementary training modules on various aspects of bioenergy community projects were developed based on the identified needs in the pilot areas. As a result, training material in the form of six modules was defined to be used in the external training workshops in the local pilot areas, through an extensive series of brainstorm meetings among BECoop partners. These modules were as follows:

- technical bioenergy and sustainability aspects,
- policy-relevant materials,
- business and innovation aspects,
- stakeholder engagement,
- bioenergy community,
- market research.

The capacity building strategy and objectives were proposed based on the previous BECoop deliverables and the gained knowledge from internal meetings with BECoop project partners. Discussions with different groups of stakeholders from the local pilot areas contributed also to this effort (some important objectives/issues were proposed). This strategy was designed to address the objectives and issues related to the deployment of the BECoop capacity building program in the selected regions (pilot areas). The defined modules (see D3.3) were developed by the task leader in cooperation with partners of the task, based on the expertise of specified partner (WUELS, CIRCE, CERTH, FIPER for technical bioenergy and sustainability aspects; IEECP for policy relevant material; Q-PLAN for business and innovation aspects; CBS on stakeholder engagement; SEV on community bioenergy; WR on market research). Before delivering the materials for training workshops, the local partners were trained accordingly by the BECoop expert partners in each training field.

It should be marked that the final content (materials) of the modules were catered/adjusted to the specific situation/strategy and the stage of the advancement of the bioenergy cooperative development in the given local pilot area (Poland, Greece, Italy, Spain). Therefore, some final objectives and targets planned to be achieved may vary from region to region. Moreover, in cases where it was necessary, the training workshop materials were elaborated and translated into the local language to facilitate better understanding and engagement among the stakeholders. The project partners assigned to support the local pilot area partners were responsible for the final preparation and development of the training materials for the given regions.

2.2 Pilot Training Workshops

The training workshops were performed in the four local pilot areas located in Poland, Spain, Italy, and Greece. The material presented in each pilot's training workshops can be found online on the project website, more specifically in the [Knowledge repository](#) section of the KEP.

2.2.1 Polish Pilot Area

Three training workshops in Poland were organized in the Local Pilot Area (Table 1) located in the Oborniki Śląskie commune. The timeframe (list of workshops) is as follows:

Table 1. Polish Pilot training workshops

Polish Training Workshops			
Pilot Area	Day	Number of Participants	Types of Stakeholders
Poland	29 th of November 2022	20	Residents, Representatives of other commune office, Biogas plant provider, Farmers, Village mayors, Entrepreneurs, Students, WUELS/OBS representatives, Agricultural advisers, Bank representatives, Biomass boiler producer
	11 th of February 2023	25	
	28 th of February 2023	31	

1st training workshop

The 1st training workshop engaged a diverse group of stakeholders from the local pilot area in Poland, including residents, representatives of other commune offices, biogas plant providers, farmers, village mayors, entrepreneurs, and students. The workshop focused on various key topics to foster knowledge exchange and capacity building for community bioenergy heating projects.

The main focal points of the workshop's agenda were as follows:

- Introduction: Participants were introduced to the concept of an energy cooperative operating in the field of renewable energy, with a focus on the role of biomass in heat production.
- Biomass Potential: The workshop explored the general characteristics of the commune of Oborniki Śląskie in terms of its biomass potential.
- Bioenergy Cooperative Development: Issues related to the development of a bioenergy cooperative in the Polish pilot area were discussed, covering legal, formal, political, technical, environmental, economic, and social aspects.
- BECoop Tools: The participants were presented with an overview of the supporting tools available through BECoop.
- Technical Support: An open discussion and future plans were explored, allowing participants to address technical aspects and seek further support.

During the workshop, participants' skills, barriers, perceptions, and knowledge gaps were identified to gain insights into their readiness for bioenergy heating projects.

Positive aspects and skills identified among the participants included:

- Residents demonstrated awareness of financial support programs for individual heating system changes and the applicable types of systems.
- Business owners exhibited knowledge of establishing cooperation for a logistics chain related to local biomass utilization.
- Younger residents displayed higher environmental awareness and an understanding of the positive impact of increased biomass use on local air quality.
- Local authorities were experienced in working with multiple stakeholders and facilitating cooperation between different groups.
- Local farmers were well-informed about companies or institutions where they could provide surplus waste biomass.

Additionally, barriers to the implementation of bioenergy projects were identified, including concerns about the financial benefit, trust in biomass suppliers, lack of local examples, and legal complications, among others.

List of identified barriers:

- Lack of willingness to change the heating system if there will be no direct financial benefit from it. Social and environmental benefits are treated as secondary.
- The lack of trust of citizens in companies that can ensure the continuity of biomass supplies due to the current problems with the availability of coal on the Polish and European markets.
- No possibility to follow another model example of a bioenergy energy cooperative in Poland – there are only 1-2 energy cooperatives in Poland based on photovoltaics.
- Bad memories with the legal aspects of completing applications related to energy modifications of residential buildings - legal complications, bureaucracy, the need to provide a large number of documents, time-consuming activities.
- Difficulty in persuading people to new technical solutions - poor social trust in new technologies. Simultaneous pessimism related to the potential financial failure of the project.
- Fear of an energy crisis causes biomass owners to accumulate a surplus of raw material for their own needs or to inflate its price.
- No possibility to join the existing system - no heating network in the OBS commune. Hence the reluctance of residents to declare in the perspective of several years, due to the potential problem of rising prices and uncertainty.
- Lack of a main stakeholder who could drive the creation of an energy cooperative and encourage people to cooperate.

List of main perceptions:

- Residents acknowledge the social and environmental benefits of biomass usage, but due to the current high price of pellets, they are exploring alternative heating methods as the financial aspect takes precedence.
- Residents recognise the potential of establishing an energy cooperative based on a biogas plant, but they express uncertainty about its impact on reducing fees for organic waste management and concerns about potential environmental issues, such as odours.
- The fluctuating energy prices and inflation create uncertainty, making it challenging to make a decision at present, as stakeholders are unsure whether the bioenergy project will yield returns in the long term.
- Most shareholders see the potential of creating an energy cooperative, but there are concerns about the complexities involved in setting up a partner network and managing its operations. The equal voting rights among members, irrespective of their financial contributions, also pose a challenge.
- Stakeholders express concerns about the profitability of a bioenergy-based project compared to other investments, such as heat pumps combined with photovoltaics.
- Some residents are eager to embrace new solutions, but they emphasise the need for a main social shareholder (leader) who can drive the creation of a partner network and provide guidance.
- Younger residents (approximately 30 years old) show a greater willingness to participate in an energy cooperative based on biomass, as they are more environmentally aware and do not associate negative memories with the era of communism.

List of main knowledge gaps:

- Financial profitability of heating projects based on biomass and economic analyses.
- There are no real Polish scenarios of building energy cooperatives and possible directions of establishing cooperation between various groups of shareholders.
- Advantages of biomass in comparison with other sources of energy carriers.
- It is necessary to reach a larger group of recipients (villages, housing cooperatives), because some people have only basic knowledge about the energy cooperative.
- More information is needed on where stakeholders (mainly residents) can submit their ideas, willingness to participate in the project, arranging an energy cooperative.
- Model examples and best practices of creating energy communities need to be showcased in Poland, along with the resulting benefits.

Conclusions: The meeting indicated a higher response compared to previous initial events, even though it was during a standard working hour when most residents are at work. This indicates a growing interest and engagement among stakeholders. However, the main challenge remains low social involvement and limited representation of new stakeholder types. The main focus of the discussion was the financial profitability of bioenergy projects in comparison with other heat sources. Due to the unfavourable economic situation (inflation, problems with the availability of raw materials), some residents were not fully convinced about participating in the project. In addition, the recent government financial support dedicated to coal-fired users made some participants doubt the validity of the new solutions. Nevertheless, a positive aspect was observed in the majority of stakeholders acknowledging the positive environmental and social effects associated with the use of local bioenergy. To address the concerns raised and bolster stakeholder confidence, it is recommended that the next workshop places greater emphasis on presenting the financial aspects of bioenergy-based heating concepts in a more comprehensive manner. A detailed exploration of the potential benefits and economic viability could enhance stakeholders' understanding and increase the likelihood of successful project implementation.

2nd training workshop

The 2nd training workshop engaged different stakeholders from the local pilot area in Poland, including mainly residents, biogas plant providers, farmers, and village mayors. The workshop aimed at sharing the knowledge about bioenergy community and initiate the capacity building in the commune.

The main focal points of the workshop's agenda were as follows:

- Introduction: The idea of a bioenergy cooperative and the formal requirements for energy cooperative creation in Poland was explained.
- Biomass potential: The local harvesting potential of forestry and agro biomass was indicated as well as logistics issues in the commune of Oborniki Śląskie.
- Bioenergy Cooperative Development: Issues related to the development of a bioenergy cooperative in the Polish pilot area were discussed, covering legal, formal, political, technical, environmental, economic, and social aspects.
- BECoop Tools: The overview of the supporting tools available through BECoop were performed to facilitate their activity in this area.
- Financial Support: The participants were informed about the first Polish supporting programme assigned to RESCoop/BECoop creation.

- Technical Support: An open discussion and future plans were presented, allowing participants to address technical aspects and seek further support.

During the workshop, participants' skills, barriers, perceptions, and knowledge gaps were identified to gain insights into their readiness for bioenergy heating projects.

Positive aspects and skills identified among the participants included:

- Representative of the biogas company has skills to design small biogas plant matched to the number of available substrates,
- Residents are familiar with solid fuel combustion in the boilers (more than 50% of the heating systems in OBS are solid fuel fed boilers),
- Farmer has expertise in acquisition of manures for biogas production (he owns ca. 200 cows and has space and devices for collecting and storage),
- Older residents have experience with cooperative operation (in the communism time there were organisations in the region).

List of identified barriers:

- There are bad experiences with cooperatives (consequences of the communism).
- Complicated approach in terms of balance of demand-production by the energy cooperatives – problem of optimisation (an expert in energy systems and energy measurements is required to help).
- There are no direct profits for energy cooperatives when operated with heat (short logistic chain and cooperation of all members should lead to lower costs of heating).
- Lack of real RESCoops in Poland (some initiatives already started in eastern part of Poland).
- High prices of the fertilizers block the use of straw for heating purposes (the situation is going to be stabilized in the future, economic analysis must be validated more frequently as it changes fast).
- There are no heating network in the OBS (own heating systems are the solutions, but it must be validated with the Polish regulation that does not describe it properly).
- The procedures are very complicated and time-consuming (the experts in this field can help).
- Low knowledge of the English language making difficult the use of BECoop supporting tools.

