UNLOCKING THE COMMUNITY BIOENERGY POTENTIAL

D2.1 Self-assessment tool for evaluating current regional status and future potential – First

OCTOBER 2021

www.becoop-project.eu

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

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

Document information

Document Factsheet	
Full title	D2.1: Self-assessment tool for evaluating current regional status and future potential – First
Work Package	WP2
Task(s)	T.2.1
Author Organisation	Sebastián Zapata (CIRCE), Maider Gómez (CIRCE)
Reviewers	Michael-Alexandros Kougioumtzis (CERTH), Kostas Dasopoulos (Q-PLAN), Antonia Kalimeri (WR), Dimitrios Chapizanis (WR)
Date	October 2021

Document dissemination Level

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

Document history

Version	Date	Main modification	Entity
V0.1	05/10/2021	Draft version distributed for quality review	CIRCE
V0.2	19/10/2021	Internal Quality review	CERTH, Q-PLAN
V0.3	20/10/2021	Review by the project coordinator	WR
V1.0	25/10/2021	Final version submitted to the EC	WR

Legal Notice

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

Table of Contents

List of Figures

List of Tables

Abbreviations

CHP	Combined heat and power
DH	District Heating
ESCO	Energy Service Company
EU	European Union
GHG	Greenhouse gas emissions
RED	Renewable Energy Directive

Executive Summary

The aim of this deliverable is to demonstrate and further explain how the BECoop self-assessment tool can be used, as well as the type of information the targeted users can obtain, and how this information can help them to assess the status and be in a better position to establish the path towards a successful implementation of a community bioenergy heating project.

In order to achieve this goal, the deliverable is organised as follows:

- Firstly, an introduction chapter is presented, justifying the usefulness of the BECoop self-assessment tool.
- Secondly, the tool is briefly described, seeking to summarize the input data required, the nature of output delivered, how tool outputs can be exploited by users etc. The main goal is to provide a clear picture of the information that the user may obtain and how this can be further used to achieve a successful implementation of a bioenergy heating initiative.
- Thirdly, the methodology applied to develop the tool is being described.
- The following chapter displays an example of using the tool regarding the assessment of installing and operating a district heating unit which is fed with agriculture biomass. This example aims to help potential tool-users better understand the type of information and nature of results that the tool delivers.
- Then, the BECoop self-assessment tool guideline is briefly presented, addressing potential users and indicating all the steps to be carried out, as well as the different options to choose from while using the tool.
- The deliverable ends with a conclusion chapter including a summary of the main aspects of the tool and the next steps, regarding the tool development and enhancement, to be followed within the upcoming months.

Additionally, an annex has been incorporated in the document including all information (questions, possible answers, recommendations, links and ratings) for a certain activity (District Heating-DH) and a certain type of resource (agricultural biomass).

This deliverable contains the self-assessment methodology exercise while a beta version has been already developed and will be available online by November 2021 (https://www.becoop-project.eu/tools/assessment-tool/) to be continuously optimised over 2022, based on the feedback received from different users' typology.

The detailed **self-assessment methodology**, that is all questions together with possible answers and recommendations, is presented in a dedicated document (**Supplementary Data**) which accompanies D2.1. At the same time, an assessment exercise example can be found in Annex 1.

1 Introduction

In the coming years energy communities are expected to have a huge potential in Europe since, in the article 22 of the new RED II[1], the EU considers the energy communities as key actor to achieve the main goals established seeking to drive the transition from fossil based energy to renewable energies (ensuring that 32 % of Europe's energy supply come from RES by 2030). Additionally, the EU climate goals set for a neutral Europe by 2050 reinforce the importance of promoting the use of renewable resources as for instance the biomass.

Currently, energy communities are very focused on the production and/or distribution of electricity based on renewable energy sources, such as solar or wind energy. Nevertheless, *bio*energy communities are not equally popular or widespread, although the bioenergy concept is strongly linked to the energy community philosophy, since biomass should be consumed in the nearby areas contributing to the local development (creation of employment, solution to agricultural disposal waste problems, empowering of the local economy, exploitation of local energy potentials, etc.).

Current bioenergy initiatives are mainly focused on heating and cooling applications. At this moment, renewable energy accounts for 22.1 % of total energy use for heating and cooling in the EU-27[2], which means that 77.9 % comes from fossil fuels resources. For this reason, the promotion of new renewable sources, such as biomass and the wider uptake of the bioenergy community concept can greatly contribute to achieve the goals of the EU and facilitate the penetration of bioenergy in the residential, industrial and transportation sector.

As indicated, the development of suitable bioenergy initiatives implies that they are manufactured and consumed in the local area. This fact is closely linked with the energy community concept, however the lack of knowledge about *how to implement bioenergy initiatives* is a barrier in some cases. On this basis, **the self-assessment tool for bioenergy communities has been developed aiming to allow to carry out a preliminary diagnose of the initiative that the stakeholder wants to promote and provide hints on the future steps required.**

In order to cover the maximum of possibilities, five group of resources have been addressed (agricultural, forestry, agro-industrial, biomass from urban parks and gardens and wet biomass) as well as 14 different activities that the energy community can promote. These activities have been grouped in five different categories taking into account that the focus is mostly on the domestic sector and small heating applications and considering that the most relevant aspects when promoting energy communities include the generation of energy, distribution, consumption and sharing. As such, activities considered are clustered in the following groups: logistic supply; biomass processing; electricity and heat production; distribution; and consumption.

The deliverable presents a description of the BECoop self-assessment tool, the employed methodology for its implementation, a guideline for potential users, as well as an example of a self-assessment exercise, so as to adequately explain the nature of outputs that the tool delivers.

[1] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2001&from=fr
[2] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Renewable_energy_statistics#Over_one_fifth_of_energy_used_for_heating_and_cooling_from_renewable_sources

2 Tool brief overview

The BECoop self-assessment tool is designed for non-specialised, inexperienced users seeking to assess the current state of a cooperative/community bioenergy project. The tool consists of self-evaluation forms that allow to assess an initiative's status and identify the process, technical solution and business model that needs to be followed for initiating and taking part to a community bionergy heating project. The questions asked will act as roadmap, helping the user to check if the most relevant aspects or considerations have been taken into account. The different answers provided will suggest the steps needed to achieve a successful implementation of a new business model, as well as links (when applicable) to current tools and reports that may be useful to get beyond that stage. Such outputs offer a clear picture of a user's project status, highlighting the strengths and weaknesses and providing a series of recommendations for further developing the initiative. Questions are grouped into different question-categories, each of which are associated with a rating indicator. Internally, a BECoop experts panel has been assigned to the development of each set of questions - respective answers and corresponding rating scheme. Outcomes are also depicted in a graphic way by means of a spider-net. Tool's outputs can also be downloaded.

Firstly, and after reading the description of the self-assessment tool, the user can start by selecting **the biomass resource type**. Five biomass resources have been identified: R1. Agricultural resources; R2. Forestry resources; R3. Agro-industrial resources; R4. Biomass from urban parks and gardens and R5. Wet biomass (Figure 1). Among them, 3 have been addressed in the first version of the current deliverable (labelled with a green circle - R1, R2 and R3, as showcased in Figure 1). After clicking in the resource type, a set of 5 questions (with multiple-option styled answers), relevant to the chosen resource type, will appear. Each time, the user will need to select the answer that best applies to her/his case. Recommended actions will then appear, according to the selected answer, and a score will be assigned, depending on the option chosen.

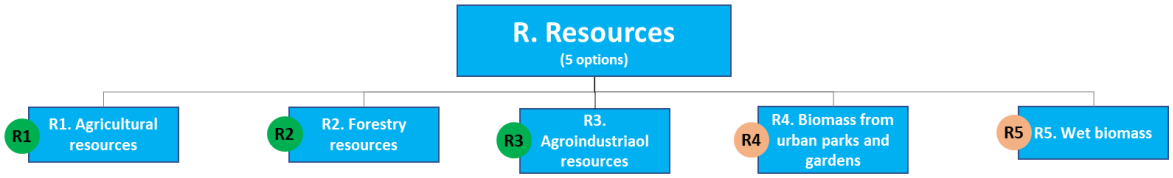

Figure 1. Biomass resources considered in the self-assessment tool.

Secondly, the user should select the **activity to be implemented**. 14 different activity options are reflected in the self-assessment tool, as showcased in Figure 2, out of which 8 are already incorporated in the tool within the first year of the project (labelled with a green numbered circle in Figure 2).