List of identified perceptions:

- The lack of Polish experience in the field of RESCoop/BECoop affects the very cautious approach of stakeholders as to the belief in the success of such an undertaking.
- The current situation on the market of electricity and heating fuels makes it difficult to make any decisions that require changes. Residents prefer not to change anything to at least not worsen their situation - they do not want to risk investments without a guarantee of success.
- Very high inflation in Poland has slowed down investments. Stakeholders in an uncertain and unstable situation in Poland hold money - they refuse to invest.
- All stakeholders like the goal and idea of an energy cooperative but have concerns about its feasibility in Polish conditions.
- Complicated formal, legislative, and accounting procedures in the field of settlements prevent some optimism and a positive impression about the idea itself.
- Residents like the model of using local resources (agricultural and forestry) because they see the potential to reduce heating costs.

List of identified knowledge gaps:

- The legal and formal procedures for RESCoop creation.
- Coal fired boilers can be directly replaced by biomass-fired boiler. Sometimes it is simple enough to change fuel from coal to biomass.
- Still many residents have no idea what the RESCoop/BECoop is.
- More information is needed on which form of biomass can replace given type of coal used for heating (i.e., peat coal can be replaced by pellets, nut coal can be replaced by briquettes or logs).
- How to store biomass safely (to keep it dry).

Conclusions: Workshop participants seem to be satisfied with their participation, they commented on certain issues, asked details but also more general questions about what is currently happening in Poland on the fuel market price. There were no organizational problems. The prepared catering certainly allowed for a good discussion in the lobby during the break, also between the stakeholders themselves. Attendance is always a problematic issue (despite many information paths). Participants were informed about the next workshops and activities. The company dealing with biogas plants expressed its willingness to join the E-market environment and NoI groups. In turn, a farmer with cows is considering the possibility of becoming a follower case to receive support from BECoop, in terms of the possibility of creating an energy cooperative with its participation. A clear and significant problem in the use of supporting tools is the general lack of English knowledge. Additionally, in Poland there is no habit of using programs supporting certain activities by individuals, especially from rural areas (only professional companies deal with this). The completed workshops have a positive effect, because each action trying to change the approach of the local community to the problem of generating heat from a source other than coal and encouraging discussion on the local use of biomass and joint energy generation, will affect their ecological awareness and increase knowledge in this area.

3rd training workshop

In the 3rd training workshop a very wide group of stakeholders from the local pilot area in Poland participated, including local residents, representatives of other commune offices, biogas plant providers, farmers, village mayors, entrepreneurs, students, agricultural advisers, bank representatives or biomass boiler producers. The workshop included various aspects relating to the capacity building for community bioenergy creation.

The main focal points of the workshop's agenda were as follows:

- Introduction: The concept of an energy cooperative, its social background, and possibilities of implementation in Polish conditions,
- Potential of local resources: The availability of biomass from agricultural sector and forestry area was presented, especially in the Oborniki Śląskie commune,
- Bioenergy Cooperative Functioning: Characteristics of multi-directional aspects related to energy cooperatives, with particular emphasis on technical and financial issues,
- BECoop Tools: The presentation of the supporting tools available through BECoop,
- Technical Support: An open discussion and future activities of the BECoop project in the region were indicated.

During the workshop, participants' skills, barriers, perceptions, and knowledge gaps were identified to gain insights into their readiness for bioenergy heating projects.

List of identified skills:

- Most types of stakeholders know how many energy cooperatives there are in Poland (and of what type) and how many there are in other European countries in comparison.
- Residents know what eco-pea coal is and, what are the types of coal, what are their characteristics - e.g., eco-pea coal is characterized by lower sulphur content.
- Residents and farmers know that batch boilers previously fired with fossil fuel can be replaced with biomass fuel without the need to change the boiler.
- Farmers know that ash from burning biomass can be used as fertilizer (e.g., in the garden).
- All stakeholder groups are aware of potential logistic chains and their needs (e.g., if a biogas plant is chosen, heat utilization must be ensured).
- Representatives of local authorities know that there is a possibility of good regional cooperation with the use of biomass (example from Strzeszów village).
- Representatives of the Development Agency know what an ORC installation is and what its basic parameters are.

List of identified barriers:

- No possibility to follow others - even though there is an upward trend of cooperatives based on photovoltaics, there are still no bioenergy cooperatives.
- Inability to satisfy all members of the energy cooperative - potential conflict of interest between activists, sponsors, issues of democracy.
- In terms of quantity, biomass needs more than coal - the need to modernize existing storage facilities or more frequent delivery, resulting in higher costs, which negatively affects the desire to replace the heat source.
- Toolkit is in English - a large part of the participants are older people who do not speak this language.
- Good practices abroad are not everything - workshop participants believe that these things cannot be compared due to the different economic situation in Poland, other currencies, and different attitudes of the society.
- The word “cooperative” is terrible in Polish conditions, associated with the lack of trust of older people who previously belonged to other cooperatives during the communist era/period.
- Legal formalities are too complicated for a physical person to get alone through all steps related to RESCoop creation.
- The registration process of the RESCoop requires some expenses (lawyer services, accounts services, registration costs, etc.) which hinder the initiation of this process.
- Crucial issues of social trust - energy cooperatives may fail due to the problem of decision-making, hierarchy, and presidents - i.e., people who want to rule and dictate conditions to other stakeholders.

List of identified main perceptions:

- Residents see pellet boilers are an excellent example of using biomass - “if the neighbour has it, I can have it too!”. Unfortunately, in the context of energy cooperatives, following the example of others in Polish conditions is impossible.
- Farmers (biomass owners) are dissatisfied that there are no formal profits in heat production (no possibility to earn money on heat production).

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- Residents see that establishing the statute of energy cooperatives, under current legislation, especially in terms of entry and exit of a member to an energy cooperative, can be highly problematic, costly, and time-consuming.
- All stakeholder groups see that the Polish government has finally taken an interest in the development of energy cooperatives by implementing a new support program, “Energy for Rural Area”.
- Workshop participants positively perceive the possibility of implementing biomass energy cooperatives. “Poland is an agricultural country. We have nothing to be ashamed of. Let’s use biomass”.
- Residents agree that an energy cooperative is an exciting solution, but due to low social trust, they suspect that corruption in high positions may occur in the structures of the cooperative.
- Residents (potential members) are satisfied that there are no penalties for termination of contracts between the cooperative and members, as is sometimes the case in housing cooperatives.

List of main knowledge gaps:

- To set up an energy cooperative, you need to know the characteristics of its members. Need more information on how to calculate it, and how the features of the members affect the needs of the cooperative.
- Despite the description of the method of accounting for the energy cooperative, the accounting process is very complicated. A detailed meeting is needed to explain this further.
- Constant legal changes - the need for training in the law because the regulations currently do not keep up with technology.
- Replacing a coal-fired boiler with biomass and modifying systems - in particular, the need for information on chimneys and flue gas temperatures.
- How to build social trust? - Balancing stakeholders in terms of partnership in an energy cooperative.
- Estimating the potential of biomass - what specific types of biomass can be used for, and which types are more useful for combustion and others for biogas production/composting.

Conclusions: The meeting occurred on Tuesday, February 28th 2023 at noon. Particularly noteworthy is the fact that many farmers interested in the subject of energy cooperatives attended the meeting. The workshop was also attended by a representative of another commune from the province (Ząbkowice Śląskie), where local authorities are interested in implementing an energy cooperative. Compared to the previous workshops, the attendance was similar (ca. 30 people with the technical support of the training). However, despite the multi-directional promotion, few people are still interested in the subject. The lack of interest on the part of the village authorities - village mayors, who do not attend the meetings, despite invitations, is worrying. It deserves the recognition that the legal and financial aspects of the functioning of the energy cooperative were presented from a broader perspective, and most stakeholders began to recognize the advantages related to the reduction of heating costs. The meeting ended with an open discussion using a flipchart, where the subject of energy cooperatives was lively debated. The group’s most important topic was the lack of social trust in Polish society, as well as very complicated and time-engaging procedure which may be significant barriers to implementing energy communities. A fruitful discussion in the field of construction of straw-powered boiler was the result of the presence of the technical director of a company known on the Polish market for the production of biomass boilers.

2.2.2 Greek Pilot Area

Two training workshops in Greece were organized in the Local Pilot Area (Table 2) located in the municipality of Trikala. The timeframe (list of workshops) is as follows:

- Local Technical Workshops Greek Pilot Area – December 9th, 2022,
- Local Technical Workshops Greek Pilot Area (Biomass day: The role and contribution of Bioenergy as an active branch of the Bio economy in dealing with the energy crisis) – January 27th, 2023.

Table 2. Greek Pilot training workshops

Greek Training Workshops			
Pilot Area	Day	Number of Participants	Types of Stakeholders
Greece	9 th of December 2022	6	Local residents from municipality of Trikala, representatives of other commune office, coffee shops owners, coffee producers, village mayors, entrepreneurs, students, representatives from ESEK and CERTH, agricultural advisers
	27 th of January 2023	50	

1st training workshop

The 1st training workshop engaged the following stakeholders from the local pilot area in Greece: local residents from municipality of Trikala, representatives of other commune office, coffee shops owners, coffee producers, village mayors, entrepreneurs, students, representatives from ESEK and CERTH, agricultural advisers.

The main focal points of the workshop's agenda were as follows:

- Introduction: An introduction was made by the facilitator of the workshop and the structure of the workshop was mentioned, as well as a tour de table was performed in order for everyone to present themselves.
- BECoop: A short presentation of the BECoop project and its objectives were presented.
- Bioenergy Cooperative Development: A round of introductory discussion where the needs for the implementation of the community and the positive impact it would have on the local community of Trikala was raised. In addition, a brief presentation of the new activities of ESEK, as RESCoop were presented.
- BECoop Tools: The participants were presented with an overview of the supporting tools available through BECoop.
- Technical Support: during the round table discussion all needs of stakeholders in terms of technical aspects were discussed and mapped. The ESEK answered the questions and suggested some technical solutions.

During the workshop, participants' skills, barriers, perceptions, and knowledge gaps were identified to gain insights into their readiness for bioenergy heating projects.

Positive aspects and skills identified among the participants included:

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- Coffee grounds collection – NGO InCommOn transferred to audience the concept of the design and operation of a well-organized collection plan tailor-made at the specific local characteristics of the municipality of Trikala.
- Determination of the fuel properties - CERTH has the expertise to measure and evaluate the properties of the new fuel (city prunings and residual coffee grounds).
- Processing and standardization of the raw material - ESEK has all the necessary machinery to valorise the residual biomass and produce alternative solid biofuels.
- Experience to the implementation of pilot scale activities - Municipality of Trikala has a long experience in the implementation of pilot scale activities and in a new agency development (e-Trikala).

List of identified barriers:

- Lack of a motivation of coffee shops owners (together with the local community) in engaging other companies/individuals and in transferring the message of local circular economy (the exploitation of the coffee residues provides energy and decreases the municipal costs for disposing organic wastes to landfills).
- Too complex and too complicated approach in terms of balance of demand-production by the energy cooperatives – problem of optimisation (an expert in energy systems and energy measurements is required to help).
- Lack of the uniformity of the waste sorting/management in the local system.
- The procedures of RESCoop creation are very complicated and time-consuming (the experts in this field are required).
- Low knowledge of the English language enabling the use of BECoop supporting tools.