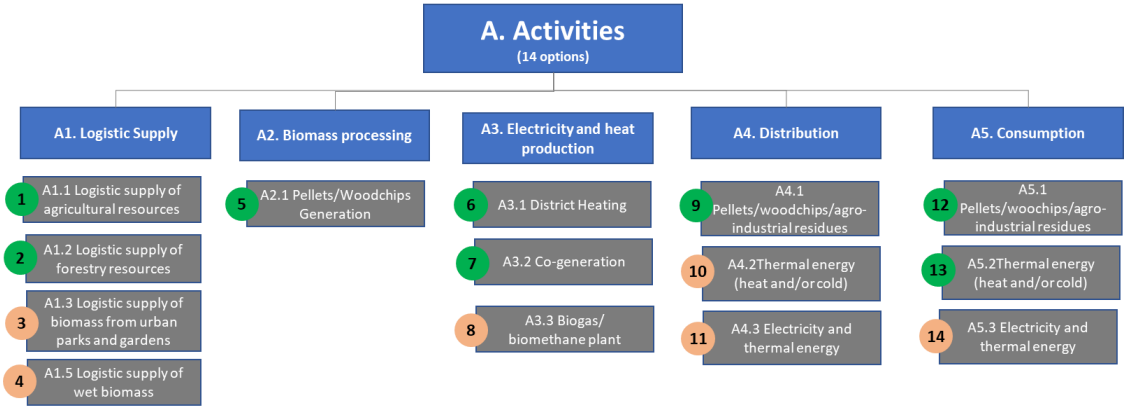

Figure 2. Activities that are considered in the self-assessment tool.

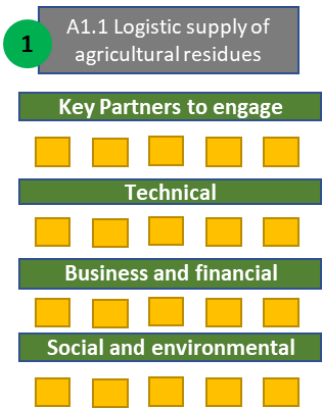

Figure 3. Different types of aspects examined

After clicking on each activity, a brief description/explanation of each chosen option will be displayed. **4 different types of aspects are then examined for each activity,** namely: *key partners, key technical aspects, key business and financial aspect, and key social* and *environmental aspects* (see Figure 3). In this context, each type of examined aspect entails a series of 3-5 multiple-choice type questions. Once again, based on chosen answers, a numeric score is being formed accompanied by a series of recommended actions.

Tool Indicators: based on the sequence of all questions posed, a **set of indicators** is defined, for each questions-category, as follows.

- **Knowledge regarding the resource** → based on the questions related to the resource type.
- **User engagement**→ based on the key partner questions.
- **Technical solution maturity** → related to the key technical activity's questions.
- **Business solution maturity** → based on the key business and financial questions.
- **Social and environmental impact** → according to the answers provided to the key social and environmental activities questions.

By considering the average rate scored - depending on user-specific answers - per indicator, we are further empowered to visualize the tool's outputs by means of a spider net (see Figure 4). A detailed analysis of user-specific ratings, scored in all major question categories is also provided (Figure 7).

According to answers chosen, project-generated recommendations are displayed and, when applicable, links to the BECoop toolkit and/or external links are provided that could be helpful for potential users to carry out the development of the initiative.

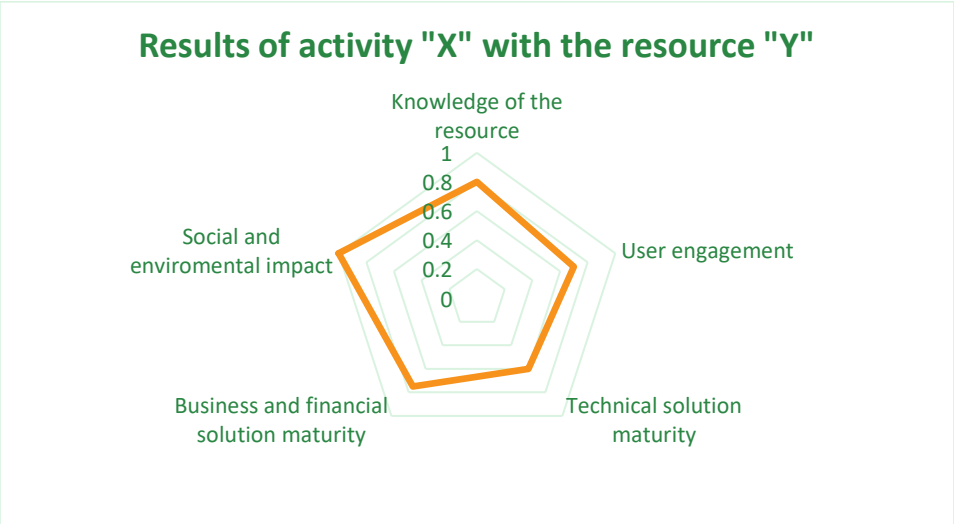

Figure 4: User-specific self-assessment outputs visualised as a spider-net diagram

3 The self-assessment methodology

This section provides all details of the self-assessment exercise. Carrying out and assessing the current status of a bioenergy community initiative, without interacting with each responsible stakeholder, is a huge challenge that is addressed by the tool. Providing such a tool to stakeholders, allows them to perform an assessment themselves, therefore reducing their dependence to consultancy services but also save time and resources (it is expected that the tool can help to save 20 % of the time required by non-specialised users in the decision-making process). Although the assessment will not be detailed, it provides clear guidance on the steps that need to be accomplished to achieve a successful implementation. This tool is, therefore, conceived as a diagnostic means which allows the stakeholders of a new bioenergy cooperative/community to assess the current position/status of their initiative.

3.1 Core structure

Note: *BECoop is a project oriented towards the market uptake of bioenergy communities in mainly the residential sector and small heating applications, so the bioenergy cases addressed in the self-assessment tool were selected taking into account this consideration.*

At the initial stage, a template for an internal, consortium brainstorming (*Annex II*) was circulated and BECoop partners identified potential users and cases where the self-assessment tool could be relevant. Some theoretical examples were pointed out together with discussions over the main concept of the service to promote. This internal analysis together with the experience of all the partners helped to then identify the most relevant types of resources and activities to be considered and relevant investigative questions to be formed. For each question a set of potential answers and a corresponding rating score were developed and assigned.

Thus, the employed methodology intends to carry out the self-assessment through **a series of multiple choice questions. Users are called to select the options that best fit to their current situation and state of their potential bioenergy community initiative.** Since the target audience of the tool is non-specialised users, the questions and answers have been written in an understandable language. Furthermore, when needed, additional comments are incorporated to facilitate the understanding of each question. To complement the self-assessment process, the user will also receive recommendations and links (if applicable) that are included in each given answer. Moreover, the tool outputs include a spider net visualisation where an initiative's status is assessed based on the rating score that corresponds to the user-chosen answers.

The tool's core elements, including a thorough presentation of core question-categories and methodological details of the self-assessment exercise are presented in detail below.

3.1.1 Selections of resources to use

*Note: This questions-category is associated to the "**Knowledge regarding the resource**" tool indicator*

Users should first have at least some basic knowledge around the resources to be used. Focusing on biomass, this aspect is quite relevant due to the heterogeneity of the different available resources. Biomass resources, used as an energy source, can be broadly grouped into different groups as forestry, agricultural, agro-industrial, wet biomass, biomass collected from urban parks and gardens in the municipality and other waste from industries. In the case of BECoop, the resources selected are

classified in five main groups (Figure 1). Questions here address aspects such as i) availability, ii) when raw materials are released to the market, iii) current use and iv) possible needs and challenges that must be tackled

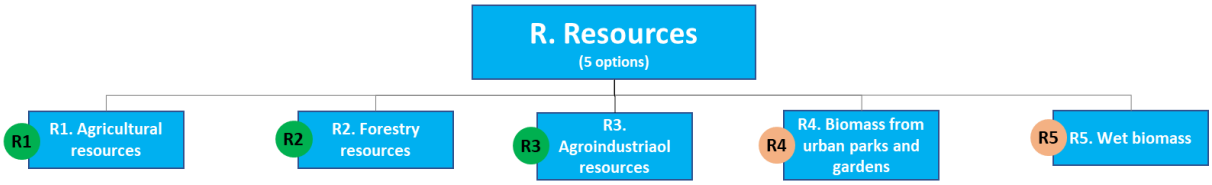

Figure 1. - cited from report's chapter 2 – Tool Brief Overview

Agricultural resources

As agricultural resources, we consider the biomass produced after carrying out the pruning and plantation removal operation to maintain the productivity of the agricultural crops. In most cases, such agricultural residues (e.g. pruning) remain unexploited and are either burned in open fires or mulched on soil. Five main subgroups can be differentiated here:

- **Vineyard pruning:** each year pruning operations should be performed to maintain the productivity of the vineyards.
- **Olive pruning:** once annually or biennially pruning operations should be carried out to maintain the productivity of the olive trees.
- **Fruit pruning**: each year pruning operations should be done to maintain the productivity of the fruit trees, also graft pruning are frequently being done in a certain period of time.
- **Plantation removal** of the above-mentioned agricultural crops should be performed when the tree productivity decreases.
- **Herbaceous material** as wheat straw or corn stalk, these type of biomass is in general harvested each year and before starting preparation operations for the new crop cycle straw or corn stover needs to be removed from the field.

Forestry resources

Forestry resources include the biomass that is coming from the forest considering a sustainable management, which contributes to prevent fire hazards or to maintain/increase the productivity of the forest in the future. It is the most frequently used biomass in the domestic sector from which two main subgroups can be differentiated here:

- **Shaft biomass:** generally used for woody applications, even though if sustainable practices and cascading use principles allow it, it can also be used for energy purposes.
- **Branch and stem biomass (forestry residues):** generally, this is the main part that is destined for biomass in order to respect the sustainable cascading use.

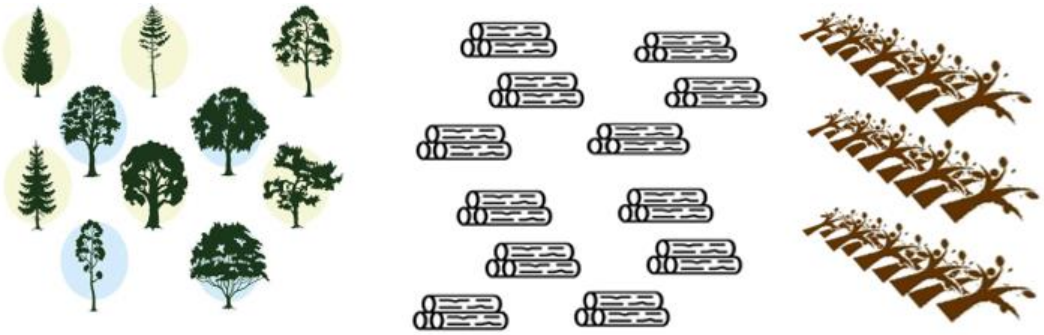

Figure 5. Shaft biomass (centre picture) and branch and steam biomass (right picture).

Agro-industrial resources

Agro-industrial resources involve the biomass generated after processing the main agricultural crops in an agro-industry and cooperatives. Currently, stakeholders involved in such missions use this resource for power or heat generation demanded in their process and/or sell it to final consumer or distribution operators. There are different types of agro-industrial resources, including:

- **Olive pits and exhausted olive cakes**: both are produced in olive agro-industry/cooperative (olive mills or pomace mills). For the residential sector the mainly used agro-industrial biomass is olive pits.
- **Almond shell**: are produced in fruit agro-industry/cooperative. It is a very popular fuel, since the ratio quality/price is very competitive.
- **Sunflower husk**: is obtained in the sunflower oil industry and is a low-quality fuel destined for industrial applications. Generally, it has a very competitive price compared to other solid biofuels, therefore it is consumed by medium-large size installations.

Biomass from urban parks and gardens

Biomass collected from urban parks and gardens in the municipality includes the biomass that is obtained after cleaning/maintenance operations of parks, roads, highways, etc. The biomass obtained from the trees cleaning operation in the municipality can be classified mainly as forestry biomass, but since the fuel characteristics and the harvesting operations are significantly different, an additional section has been added to address this resource.

Remark: This part will be implemented in the tool during the second year of the project, October 2022.

Wet biomass

Wet biomass consists of organic matter from wastewater and sewage sludge, organic fraction of municipal solid waste (MSW), slurries of the livestock, etc. The use of these biomasses is on the rise, and it is expected to be growing in the following years.

Remark: This part will be implemented in the tool during the second year of the project, October 2022.