List of main perceptions:

- Local ecosystem benefits (Economic benefits due to high prices of fossil fuels, social cohesion due to collaboration of the local actors and environmental benefits due to the valorisation of the residual biomass and reduction of fossil fuels).
- Creation of a value chain (The development of a supply chain starting from the biomass owner and ending up to final user of the bioenergy).
- Biomass should be used in a sustainable way (A bioenergy community/project should exploit biomass resources in a sustainable way, obtaining a two-fold benefit: from an economic point of view, savings on the purchase of energy, and creation of local works; and from an environmental way, the use of unexploited resources and the sustainable management of forest will also have positive environmental impact such as : GHG savings, improvement in air quality compared to open-field burning of prunings and agricultural residues).

List of main knowledge gaps:

- Sorting of pruning - after the city tree cuts, the produced piles contain very often various other residues/waste, such as plastics, iron etc, thus the processing and biofuel production are difficult or impossible.
- Identification of residual coffee collection methods - At the recording of the problems that took place in a pilot collection of coffee residues at the beginning of the project, it was observed that the collection could be a significant obstacle since each coffee house has its own way of collecting their wastes according to their design, available space, even the way (habit) that the employees have adopted.

- Investment costs and funding - Identification of different options of financing and supports should be explored for e.g., cost for biomass boiler installations in public buildings.

Conclusions: To develop a bioenergy community a variety of stakeholders should be involved. All the desired key stakeholders participated in the workshops. All participants expressed their interest in the project's activities and their support for the market uptake of bioenergy and community bioenergy.

The municipality of Trikala (through the mayor advisor) participated actively at the event and expressed willingness to participate in the BECoop community to exploit residual biomass coming from city tree cuts and coffee residuals. Regarding the city tree cuts, they mentioned that ESEK and the municipality can join forces and together they will process the residual biomass coming from tree prunings.

Due to the active presence of the key stakeholders, the workshops succeeded in meeting the planned objectives. The participants were satisfied with the workshops and were very interested in further developments of BECoop, but also, they were determined to move on by implementing real actions for exploiting the proposed new feedstocks (urban prunings and coffee residues).

2nd training workshop

The 2nd training workshop engaged the following stakeholders from the local pilot area in Greece: local residents from municipality, representatives of other commune office, village mayors, entrepreneurs, students, representatives from ESEK and CERTH HELLAVIOM, and agricultural advisers. This workshop was organized in collaboration with CERTH, CRES, CluBE and the MSc of Bioeconomy, Circular Economy, Sustainable Development.

The main focal points of the workshop's agenda were as follows:

- Introduction: General idea of energy communities was presented.
- BECoop: BECoop project overview combined with discussion over the potential of community bioenergy projects development in the region. ESEK + CERTH performed the presentation on: activation of the community energy market for bioeconomy. CRES prepared presentation on an overview of the utilization of renewable gases in EU and Greece, as foreseen in the RePowerEU plan.
- Bioenergy Cooperative Development: Presentation of opportunities and challenges for the bioenergy sector in Europe in 2023 conducted by CERTH. CRES prepared the presentation on management of biomass to produce energy and energy products, Hellenic biomass development: Bioenergy and standardized solid biofuel production applications, CluBE have conducted presentation on the role of bioeconomy in addressing the energy crisis.
- BECoop Tools: The participants were presented with an overview of the supporting tools available through BECoop webpage.
- Technical Support: Scientific associate of CERTH presented gasification technologies to produce liquid and gaseous biofuels and their contribution to sustainable transport.

During the workshop, participants' skills, barriers, perceptions, and knowledge gaps were identified to gain insights into their readiness for bioenergy heating projects.

Positive aspects and skills identified among the participants included:

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- Communication dissemination: The various participants of the workshop (industries, technical institutions, biomass associations, academics, students, local authorities, etc.) can transfer and disseminate the benefits of the community bioenergy and how the pilot cases can be replicated in other areas.
- Replication potential: Local authorities that participated at the workshop were informed about the pilot cases and the exploitation of residual biomass. They found the pilot case of Greece very interesting and see it as role model for their municipalities regarding the exploitation of coffee residues and urban prunings from their parks.

List of identified barriers:

- Lack of a motivation of local authorities to engaging more together with the local community and transfer the message of circular economy as well as the exploitation of biomass via different valorisation techniques,
- Too complex and too complicated approach in terms of balance of demand-production by the energy cooperatives – problem of optimisation (an expert in energy systems and energy measurements is required to help).
- Lack of the uniformity in the local system for sorting and converting different biomass wastes to heat.
- The procedures related to the energy cooperative registration are very complicated and time-consuming that requires the participation and support of the dedicated experts in this field.
- BECoop supporting tools are only in English (it causes significant problems in their utilisation by non-English speakers).

List of perceptions:

- Local ecosystem benefits: Economic benefits due to high prices of fossil fuels, social cohesion due to collaboration of the local actors, and environmental benefits due to the valorisation of the residual biomass and reduction of fossil fuels utilisation.
- Organisation of the logistics chain including the engagement of the biomass owner, fuel processing/handling company, and final user.
- Biomass should be used in a sustainable way. It is expected that their utilisation for energy purposes will bring savings in energy costs, create local jobs, and have positive environmental impact thanks to the reduction of open field burning of pruning and agricultural residues.

List of knowledge gaps:

- Misconceptions about the uses of biomass/technical knowledge gaps: There was a gap on the potential use of biomass and the technical issues of the use of alternative fuels such as, coffee residues, urban pruning etc.
- Funding tools and concrete business plans: How to finance or obtain public funding for developing the bioenergy projects. Most people had an idea but no detailed knowledge on how to obtain the funding or which actions can be suitable to be performed by a newly created bioenergy community.
- Collaboration of local actors: The attendants expressed their lack of knowledge on the existence/mapping of local actors working in this sector. They also mentioned that they have

limited experience with collaborating with the various actors needed to establish a successful biomass value chain or EC.

- Success cases: A lot of attendants were unaware of successfully implemented bioenergy projects and bioenergy community energies.

Conclusions: The Biomass Day took place on Friday 27th of January 2023 under the auspices of the Hellenic Biomass Development and was organized in collaboration with CERTH, CRES, CluBE and the MSc of Bioeconomy, Circular Economy, Sustainable Development. Many experts in the field participated in the discussion and exchange of opinions. This workshop helped enrich the knowledge of the participants regarding the valorisation of biomass in the field of bioenergy. From a general point of view, the participants were satisfied with the workshop. It can be concluded that the workshop succeeded in meeting its objectives, which were to transfer the knowledge on bioenergy-related aspects and present the BECoop project and the developed tools to potential stakeholders interested in setting up a bioenergy project or bioenergy community.

2.2.3 Italian Pilot Area

Two training workshops in Italy were organized in the Local Pilot Area (Table 3) located in the municipality of Tovo Sant'Agata. The timeframe (list of workshops) is as follows:

- Local Technical Workshops Italian Pilot Area (“Energia della Valle”) – September 17th, 2022,
- Local Technical Workshops Italian Pilot Area – April 20th, 2022, Bolzano

Table 3. Italian Pilot Area training workshops

Italian Training Workshops			
Pilot Area	Day	Number of Participants	Types of Stakeholders
Italy	17 th of September 2022	35	Local authorities from municipalities: Tovo Sant'Agata, Mazzo i Lovero, Bolzano, students, local people, regional associations, research centres, general public, representatives from BECoop: FIPER
	20 th of April 2022	35	

1st training workshop

The 1st training workshop engaged the following stakeholders from the local pilot area in Italy: local authorities from municipalities: Tovo Sant'Agata, Mazzo i Lovero, students, local people, regional associations, research centres, general public, representatives from BECoop: FIPER. This workshop was organized in collaboration with ARIBL (Assosazione Regionale Imprese Boschive della Lombardia).

The main focal points of the workshop's agenda were as follows:

- Introduction: At the beginning FIPER representatives have made introduction related to project BECoop objectives and main goals.
- BECoop: a short presentation of the BECoop main partners and the pilot installations were presented.

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- Bioenergy Cooperative Development: presentation about local woody biomass supply chain and the positive effects on the local economy, on the energy bills of citizens and companies and on the quality of the air from the countries concerned.
- BECoop Tools: The participants were introduced to an overview of the supporting tools available through BECoop webpage.
- Technical Support: practical presentation on the woody biomass harvesting machines and study tour around biomass plant.

During the workshop, participants' skills, barriers, perceptions, and knowledge gaps were identified to gain insights into their readiness for bioenergy heating projects.

Positive aspects and skills identified among the participants included:

- Techniques for processing and standardization of the raw woody biomass - ARIBL has all the necessary machinery for cutting, collecting, and valorising the residual biomass and production of alternative solid biofuels.
- Potential investors exhibited knowledge of establishing cooperation for a logistics chain related to local biomass utilization.
- Local people displayed higher environmental awareness and an understanding of the positive impact of increased biomass use on local air quality.
- Replication potential: Potential investors from other Italian municipalities that participated at the workshop were informed about the pilot cases and the exploitation of woody biomass. They found the pilot case of Tovo very interesting and see it as model role for their municipalities regarding the exploitation of woody biomass and urban prunings from their parks.

List of identified barriers:

- At the upper end of the defined range, a DHN (district heating network) will be required to utilise a significant proportion of the produced heat in order to be viable and maximise production incentive benefits for 'good quality' CHP.
- The procedures related to the energy cooperative registration are very complicated and time-consuming that requires the participation and support of the dedicated experts in this field.
- BECoop supporting tools are only in English (it causes significant problems in their utilisation by non-English speakers).

List of main perceptions:

- The use of locally available woody biomass as an energy raw material can enable increased energy self-sufficiency and reduced dependence on imported fuels among Italy regions and an increase in the country's energy security.
- Woody biomass should be used in a sustainable way. It is expected that their utilisation for energy purposes will bring savings in energy costs, create local jobs, and have positive environmental impact thanks to the reduction of open field burning of pruning and agricultural residues.
- Local ecosystem benefits: Economic benefits due to high prices of fossil fuels, social cohesion due to collaboration of the local actors, and environmental benefits due to the valorisation of the residual biomass and reduction of fossil fuels utilisation.

- Organisation of the logistics chain including the engagement of the biomass owner, fuel processing/handling company, and final user.

List of main knowledge gaps:

- Lower experience in the potential use of agrobiomass and in the technical issues of the use of alternative fuels such as, energy crops and straw from agriculture biomass etc.
- Collaboration of local actors: The attendants expressed their lack of knowledge that they have limited experience with collaborating with the various actors needed to establish a successful biomass value chain or EC.

Conclusions: District heating powered by virgin biomass in the Italian mountain areas can be a system that enhances the local forest heritage, with a super-short supply chain, with positive effects on the local economy, on the energy bills of citizens and companies and on the quality of the air from the countries concerned. To make all this better understandable, FIPER organized a demonstration day on Saturday 17 September 2022 aimed at all the citizens of Tovo Sant'Agata, Mazzo and Lovero, who, thanks to the EU-funded BECoop project, are embarking on the path towards this system. At the end of the workshop a very interesting debate took place between the experts who operate cutting woody biomass, biomass plant owner and stakeholders.