3.1.2 Selection of activities to implement

After choosing resources, the user will have to select an activity from a total of 14 options to implement. In line with what has been indicated in the case of the resources category, there is a large variety of activities that can be carried out to promote community initiatives in the bioenergy sector. Taking into account that the focus is on the residential sector and small heating applications; and considering that the most relevant aspect when promoting energy communities is the generation of energy, distribution, consumption and sharing, the following distribution activities have been proposed in the tool.

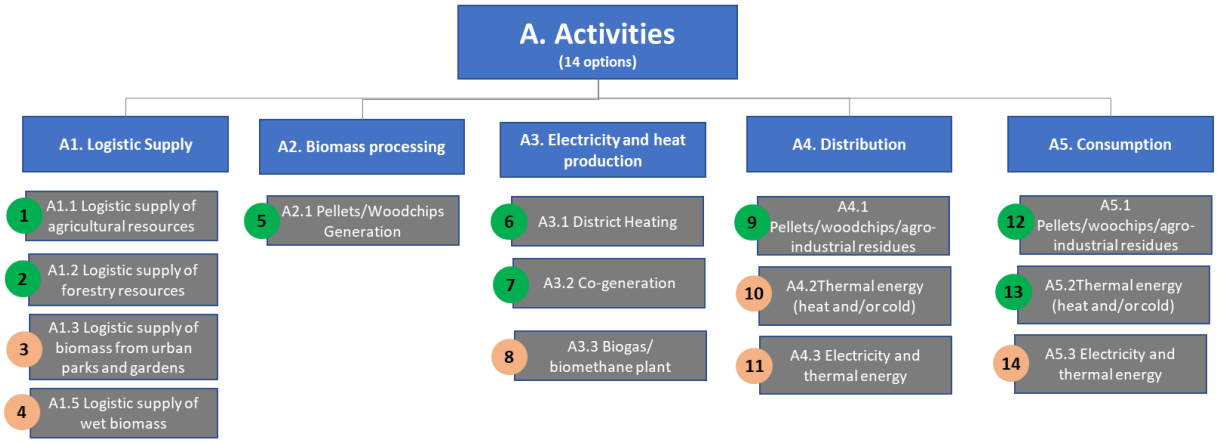

Figure 2. - cited from report's chapter 2 – Tool Brief Overview

Logistic supply

Logistic operation is a critical activity. When the valorisation of the biomass is targeted, it can represent more than the 50 % of the price of the final product. Furthermore, it can also affect the quality of the biomass. For instance, the existence of exogenous material (sand, rock, metal, etc.) should be avoided when these operations are carried out.

The user who is interested in this activity will be in charge of the harvesting of biomass from different types of crops, the biomass haulage and the selling to an intermediate manufacturer or final consumer. Additionally, the user could also oversee intermediate operations such as storage or even some pre-treatments as sieving or size distribution process.

In general, the core activities in this case involve four activities, each of them associated with a specific resource harvested/collected, since these operations will differ according to the type of biomass collected. Even within the same group of resources there are different options for the harvesting. However, the selection of the most efficient and suitable alternative will depend on a case-by-case analysis.

The breakdown of logistic operations for agro-industrial resources are not included in the tool, as in this case the logistic will mainly involve the distribution and not how the biomass is collected, due to the fact that the biomass is produced in the agro-industry/cooperative.

As a result, the four activities that can be found in this group of activities in the self-assessment tool are:

- Logistic supply of agricultural resource
- Logistic supply of forestry resource

- Logistic supply of biomass from parks and garden
- Logistic supply of wet biomass

Some examples of potential initiatives that would relate to these activities (linked with the two activities already implemented in the tool) are:

- Municipalities (or industries) willing to exploit the local biomass from agricultural resources or public/ private forests towards bioenergy production, while creating employment in the area and avoiding open fires, in the case of agricultural biomass, or sustainably maintaining the forest, in case of forestry biomass.
- Biomass trade centres (biomass yards) to sell agricultural residues or forestry residues directly (in chip/shredded/ bale form) to end-users for covering their energy demands.
- Agro-industrial industries/cooperatives wanting to use their by-products to facilitate the future operations of their associates and diversify their business line.
- Wood process industries processing the forest resources into wood products (e.g. particleboards, MDF).

Biomass processing

The size distribution and the moisture content (together with other fuel characteristics) are very relevant parameters that should be taken into account when promoting a biomass valorisation initiative. In the domestic sector, the clients usually purchase pellets/briquettes, whereas shredded material (and woodchips) is mostly used in small heating applications (> 50 kW).