2nd training workshop

The 2nd training workshop engaged the following stakeholders from the local pilot area in Italy: forestry operators, entrepreneurs and district heating managers, university researchers. This workshop was organized in collaboration with SEV, who hosted the attendees in its headquarter in Bolzano. District heating powered by virgin biomass in the Italian mountain areas can be a system that enhances the local forest heritage, with a super-short supply chain, with positive effects on the local economy, on the energy bills of citizens and companies and on the quality of the air from the countries concerned. The success of this sector is also strictly linked to the incentive policies and the environmental policies of the country, both for existing plants and for the oncoming ones. It's moreover fundamental to be clearly aware of the climate and environmental changes (at global and local level, with global and local effects) to be able, as a sector, to take part to and to try to influence the legislation process regarding the renewable energies and first of all the biomass sector. That's the reason why FIPER organised a technical workshop, inviting the University of Milan professor Giorgio Vacchiano to explain how a sustainable forest management can be a solution to the country energy supply and at the same time the carbon credits law can be used to link sustainability and economy in our country.

The main focal points of the workshop's agenda were as follows:

- Introduction: At the start of the sessions, an introduction was made by the workshop coordinator and the structure of the workshop was presented. All the present were asked to introduce themselves and a brief introduction of the experts took place.
- BECoop: a short presentation of the BECoop project and its strategy were given.
- Bioenergy Cooperative Development: Issues related to the development of a bioenergy cooperative in the Italian pilot area were discussed, covering legal, formal, political, technical, environmental, economic, and social aspects.
- BECoop Tools: The participants were presented with an overview of the supporting tools available through BECoop webpage.
- Technical Support: Exploration of the technical and environmental concepts of bioenergy, its potential for deployment in the country, and how energy communities can include this type of

solution in their range of services, beyond purely electrical self-consumption. The focus was then made on the legislation about carbon credits, in support of district heating development and of its enforcing.

During the workshop, participants' skills, barriers, perceptions, and knowledge gaps were identified to gain insights into their readiness for bioenergy heating projects.

Positive aspects and skills identified among the participants included:

- Forestry operators know the enormous potential of Italian woods and forests which are growing with no barriers since the end of the second world war and need to be managed.
- District heating managers know deeply the economical balance needed by a district heating plant to survive and thrive.
- University researchers are aware of the future horizon for biomass energies and cooperatives in terms of carbon sink effect of woods and their contribute to the fight against climate change and the power of substitution of many materials with wood, in energy and other industrial uses.

List of identified barriers:

- Forestry operators and local administrators complain about the lack of economic resources dedicated to the forest management, as well for the limits of forest exploitation due to the shape of the mountain's slopes, to the missing pieces of the supply chain and to the fickle incentives politics.
- District heating managers are now dealing with the results of the climate change: storms and fires which broke down whole forests in few hours mean at present time a too much high quantity of woody biomass, difficult to process but, first of all, entire woods to be promptly replanted to guarantee the future needs, otherwise in a few years (5-10) there will be no more possibility of using woods for producing energy and heat in certain areas.
- University researchers underlined the importance of substituting energy fuels like oil or methane with biomass, but remark that the carbon cycle needs to be respected and we need to find a way to reduce the dioxide emission much more intensively that we're doing now.

List of main perceptions:

- Difficulty in harmonizing the needs of the country with the legislation evolution, while the economic sector of the biomass energy exploitation is ready to improve and enlarge its efforts.
- It's important to keep a close link between forestry operators, district heating managers, researchers, and policy makers in order to make this harmonization become true and not to lose more time in the direction of the conversion of the Italian energy supply and energy mix towards a bioenergy more oriented one.
- has a huge potential in the biomass sector and a deeper awareness of this potential needs to be disseminated through all the population, but first of all through the policy makers, in order to have a better and wiser approach to the biomass sector, if a real push to bioenergy has to be done.

List of main knowledge gaps:

- Funding opportunities and deadlines: How to finance or obtain public funding for developing the bioenergy projects. Many people had an idea but no detailed knowledge on how to obtain the funding.

- Collaboration of local actors: The attendants expressed their lack of knowledge on the existence/mapping of local actors working in this sector. They also mentioned that they have limited experience with collaborating with the various actors needed to establish a successful biomass value chain.
- Success cases: A lot of attendants were unaware of successfully implemented bioenergy projects and bioenergy community energies.
- Constant legal changes - the need for training in the law because the regulations currently do not keep up with technology (i.e. carbon credits oncoming legislation)
- How to build social trust? – Most of the operators have low level of communications strategy approach and they need to improve their skills in involving the local stakeholders

Conclusions: The meeting, held on the April 20th in Bolzano, in SEV headquarter, was associated to the annual FIPER assembly, in order to have a higher response and presence of sector operators and managers. The debate was very participated and technical, reaching the amount of about 35 attendees. Many issues were proposed and analysed, and many requests of a deepening of some of them were made, as well as the request of a higher link between all the participants through the help of FIPER as coordinator and spreading vehicle of best practices, news, etc. The importance of having a continuous link with university researchers emerged clear from this session as well as the importance of a closer link with policy makers who are in charge of the energy issues legislation changes or implementation.

2.2.4 Spanish Pilot Area

Two training workshops in Spain were organized in the Local Pilot Area (Table 4), in the municipalities of Llodio and Sakana. The timeframe (list of workshops) is as follows:

- Local Technical Workshops Spanish Pilot Area (Training session on bioenergy communities – Llodio) –September 21st, 2022,
- Local Technical Workshops Spanish Pilot Area (Training session on bioenergy communities – Sakana) – October 26th, 2022.

Table 4. Spanish Pilot Area training workshops

Spanish Training Workshops			
Pilot Area	Day	Number of Participants	Types of Stakeholders
Spain	21 st of September 2022	9	Local authorities, municipalities, local action groups, development agencies, RESCoops, ESCO, research centres, general public, representatives from BECoop: Goiener, CIRCE
	26 th of October 2022	18	

1st training workshop

The 1st training workshop engaged the following stakeholders from the local pilot area in Spain: residents from municipality of Llodio, local authorities, municipalities, local action groups,

development agencies, RESCoops, ESCO, research centres, general public, representatives from BECoop: Goiener and CIRCE.

The main focal points of the workshop's agenda were as follows:

- Introduction: At the start of the sessions, a brief introduction took place of all the assistants (referring especially to technical expertise).
- BECoop: a short presentation of the BECoop project and its objectives were presented.
- Bioenergy Cooperative Development: Then, the leading organizations presented themselves (Goiener and CIRCE) and the BECoop project objectives and goals.
- BECoop Tools: The participants were introduced to an overview of the supporting tools available through BECoop that can help in capacity building of the local society.
- Technical Support: Exploration of the technical and environmental concepts of bioenergy, its potential for deployment in both the Basque Autonomous Community and Navarre, the support tools identified/developed, and how energy communities can include this type of solution in their range of services, beyond purely electrical self-consumption. This was accompanied by real examples. Moreover, the definition of the regulatory context associated with both aspects (heat and electricity) and the business models that could be applied were discussed.

During the workshop, participants' skills, barriers, perceptions, and knowledge gaps were identified to gain insights into their readiness for bioenergy heating projects.

Positive aspects and skills identified among the participants included:

- Representation of local people with convening/convincing power - Some participants of the workshop were local public representatives of small villages and councils. This means that they can have quite an important role in transferring to potential new/unconvinced members the advances in bioenergy community projects and the benefits they can obtain by creating an energy community.
- Information dissemination - The local agencies that came to the event were quite well-known in the area. Their talks to the local people about the benefits of establishing energy communities can have a great impact. In general, it would be a good idea to replicate these training sessions in different areas and valleys of the Basque Country and Navarre, as it was observed that people were quite aligned with the concept and philosophy of the project.
- Previous knowledge about energy communities - Some of the participants were already part of an existing energy community, so they had previous knowledge about the energy sector, which enriched the discussion and facilitated the information sharing with other participants (they confirmed the approach and its suitability for the region).

List of identified barriers:

- Lack of a motivation of local authorities to engage more stakeholders together with the local community and use the potential of local biomass like straw.
- Lack of technical knowledge and awareness of negative sights of using some kind of biomass like straw for example (high chlorine content and ash generation) by local municipalities.
- Lack of uniformity in the local system for sorting and converting different biomass residues to heat.

- The procedures related to the energy cooperative registration are very complicated and time-consuming that requires the participation and support of the dedicated experts in this field.
- BECoop supporting tools are only in English (it causes significant problems in their utilisation by non-English speakers).

List of main perceptions:

- Collaborative attitude - In general, the participants showed a very good attitude towards collaborative and community projects; there was a feeling of being part of a “great family” in which they can help each other to obtain cheap and environmentally responsible energy. The benefits on the community well-being observed in other successful cases were also transmitted and received with enthusiasm.
- Eagerness to deploy energy communities and stop depending on fossil fuels and big companies - Part of the philosophy of the bioenergy communities is to stop depending on large companies that do not care for the customer or the environment, but only for economic benefits. This is also the main reason why people were interested in stopping depending on them and start being energy self-sufficient.
- The biomass should be used in a responsible way, respecting the surrounding mountains and environment - The local allotments were a traditional way to obtain biomass and wood from local forests in previous generations. However, people nowadays are not taking advantage of them, generally. A bioenergy community can exploit these resources in a sustainable way, obtaining a two-fold benefit: from an economic point of view (savings on the purchase of energy, and creation of local jobs), and from an environmental way (the sustainable management of forest creates more healthy mountains for the citizens to enjoy). This fact was a clear driver among the participants to collaborate on having clean and healthy forests and surroundings.

List of main knowledge gaps:

- Technical knowledge gaps - There was quite a gap on technical issues of the use of alternative fuels such as, for instance, straw. In general, the technical part was quite useful for the participants to obtain some knowledge about these fuels.
- Community creation process - One of the most relevant parts of the training session was focused on communicating the ways a community can be created and structured. This was a main issue because most of the participants in the sessions did not have the knowledge about this step of the process, so it was a successful approach.
- About biomass plant operation - Some specific technical knowledge gaps that were identified were associated with the operation of biomass boilers and district heating systems. Specifically, the crucial issues that have already been pre-identified on successful cases regarding the fuel feeding and handling system, the maintenance issues, or the generated ash disposal.
- About the forest management and the biomass pre-treatment - There is quite an agreement on the need for obtaining the biomass in a sustainable and responsible way to maintain the surrounding mountains and forest healthy and well conserved. However, there were no specific ideas on how to perform this sustainable sourcing of fuels, and the establishment of a forest management plan was proposed. There was also a gap on which pre-treatments does the biomass needs prior to being fed to the boilers. The success cases and the BECoop pilot cases (specifically the Spanish ones) approaches were presented, to exemplify how these actions are currently being performed in similar situations.

- About economics and the business plan - How to articulate and govern the community, finance it, or obtain public funding is always an interesting topic to be discussed. Most participants demonstrated a general understanding of the funding acquisition process and the actions that a newly established BEC could undertake. However, detailed knowledge on the specific steps and suitable actions remained limited among the participants.

Conclusions: From a general perspective, it is always quite difficult to ignite the debate in this type of events. People are usually interested and there are always a few participants that are very active, but the rest remain in a passive attitude. In this case, presenting other local successful initiatives, with which the participants could feel identified and referred to, helped greatly to promote their interest and participation. Thus, a very interesting debate took place and the participants asked and answered each other during the workshop and breaks.

2nd training workshop

The 2nd training workshop engaged the following stakeholders from the local pilot area in Spain: local residents from municipality of Sakana, local authorities, municipalities, local action groups, development agencies, RESCoops, ESCO, research centres, general public, representatives from BECoop: Goiener and CIRCE.

The main focal points of the workshop's agenda were as follows:

- Introduction: At the start of the sessions, a brief introduction of the leading experts took place.
- BECoop: a short presentation of the BECoop project and its strategy were presented.
- Bioenergy Cooperative Development: Then, the organization presented themselves, the institutions they represented (Goiener and CIRCE) and the BECoop project objectives.
- BECoop Tools: The participants were introduced to an overview of the supporting tools available through BECoop webpage.
- Technical Support: Exploration of the technical and environmental concepts of bioenergy, its potential for deployment in both the Basque Autonomous Community and Navarre, the support tools identified/developed, and how energy communities can include this type of solution in their range of services, beyond purely electrical self-consumption. The energy concepts were supported by real examples. In the last section of the workshop the legal aspects and the business models (that could be applied) were described/proposed.

During the workshop, participants' skills, barriers, perceptions, and knowledge gaps were identified to gain insights into their readiness for bioenergy heating projects.

Positive aspects and skills identified among the participants included:

- Representation of stakeholders with convening power - Some of the participants of the workshop were local public representatives of small villages and councils. This means that they can have quite an important role in transmitting to potential new/unconvinced members the advances in bioenergy community projects and the benefits they can obtain by creating an energy community.
- Information dissemination - The local agencies that came to the event were quite well-known in the area. Their talks to the local people about the benefits of establishing energy communities built the trust amongst the listeners. In general, it would be a good idea to replicate these training sessions in different areas and valleys of the Basque Country and

Navarra, as it was observed that people were quite aligned with the concept and philosophy of the project.

- Previous knowledge about energy communities - Some of the participants were already part of an existing energy community, so they had previous knowledge about the sector, which was enriching for the discussion and to communication with other participants. Their presence proved the good approach and the reality of such energy cooperation.

List of main perceptions:

- Collaborative attitude – Stakeholders have shown a positive attitude for work on new energy communities; people who participate in this workshop have shown a teamwork spirit on the green technologies. The presenters have presented a successful cases which can be re-scale and implement in new localizations.
- Determination for change the current situation in which big companies are producing energy from fossil fuels and to take a action in which new stakeholders are producing green energy from distributed energy system - Part of the philosophy of the bioenergy communities is to stop depending on large companies that do not care for the customer or the environment, only for economic benefits. This is also the main reason why people were interested in stopping depending on them and star being energy self-sufficient.
- Local resources of biomass should be use within the respect to the surrounding environment- the local allotments have been a traditional way to obtain biomass and wood from local forests in previous generations. However, people nowadays are not taking advantage of them, generally. Two directions for sustainable development: economic approach: energy saving, plus generation of new local works; and from an environmental way, the sustainable management of forest will bring benefits on the health on the local population.

List of identified barriers:

- Lack of a motivation of local authorities to better and more effective use of the potential of local biomass like straw.
- Lack of technical knowledge and awareness of negative sights of using some kind of biomass like straw for example (high chlorine content) by local municipalities.
- Lack of the uniformity in the local system for collection and processing different types and forms of biomass wastes to heat.
- The procedures related to the energy cooperative registration are very complicated and time-consuming that requires the participation and support of the dedicated experts in this field.
- BECoop supporting tools are only in English (it causes significant problems in their utilisation by non-English speakers).

List of main knowledge gaps:

- Technical knowledge gaps - There was quite a gap on technical issues of the use of alternative fuels such as, for instance, straw. In general, the technical part was quite useful for the participants to obtain some knowledge about these fuels.
- Community creation process - One of the most relevant parts of the training session was focused on communicating the ways a community can be created and structured. This was a main issue because most of the participants in the sessions didn't have the knowledge about this step of the process, so it was a successful approach.

- About biomass plant operation - Some specific technical knowledge gaps that were identified were associated with the operation of biomass boilers and district heating systems. Specifically, the main issues that have already been pre-identified on successful cases regarding the fuel feeding and handling system, the maintenance issues, or the generated ash disposal.
- Forest management and the biomass pre-treatment - There is quite an agreement on the need for obtaining the biomass in a sustainable and responsible way to maintain the surrounding mountains and forest healthy and well conserved. However, there were no specific ideas on how to perform this sustainable sourcing of fuels, and the establishment of a forest management plan was proposed. There was also a gap on which pre-treatments does the biomass needs prior to being fed to the boilers. The success cases and the BECoop pilot cases (specifically the Spanish one) approaches were presented, to exemplify how these actions are currently being performed in similar situations.
- About economics and the business plan - How to articulate and govern the community, finance it, or obtain public funding is always an interesting topic to be discussed. Most participants demonstrated a general understanding of the funding acquisition process and the actions that a newly established BEC could undertake. However, detailed knowledge on the specific steps and suitable actions remained limited among the participants.

Conclusions: From a general perspective, it is always quite difficult to ignite the debate in this type of events. People are usually interested and there are always a few participants that are very active, but the rest remain in a passive attitude. In this case, presenting other local successful initiatives, with which the participants could feel identified and referred to, helped greatly to promote their interest and participation. Thus, a very interesting debate took place, and the participants raised many questions. The technical experts explained all the doubts and recommended the visit of the BECoop resources (webpage).

3. BECoop Training Webinars

3.1 Communication actions - Webinars' promotion

In order to reach a wide range of stakeholders, both locally and internationally, and enhance the project's impact in terms of knowledge dissemination related to the establishment of energy cooperatives based on biomass resources and capacity building in rural communities, various activities were undertaken to promote information through webinars organized by BECoop project partners. The primary communication channels used to promote these webinars among national and international stakeholders included:

- BECoop social media accounts,
- BECoop official website,
- BECoop representatives business networks,
- BECoop representatives' scientific networks,
- BECoop stakeholders' networks,
- BECoop partners institutions websites,
- BECoop newsletter email alert,
- BECoop representatives during the participation in other events (i.e. sister projects kick of meetings), workshops (i .e. BioTrainValue project Horizon Europe),
- BECoop representatives during the participation in scientific international conferences and exhibitions,
- BECoop representatives during the participation in scientific national conferences,
- BECoop representatives during the participation in meetings with local authorities and policy makers,
- BECoop representatives during participation in business meetings,
- Direct personal and telephone contacts with selected stakeholders.

Topic	Time
INTRODUCTION Nina Louvrou - White Research	9:00 - 9:05 AM
STAKEHOLDER ENGAGEMENT INSIGHTS Amalia Giannakopoulou - CBS	9:05 - 9:15 AM
COMMUNITY BIOENERGY DISTRICT HEATING TO KICKSTART SUSTAINABLE HEATING IN EUROPE'S CITY CENTERS Karel Derveaux - Ecopower	9:15 - 9:35 AM
COOPERATIVES IN SOUTH TYROL, ITALY Hanspeter Fuchs - SEV	9:35 - 9:45 AM
Q&A SESSION AND WRAP-UP	9:45 - 10:00 AM

Figure 1. Communication visuals for broadcasting the BECoop webinars

3.2 Selection of the Webinars' topic

Ten webinars aimed to share knowledge with stakeholders outside the Local Pilot Areas, and to attract an international audience of RESCoops and other authorities. These webinars were designed with a focus on addressing the specific needs of local communities, drawing insights from the outcomes of Task 1.3, Task 1.4, and additional desk research. As a result, the following topics of the webinars were defined:

- Webinar 1: General information on biomass,
- Webinar 2: Biomass Combustion - Everything you need to know,
- Webinar 3: Symbiosis and Synergies for RESCoops,
- Webinar 4: Bioenergy communities in action - The BECoop tools,
- Webinar 5: DH all you ever wanted to know,
- Webinar 6: Biogas Plants: operation and design for renewable energy communities,

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- Webinar 7: Business and financing aspects of RESCoops,
- Webinar 8: Solid biofuel production & circular economy,
- Webinar 9: Future legal frameworks related to RESCOOPs,
- Webinar 10: Community and Stakeholder engagement in developing a Bioenergy project.

The materials for the webinars were elaborated by the experts (including experts outside the BECoop consortium).



BECoop presents - Business and financing aspects of RESCoops

Feel free to post questions to the presenter in our [forum](#)



BECoop presents: bioenergy communities - solid biofuel production and circular economy

Feel free to post questions to the presenter in our [forum](#)



BECoop presents: Future legal frameworks related to RESCOOPs



BECoop presents: Community and Stakeholder engagement in developing a Bioenergy project

Figure 2. Screenshot from the list of webinars found online at the Knowledge Repository, KEP

All webinars (Figure 2) were performed online, and the materials were made available on the BECoop website and KEP at <https://becoop-kep.eu/knowledge-repository/>

Table 5. Webinars organised within BECoop project

Training Webinars			
Title of the Webinar	Responsible Partner	Date of the event	Number of Participants
Webinar 1: General information on biomass	WUELS	04.11.2022	58
Webinar 2: Biomass Combustion - Everything you need to know	WUELS	09.12.2022	17
Webinar 3: Symbiosis and Synergies for RESCoops	SEV	26.01.2022	21
Webinar 4: Bioenergy communities in action - The BECoop tools	CIRCE	08.02.2023	47
Webinar 5: DH all you ever wanted to know	FIPER	13.03.2023	118
Webinar 6: Biogas Plants: operation and design for renewable energy communities	WUELS	26.03.2023	28
Webinar 7: Business and financing aspects of RESCoops	Q-PLAN	05.04.2023	43
Webinar 8: Solid biofuel production & circular economy	CIRCE	26.04.2023	32
Webinar 9: Future legal frameworks related to RESCOOPs	IEECP	10.05.2023	29
Webinar 10: BECoop presents: community and stakeholder engagement in developing a bioenergy project	WR	31.05.2023	39

3.2.1 Webinar 1: General information on biomass

Rationale behind topic selection

The selection of this topic for Webinar 1 was driven by the importance of providing a fundamental understanding of biomass and its role in energy communities. By focusing on biomass, the webinar aimed to provide participants with essential knowledge to better comprehend its significance and opportunities in energy cooperatives.

The knowledge gained from the Webinar 1 covered the following aspects:

- Information about definitions of energy communities and RED Directives;
- Broad knowledge about biomass as a biofuels – their availability on Earth and potential of use in the near future;

- Information on how to properly store biomass and about the most economical and effective types of biomass valorisation;
- Barriers for using biomass as a substitution biofuel against fossil fuels like coal;
- New knowledge about the economic factors of using biomass as a biofuel from logistic point of view: storage and transport.

Stakeholders engaged: The following stakeholders participated in the Webinar 1: project Partners, researchers (established researchers, professors), PhD students, Master students, Bachelor students, farmers, biomass producers, individual stakeholders, in particular potential end users of biomass (households, schools, multi-family buildings, housing cooperatives, public institutions), engineers, energy advisors on rural areas, energy consultants.

Webinar focal points

The introduction presented the BECoop project objectives in terms of 4 pilot areas investigated in Poland, Spain, Italy and Greece. Next, the webinar addressed the RED II Directive, Renewable Energy Community, definition of energy communities, Polish law relating to energy communities (as an example), statistical information on worldwide renewable heat production from biomass, bioenergy history, climate change, classification of biomass, potential of biomass as a renewable energy source, structure of typical woody biomass, factors influencing the biomass energy community creation, benefits from local biomass utilization. Further, the Oborniki Śląskie commune (as an example of the Polish pilot case) where the activities to create bioenergy cooperative are taken place. The issues of using biomass for heat production, technologies (e.g. machines, type of apparatus and technologies for heat and electricity production in small and medium scale), case studies and the corresponding current situation on heating systems for small and medium applications (pros and cons), techno-economical evaluation of specific cases in Poland, Spain, Greece and Italy, biomass logistic chains, new domestic bioindustry, biorefineries, types of biomass boilers, and biomass heating methods (direct, indirect).

3.2.1 Webinar 2: Biomass combustion - everything you need to know

Rationale behind topic selection

Combustion of biomass differs from thermal utilisation of gas, heavy and light oil, and even coal. Therefore, to avoid the potential problems related to the biomass burning (fouling, slagging, corrosion, thermal power etc.) it is crucial to understand the process of biomass combustion. Especially, that the combustion techniques and units must be adjusted to the biomass form, type and physical-chemical composition and properties. The knowledge in this field facilitates the decision making in design of the complete heating system basing on biomass.

The knowledge gained from the Webinar 2 covered the following aspects:

- Broad knowledge about biomass as a biofuel – biomass combustion techniques;
- Info about proper combustion of different types of biomass depending on their properties and form;
- Exploitation and service of the biomass boilers;
- Knowledge on benefits coming from different types of biomass valorisation techniques: mostly drying (storage), combustion: direct and indirect, gasification;

- New knowledge about the economic factors of using combustion biomass as a biofuel from logistic point of view: storage and transport.

Stakeholders engaged: The following stakeholders participated in the Webinar 2: project Partners, researchers (established researchers, professors), PhD students, Master students, Bachelor students, RESCoops, authorities, farmers, biomass producers, individual stakeholders, in particular potential end-users of biomass (households, schools, multi-family buildings, housing cooperatives, public institutions), scientists, engineers, energy advisors on rural areas, energy consultants.

Webinar focal points

The introduction of Webinar 2 presented the BECoop project objectives and short description of the 4 pilot areas located in Poland, Greece, Italy and Spain. The webinar covered the following topics: RED II Directive, Renewable Energy Community, definition of energy communities, Polish law on energy communities, biomass combustion/gasification systems in local bioenergy cooperatives (direct and indirect solutions), construction, exploitation and operation issues of different biomass boilers (small and middle thermal capacity), environmental issues related to solid biomass combustion/gasification in heating units, success cases – best local practices, in particular district heating (Polygeneration Unit in Złoczew – łódzkie voivodship centre of Poland, Biomass boiler in the Hotel Barceló Bobadilla, Loja Grenade Biomass Gasification Plant INERCO Aoiz (Navarra), Biomass District Heating - Greece DETEPA).

3.2.2 Webinar 3: Symbiosis and synergies for RESCoops

Rationale behind topic selection

The selection of this topic for Webinar 3 was driven by the importance of providing a fundamental understanding of what kind of benefits for society and mostly for the local people comes from using biomass for heat generation. Moreover, as there is high pressure to reduce the utilization of fossil fuels for energy purposes, the alternative solutions using renewable energy sources started to play an important role, especially in rural areas that are characterized by high local potential. By focusing on energy poverty, energy independence, crisis of the energy market the webinar aimed to provide participants with essential knowledge to better comprehend its significance and opportunities using local biomass resources for heat generation and it's benefits for local society. Finally, the presentation of the synergy between local energy potential and the local energy needs seems to be crucial to convince the local stakeholders to common activity in the field of BECoop/RESCoop. Finally, it is a part of the capacity building in the region.

The knowledge gained from the Webinar 3 covered the following aspects:

- New knowledge on the importance of multi-utility energy and biomass cooperatives in terms of social, financial and ecological benefits (best practices in the region of South Tyrol, located in Northern Italy: possibilities, challenges and benefits).
- Information on the collective self-consumption as defined by the Renewable Energy Directive being explained vs. the concept of energy community.
- The aspect of energy poverty and how collective energy initiatives (its benefits) can help is being discussed upon from different point of views.

Stakeholders engaged: The following stakeholders participated in the Webinar 3: project Partners, researchers (established researchers, professors), PhD students, Master students, Bachelor students, RESCoops, authorities, farmers, biomass producers, individual stakeholders, in particular potential end-users of biomass (households, schools, multi-family buildings, housing cooperatives, public institutions), scientist, engineers, energy advisors on rural areas, energy consultants.

Webinar focal points

The webinar highlighted the importance of multi utility energy and biomass cooperatives in terms of social, financial, and ecological benefits. By showing the best practices in the region of South Tyrol, located in Northern Italy, participants, and later viewers gained a better grasp on the possibilities, challenges, and benefits.

During the webinar, the concept of collective self-consumption (as defined by the Renewable Energy Directive) was presented and the differences with the concept of energy community were explained. The aspect of energy poverty and how collective energy initiatives can help was discussed upon from different point of views. To underline the social aspect and the benefits of such initiatives two different case studies were presented. During the Webinar participants received an insight into best practice examples around Europe and an overview of different concepts of bioenergy communities.

3.2.3 Webinar 4: Bioenergy communities in action - the BECoop tools

Rationale behind topic selection

The selection of this topic for Webinar 4 was driven by the importance of providing a new skill on how to use tools developed along the BECoop project: self-assessment tool, Toolkit, e-Market platform, Knowledge Exchange Platform, Network of Interest. By focusing on BECoop tools the webinar helped stakeholders on identifying their needs and mapping the potential in their local area for establishing new BECoop initiatives. Moreover, the tools can be used also as a source of wide range of information including technical data and solutions, energy potential maps, list of contacts with other stakeholders or a place for open discussion and share of experiences.

The knowledge gained from the Webinar 4 covered the following aspects:

- The main goal of the webinar was to present the tools developed along the BECoop project, namely, Self-assessment tool, Toolkit, eMarket platform, Knowledge Exchange Platform, Network of interest.
- The tools were presented in their original version, as they are uploaded to the project webpage, to explain their use and attract more people to their utilisation.

Stakeholders engaged: The following stakeholders participated in the Webinar 4: project Partners, researchers (established researchers, professors), PhD students, Master students, Bachelor students, RESCoops, authorities, energy consultants.

Webinar focal points

The main objective of the webinar was to present the tools developed along the BECoop project, namely, Self-assessment tool, toolkit, e-Market platform, knowledge exchange platform, network of interest.

The tools were presented in their original version, as they are uploaded to the project webpage, to explain their use and attract more people to their utilization.

During the webinar, these tools were presented in their original form, exactly as they are accessible on the project's webpage. This approach was chosen to provide attendees with a firsthand experience of their functionalities and benefits. By showcasing the tools as such, the intention was to not only elucidate their utility but also to pique the interest of a wider audience, encouraging greater participation and engagement.

3.2.4 Webinar 5: DH all you ever wanted to know

Rationale behind topic selection

The selection of this topic for Webinar 5 was driven by the importance of providing a fundamental understanding of biomass district heating. The development of the district heating in rural areas is not as obvious as in urban areas due to dispersion of users and high investment costs. At the same time, in the case of combustion of solid fuels (including biomass), it is important to present the positive effects of the operation of district heating networks, including, for example, reduced emissions of pollutants into the atmosphere, higher fuel combustion efficiency or lack of end-user service. By focusing on district heating the stakeholders had the opportunity to learn from the Italian experience in the field of biomass district heating (DH) from a technical and a non-technical point of view.

The knowledge gained from the Webinar 5 covered the following aspects:

- The webinar aimed at providing information both on the BECoop activities and the main features of biomass district heating;
- Participants from different countries had the opportunity to learn from the Italian experience from existing biomass district heating (DH) from a technological perspective and from a non-technical point of view.

Stakeholders engaged: The following stakeholders participated in the Webinar 5: architecture master scholars were present physically. EU stakeholders online: project Partners, researchers (established researchers, professors), PhD students, Master students, Bachelor students, RESCoops, authorities, farmers, biomass producers, individual stakeholders, in particular potential end-users of biomass (households, schools, multi-family buildings, housing cooperatives, public institutions), scientist, engineers, energy advisors on rural areas, energy consultants.

Webinar focal points

The webinar had the objective of providing information both on the BECoop activities and the main features of biomass district heating. Participants from different countries had the opportunity to learn from the Italian experience in the field of biomass DH both from a technical and non-technical point of view. The main topic of the webinar was the presentation of the Italian experience about biomass DH, technical and non-technical features and to describe the Italian pilot of the BECoop project. According to the target audience and the time available, the presentation provided sufficient details to provide a general overview about the development of biomass DH and references to deepen the topic have been provided.

3.2.5 Webinar 6: Biogas plants: operation and design for renewable energy communities

Rationale behind topic selection

Biogas plants belong to the heat and electricity generation units that are highly recommended only in rural areas, as their operation and feedstock required is very specific. Moreover, the localisation of biogas plant and its capacity must be planned with care to ensure feasibility of the investment and to cover local needs. Finally, for many existing energy communities in rural areas, the biogas plant is considered as a main energy unit. As a result, the share of the knowledge in this field is very important to avoid unfortunate decisions during such type of the bioenergy cooperative planning.

The knowledge gained from the Webinar 6 covered the following aspects:

- Information about biogas composition,
- Knowledge about biogas purification methods to increase amount of methane in biogas,
- Theoretical and practical knowledge on the heat and electricity production in CHP units working together with biogas plant,
- Exploitation and service of biogas biorefinery,
- Knowledge on benefits coming from biogas production,
- New knowledge about designing, constructing and purchasing a small compact biogas unit.

Stakeholders engaged: The following stakeholders participated in the Webinar 6: project Partners, researchers (established researchers, professors), PhD students, Master students, Bachelor students, RESCoops, authorities, farmers, biomass producers, individual stakeholders, in particular potential end-users of biomass (households, schools, multi-family buildings, housing cooperatives, public institutions), scientist, students, engineers, energy advisors on rural areas, energy consultants.

Webinar focal points

This Webinar covered two main modules: the first module was devoted to the training on biogas composition, bio-methane production and fermentation process itself, the biomass resources and their potential estimation for local biogas plants, biogas plants – localization and substrates logistic (transport and storage), biogas plants – implementation for RESCoop, biogas solid residues (BSR) – main operation problem?, biogas plants – CHP unit the most electrical energy production?, biogas plants – agro biomass or manure? pros and cons, good practices and examples. The second module was conducted by Mr. Stephan Hinterberger from Muller Abfalprojekt with focus on: biogas plant – its design, construction, operation, exploitation with focus on the main exploitation problems which are occurring with substrates, CHP installation or with biogas reactor.

3.2.6 Webinar 7: Business and financing aspects of RESCoops

Rationale behind topic selection

The webinar 7 contributes to the development of business skills that are required for the creation, establishment, operation and development of an energy community. These issues are crucial as the economic aspects (profitability, ROI, CAPEX, OPEX) and knowledge about the business planning (strategy of action and founding acquisition) strongly influence on the decision making. In fact, the creation of the bioenergy cooperative must be followed by these processes.

The knowledge gained from the Webinar 7 covered the following aspects:

- Information about business and financial aspects of RESCoops,
- Knowledge about CANVAS models,
- Theoretical and practical knowledge on techno-economical assessment of biomass plant as investment,
- Exploitation and service of biomass plants,
- Knowledge on benefits coming from biomass plants.

Stakeholders engaged: The following stakeholders participated in the Webinar 7: project Partners, researchers (established researchers, professors), PhD students, Master students, Bachelor students, RESCoops, authorities, farmers, biomass producers, individual stakeholders, in particular potential

end-users of biomass (households, schools, multi-family buildings, housing cooperatives, public institutions), scientist, students, engineers, energy advisors on rural areas, energy consultants.

Webinar focal points

Within the webinar the two business support sessions were presented. During the first session, the methodology that the BECoop partners followed was presented in order to conclude on the most crucial aspects that formed the business catalogue of BECoop. After the methodology, 4 particular (and exemplary) business models were presented. Later, the audience had the opportunity to see the specific business model canvas that was created for the BECoop project, which is the main tool for structuring the business of our RESCoops and the model that guides their projects' implementation.

In the second session it was shown how to conduct a successful investment planning along with its importance on the decision-making process. In the beginning, the critical parameters and the methodology was presented. Later on, the participants became familiar with the process of the cost benefit analysis which included the breakdown of CAPEX, OPEX and the revenues with the energy savings. The results of the particular investment planning for our Greek pilot case were demonstrated as a case study with a quite profitable concept and a feasible plan for the local community.

The last session was about the available financial opportunities that a RESCoop can utilize to kick-start its activities. There is a lot of potential funding but the selection of the most suitable one might be the most crucial element for the development of energy communities. Various opportunities that so far have been issued as the most typical resources for RESCoops with their description and applicability were presented. In the end, dedicated slides on how to address funding and investors was also presented as the conclusions of this session.

3.2.7 Webinar 8: Solid biofuel production & circular economy

Rationale behind topic selection

The webinar 8 contributes to the development of new knowledge on the different equipment for biomass valorisation, cost assessment, certification schemes for produced solid biofuels, success cases of solid biofuel producers and development of an energy community based on solid biofuel production. In particular webinar 8 can help the stakeholders as well as the final users understand the role of circular bioeconomy, its relation to biofuel production process and correlation with local society that want to use regional resources (i.e. forestry or agricultural biomass) in sustainable way.

The knowledge gained from the Webinar 8 covered the following aspects:

- Type of solid biofuels (e.g. chips, pellets, briquettes),
- Using of equipment/ infrastructure needed for biomass valorisation,
- Knowledge on costs assessment for solid biofuel production,
- New knowledge on certification schemes for produced solid biofuels,
- Success cases of solid biofuel producers,
- Knowledge on circular economy: information how biomass production for biofuels is closing the circle.

Stakeholders engaged: The following stakeholders participated in the Webinar 8: project Partners, researchers (established researchers, professors), PhD students, Master students, Bachelor students,

RESCoops, authorities, farmers, biomass producers, individual stakeholders, in particular potential end-users of biomass (households, schools, multi-family buildings, housing cooperatives, public institutions), scientist, engineers, energy advisors on rural areas, energy consultants.

Webinar focal points

Presentations were made about the various types of solid biofuel and their main properties, the importance of certificated schemes and how it is important to expand the production of biofuels, about the exploitation of biomass waste streams and finally was about successful examples that already exists in Greece, two companies KLIMIS and AGRIGAS that process and standardize the residual biomass and produce products.

After the end of the presentations a discussion was made and questions were raised regarding the challenges that the success cases faced in promoting the use of solid biofuels in Greece and how they were addressed, as well as, about the impact to the local community and finally about the future of the solid biofuel industry both in Greece and in Europe.

3.2.8 Webinar 9: Future legal frameworks related to RESCOOPs

Rationale behind topic selection

The webinar 9 covered the topics such as what renewable energy communities are, how to change local legislation to allow bioenergy to become more profitable and attractive in relation to fossil fuels, how to implement new infrastructure bioenergy projects faster, and what kinds of challenges are encountered by those who wish to promote these types of organisations/initiatives. Furthermore, the presentation of the practical steps needed to establish energy communities and the knowledge/experience sharing of the existing energy communities is very important for the potential followers. The positive attitude that the legal and formal regulations can be met might be a key to succeed in the capacity building and further activity in this area.

The knowledge gained from the Webinar 9 covered the following aspects:

- Address “What are RESCoops?”,
- How to change local legislations to make bioenergy more profitable and attractive to fossil fuels,
- How to faster implement new infrastructure bioenergy projects,
- Actual legislations on RESCoops and bioenergy.
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The webinar covered topics such as what renewable energy communities are, how to change local legislation to allow bioenergy to become more profitable and attractive in relation to fossil fuels, how to implement new infrastructure bioenergy projects faster, and what kinds of challenges are encountered by those who wish to promote these types of organisations. Practical steps needed to establish energy communities were presented.

The seminar commenced with a live poll where participants were asked about the sectors they belonged to and their motivation to join the webinar. We also asked which further improvements in EU policy legislation they would like to see, and what they think are the main challenges in establishing bioenergy communities in their context. Aside from the poll, there were 15 presentation slides in total, covering issues such as the legal framework for energy communities in the European Union, institutional and policy factors relevant to energy communities, legal forms of energy communities,

bioenergy communities in the European Union and within the BECoop pilots, as well as future legal challenges and policy measures.

Stakeholders engaged: The following stakeholders participated in the Webinar 9: Project Partners, Researchers (Established Researchers, Professors), PhD Students, Master Students, Bachelor Students, RESCoops, Authorities, Farmers, Biomass producers, Individual stakeholders, in particular potential end-users of biomass (households, schools, multi-family buildings, housing cooperatives, public institutions), Scientist, students, Engineers, Energy advisors on rural areas, Energy consultants.

Webinar focal points

The participants represented a range of sectors, and their main motivation, as per the poll at the start of the webinar, was to learn about the legal framework to support energy communities. There were also some who were interested in practical steps to implement bioenergy communities in their area. As such, the seminar provided a comprehensive knowledge base on the legal dimensions of energy communities across Europe. The webinar also provided clear guidelines and instructions on how to address the present challenges in the policy arena.

Following the presentations, there was a rich discussion on the connections between energy communities and socio-economic and policy developments across Europe. Participants shared their experience in establishing energy communities in their area, and the lack of adequate legal and policy support that they experience. Questions and points raised by participants included how to improve the financial backing and subsidies that are available. There was also a discussion around how the legal framework protects energy community members from assuming financial risk. The video containing the presentations and discussions is now publicly available on YouTube and functions as a go-to touchpoint for anyone interested in these issues.

3.2.9 Webinar 10: Community and stakeholder engagement in developing a bioenergy project

Rationale behind topic selection

Understanding the multifaceted aspects of community and stakeholder involvement in bioenergy projects is one of the pillars of capacity building among all stakeholders. Therefore, during this webinar key observations on the involvement of individual stakeholders and highlighting their key roles in supporting the development of clean, fair and democratic renewable energy initiatives have been presented. To achieve this goal, it is essential to share knowledge on how to stimulate activity, promote teamwork, cultivate a strong public identity for RESCoop, create feedback channels and support open communication mechanisms.

The knowledge gained from the Webinar 10 covered the following aspects:

- Stakeholder engagement insights,
- Identification of stakeholders,
- Engagement and stakeholders' mobilisation action,
- Community bioenergy district heating to kickstart sustainable heating in Europe's city centres
- Cooperatives in South Tyrol: Specific case studies, such as those from South Tyrol, were presented to showcase successful examples of cooperatives in action. Participants learned from these real-world cases and gained insights into the practical implementation of community-driven bioenergy projects.

Stakeholders engaged: The following stakeholders participated in the Webinar 10: project Partners, researchers (established researchers, professors), PhD students, Master students, Bachelor students, citizens, existing RESCoops, local authorities/municipalities, farmers, biomass producers, community engagement experts.

Webinar focal points

The webinar delved into the multifaceted aspects of community and stakeholder engagement in bioenergy projects. Commencing with insights shared by CBS, the session provided key observations on stakeholder engagement and underscored its pivotal role in fostering the development of clean, equitable, and democratic renewable energy initiatives. The presentation covered the various types of stakeholders and elucidated the stages of stakeholder engagement, with a particular emphasis on the distinct contributions each stakeholder group can make during the project's initiation or expansion. Drawing from BECoop's expertise, the session offered valuable mobilisation and outreach techniques that can be tailored to different project scenarios based on their unique characteristics. In the first part of the presentation the importance of sustaining high levels of engagement through a range of methodologies, including promoting teamwork, cultivating a strong public identity for the RESCoop, establishing channels for feedback exchange, and fostering open communication mechanisms was underscored.

Subsequently, the session featured Karel Derveaux from Ecopower cv, who shared his experience in developing a community bioenergy district heating (DH) system in Flanders. The presentation emphasized that the greater the number of buildings connected to a DH network, the higher the overall energy efficiency, allowing the network to serve an increasing number of buildings. Karel highlighted the critical importance of locally harnessing wood resources for heating purposes, rather than transporting them across countries for electricity production. Stakeholder engagement, creating awareness, fostering acceptance, building trust, and cultivating goodwill among building owners and citizens at large were identified as crucial elements for the success of the DH project and collective renovation efforts.

Hanspeter Fuchs then presented insights from South Tyrol, Italy, focusing on the establishment of a cooperative district heating plant between two neighbouring communities, Dobbiaco and San Candido. The collaboration between the two regions bolstered the cooperative's strength and significantly improved the economic efficiency of the district heating plant. This example effectively conveyed the message of RESCoops and highlighted the substantial positive impact that partnerships among neighbouring communities can have.

4 Discussion and Conclusions

4.1 Summary of Workshops at Local Level

Due to the different legal status and the level of degree of knowledge about energy cooperatives both on the part of the local community and local authorities, the workshops conducted in selected countries (Poland, Greece, Italy, Spain) were characterized by an individual approach to the issue and the way they were implemented. As a result, building the potential to create an energy cooperative based on biomass fuel was based on various heat generation strategies. Various methods of delivering biomass-derived heat to end-users (potential cooperative members) were presented. Importantly, these workshops not only facilitated knowledge transfer but also sparked extensive discussions within the local communities (e.g., Poland, Spain) and initiated lasting collaborations with local authorities and other stakeholders interested in furthering the utilization of local biomass for heating purposes (e.g., Greece or Italy). Irrespective of the ultimate outcomes, these workshops yielded numerous insights, with the most significant ones being:

- **Financial Hurdles:** In the development of bioenergy cooperatives, the main practical hurdle isn't critical technical issues, but rather financial constraints—securing project funding remains a challenge.
- **Bridge Building:** The workshops played a pivotal role in capacity building and in establishing connections between potential investors and RESCoops.
- **Importance of Practical Examples:** Presenting practical examples, particularly successful case studies, is vital to foster a positive mindset among newcomers and ultimately boost the number of new RESCoops.
- **Lighthouses:** Incorporating "success stories" and sharing practical experiences during workshops, especially challenges faced during RESCoop establishment and their solutions, offers valuable economic insights.
- **Comparative Profitability:** Analysing the financial viability of bioenergy projects in comparison to alternative heat sources, considering local environmental impacts, aids potential members in decision-making.
- **Economic Climate Influence:** Some residents were hesitant to participate due to unfavourable economic factors like inflation, high fuel prices, and raw material availability issues.
- **Long-Term and Legal Barriers:** The lengthy process of RESCoop creation, coupled with legal complexities, presents a significant hurdle to engaging potential members.
- **Government Support Impact:** Government financial support targeting coal users in some cases (e.g., Poland) led to doubts about the validity of new environmentally friendly solutions.
- **Positive Environmental and Social Effects:** Despite challenges, many stakeholders recognized the positive environmental and social impacts resulting from bioenergy use.
- **Usage of Support Programs:** A challenge lies in the lack of familiarity among individuals, particularly from rural areas, with programs supporting certain activities—often utilized by professional companies.
- **Language Barrier:** The language barrier, especially among residents with rural and agricultural backgrounds, presents a challenge in utilizing supporting tools. Offering tools in native languages could significantly enhance their practical use.

- **Enhanced Technical Knowledge:** The workshops substantially enriched stakeholders' technical knowledge, both theoretical and practical, encompassing aspects like biomass harvesting, transport, logistics, storage, valorisation, and combustion/gasification for heat production.
- **Complex Administration and Legislation:** In certain pilot cases (Poland, Greece), establishing bioenergy communities faces fundamental challenges due to intricate administrative and legislative processes affecting various interest groups.
- **Social Trust as Foundation:** The cornerstone of initiating activities and capacity building for local energy cooperatives lies in the social trust between stakeholders and local authorities.

The completed workshops have undoubtedly generated a positive impact within the communities. Each action aimed to shift the local community's approach to heat generation away from fossil fuels like coal, gas, and oil. It also encouraged discussions about the localized use of biomass and collaborative energy generation, contributing significantly to ecological awareness and knowledge in this field. Additionally, the potential for end-users (residents) to participate in collective efforts to address energy poverty and reduce energy costs ensures that ongoing discussions will continue in the future. This holds true even for those who may not currently be inclined to embrace these concepts.

4.2 Summary of BECoop Webinars

The 10 conducted webinars mostly increased knowledge in the area of: biomass as a fuel, biomass boiler types and working principle, heating networks, financial perspectives for biomass plants, operation of biogas plants, of the participants we could learn a lot about social aspects of establishing a bioenergy community. There were numerous valuable discussions between experts and stakeholders, which consistently added value to each webinar. For instance, a notable question arose: "Why not utilize more biological waste techniques, such as anaerobic digestion for biogas production, followed by combined heat and power generation in a biorefinery plant? Why opt for direct combustion of agro-residue biomass?" This question underscores the importance of carefully selecting the appropriate conversion technique (fermentation, pyrolysis, or combustion) based on the specific type of biomass. At the beginning of each webinar, there was an introduction to the BECoop project objectives and an overview of four pilot areas. Regarding the webinar's core structure and content, the material comprehensively covered the agenda in principle.

Each webinar was led by an expert in the respective field. Sometimes, the webinars provided extensive theoretical knowledge, delving into aspects like biomass combustion techniques, pyrolysis, and fermentation. Other times, with practitioner experts at the helm, the audience gained practical insights.

In conclusion, the webinars substantially enriched stakeholders' theoretical and practical knowledge in the domain of bioenergy, RESCoops, the economic and social dimensions of utilizing biomass for heating, and biogas production.

The conducted webinars have brought several notable benefits:

- **Knowledge Transfer and Exchange:** These webinars have facilitated the exchange of knowledge among academics, stakeholders, and experienced engineers in the field of bioenergy production.
- **Technical Problem Solving:** Engaging discussion sessions held at the end of the webinars have successfully addressed complex technical challenges.

- **Experience Sharing:** Stakeholders have gained insights into bioenergy plant services and maintenance, facilitated by experienced professionals such as biogas plant designers who served as trainers during the webinars.
- **Innovative Ideas:** Fresh multidisciplinary concepts concerning the design of polygeneration systems for combined heat and electricity generation have been presented, offering alternative solutions to standardized heating units.
- **Case Study Knowledge Sharing:** Successful case studies have been shared, particularly highlighting legislative and economic aspects, which can significantly expedite the process of establishing new RESCoops within diverse local contexts.
- **Networking Opportunities:** By fostering connections between webinar trainers and stakeholders, the potential for future small business meetings has increased, thereby enhancing the prospects of establishing new RESCoops.
- **Enhanced Learning for Young Academics:** Young academics have notably enriched their knowledge by gaining practical insights from experts engaged in the design and operation of biomass plants. This gained practical knowledge is expected to generate increased interest in establishing RESCoops in the upcoming future. This, in consequence, will initiate endeavours with a more advanced knowledge foundation.

4.3 Identified challenges and future steps to improve capacity building

Based on the performed technical workshops at local level and realised webinars with wide international audience, the following challenges were identified in terms of the capacity building focused on the bioenergy cooperative creation:

- **Engaging Rural Inhabitants:** Increasing interest and participation among rural inhabitants, especially in low-density regions and post-communist countries, to establish energy cooperatives.
- **Lack of Role Models:** Limited availability of successful examples of energy cooperatives with comparable structures and technical approaches within specific countries or regions, making it challenging to gather valuable experiences.
- **Environmental Awareness Gap:** Insufficient environmental awareness among rural inhabitants, particularly in countries where coal remains the dominant heating fuel.
- **Expertise Requirements:** The establishment of energy cooperatives demands individuals with legal and technical expertise, skills that most potential cooperative members lack. This often involves initial financial investments.
- **Simplifying Establishment:** Finding ways to streamline the process of forming energy cooperatives to encourage greater participation, as complex procedures can discourage involvement.
- **Technical Knowledge Gap:** Insufficient technical knowledge among potential investors, particularly those interested in advanced technologies like steam boilers with advanced instrumentation, polygeneration units combining biomass boilers with PV farms, heat storage systems, and heat pumps.
- **Biogas Plant Interest:** Not enough interest in biogas plants due to a lack of understanding about proper service and operation, especially in multi-feedstock units.

- **Financial Support Awareness:** Inadequate awareness of financial support programs directly aimed at establishing new RESCoops.
- **Preference for "Blue" Fuels:** Local authorities' preference for investing in "blue" fuels such as gas over more intricate biomass-based technologies like multifuel biogas or biomethanization plants, which require more complex biogas cleaning methods.
- **Lack of Knowledge on Advanced Technologies:** Limited information available on advanced technologies beyond typical biomass boiler systems, including small-scale pyrolysis units, gasification units, and in-situ biomass torrefaction systems.
- **Need for Collaborative Solutions:** Insufficient national programs involving politicians, local authorities, farmers, and biomass experts to collaboratively develop solutions tailored to the heat demand requirements of rural areas.

To increase the interest of the local society to common activity and to facilitate the process of the bioenergy community establishment, it is recommended:

- **Building Trust and Cooperation:** Strengthening mutual trust and cooperation between residents and local authorities concerning energy cooperative strategies.
- **Overcoming Language Barriers:** Breaking down language barriers among stakeholders to provide access to professional knowledge and tools essential for energy cooperative creation.
- **Financial Support Access:** Providing direct funding support for energy cooperatives during both preparatory and execution phases.
- **Sharing Best Practices:** Increasing access to exemplary energy cooperative models and success stories.
- **Balancing Contributions:** Balancing the rights of cooperative members with varying financial contributions to ensure equity.
- **Rural Heating Networks:** Developing heating networks within widely dispersed rural energy cooperative member systems.
- **Harmonising Regulations:** Standardizing energy cooperative establishment and operational regulations across EU Member States.
- **Promoting Horizon Europe Projects:** Expanding Horizon Europe projects related to new RESCoop establishment to inform stakeholders about the benefits of local bioenergy communities. This includes facilitating discussions through 'round table' sessions with potential investors.
- **Localised Communication:** Enhancing stakeholder communication by providing a wealth of resources, including materials, webinars, training sessions, conferences, books, and handbooks in local languages.
- **Tailored Initiatives for Farmers:** Designing specific projects or calls dedicated to farmers, a significant biomass source for heating. This aims to increase the number of new RESCoops in rural areas.
- **Showcasing Local Successes:** Presenting successful local initiatives to resonate with participants and stakeholders, fostering interest and participation.
- **Academic Involvement:** Incorporating the concept of energy cooperatives into academic curricula, encouraging students, PhD candidates, and educators to become potential stakeholders in future RESCoop initiatives.
- **Economic Influence:** Capitalizing on the current and anticipated trends in the electrical and energy markets, where rising prices incentivize new RESCoop establishment.

- **Local Technical Workshops:** Organizing more localized technical workshops to enhance practical biomass utilization skills and stimulate the initiation of new energy community projects within the region.
- **Structuring Community Creation:** Prioritising training sessions during workshops to effectively communicate methods for creating and structuring energy communities, a crucial step often overlooked by participants.
- **Engaging Stakeholders Proactively:** Preceding new projects with meetings involving potential stakeholders, identifying evolving needs stemming from dynamic energy market changes.

References

- [1] BECoop H2020 Project (952930) D2.1 Self-assessment tool for evaluating current regional status and future potential – First 82021).
- [2] Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products.