This activity focuses on users aiming to create a biomass manufacturing centre in order to process the biomass already collected (the self-assessment for the collection of the biomass is addressed in the activity regarding the logistic supply). This activity's aim is to produce a higher quality solid biofuel such as pellet/briquettes/woodchips and sell it to a third person who can be a distribution company or an end user.

Some examples of this kind of initiatives are:

- RESCoop or energy communities willing to create a biomass logistic centre to process biomass and sell it to their associates.
- Agro-industrial cooperatives/agro-industries willing to create and adapt their current installations to a biomass logistic centre to process biomass and sell it to biomass suppliers or final consumers (it could be their associates or others).
- Local industries can join with famers (for instance) and use the waste/biomass to produce biofuels and sell it to biomass suppliers or final consumers.
- Pellet plants producing pellets (or briquettes) from agricultural/forest residues to cover the energy demands of public buildings and industries.
- Vineyard, fruits, olive, etc. farmers can join the energy cooperative in order to create a biomass logistic centre that would be located in the surrounding area where the biomass can be gathered after pruning and being processed (woodchips, briquettes, pellets, …) and sold to the biomass suppliers or final consumers.

Electricity and heat production

This group of activities apply to the case in which the user wants to start an industrial installation to produce heat and/or electricity.

The production of heat and electricity from biomass, could be accomplished by means of thermochemical and biological process. By taking into account the BECoop concept, three main activities have been identified as the most relevant for the bioenergy communities and therefore addressed in the self-assessment tool:

- **District heating:** District heating is a system seeking to produce, and afterwards, distribute heat generated in a centralized location, mainly focused on residential sector and therefore avoiding the need of installing individual boilers by the end users. This system is becoming very popular, and the operation through an energy community is expected to increase in the coming years.

Some examples regarding this type of initiative are:

- RESCoop/ energy community that is trying to evaluate the feasibility to establish a district heating production unit to supply some of their associates.
- Neighbourhood that currently has a district heating unit that works with gas or other fossil fuel, trying to assess the investment required to switch to an equipment working with a renewable source, more specifically biomass.
- Municipalities (small villages) considering covering their thermal energy demands by means of renewable energy resource through district heating.
- A group of industrial companies inside the same industrial park (or the surrounding area) willing to create a community in order to produce heat for covering their thermal energy demands, and for sharing the excess heat with nearby buildings.

- **Small co-generation:** Combined Heat and Power (CHP) plants generate two different types of energy, in general electricity and heat. Different technologies are suitable to valorise biomass that can be implemented in CHP plants such as combustion, gasification, anaerobic digestion, etc. This type of installation is very popular for large power plants, even though it is expected to increase in the coming years for intermediate and small power plants.

Some examples of this type of initiatives are:

- RESCoop/energy community, considering the feasibility to establish a heating and power production plant to supply some of their associates.
- RESCoop/energy community, currently producing electricity willing to produce also heat to cover all the energy demands of their associates.
- Municipalities (small villages) considering alternatives to cover their energy demands by means of renewable energy (electricity and heating).
- Cooperatives dealing with forest and/or agricultural residues (vineyard and/or olive pruning, straw, etc.) that invest in a local small CHP (for cogeneration) in order to cover their energy demands.

- **Biogas/biomethane plant:** Biomass resources (dry and wet biomass) are being valorised in some cases through biogas plant. Currently, the feasibility of the upgrading of this gas to produce biomethane is being explored since it can be transported through the natural gas pipelines and

commercialized just like the natural gas with renewable origin certificate. This case will be also implemented in the self-assessment tool, but it will not be available until October 2022.

Distribution

This group of activities apply to the case in which the user intends to carry out the distribution of three main activities: solid biofuels, thermal energy, and electricity and thermal energy together.

- **Distribution of solid biofuels:** The user interested in this activity will oversee the purchase of biomass and its selling to their associates/clients. Intermediate operations such as storage or even some pre-treatments as sieving or size distribution could be included in the activities.

An example related to this type of initiative is:

- RESCoop / energy community acting as an intermediate actor in charge of biofuels supply (as pellets, woodchips, briquettes, …), storage and distribution to their associates.

- **Distribution of thermal energy:** The user will oversee the purchase of thermal energy and its selling to their associates/clients. This case will be also implemented in the self-assessment tool, but it will not be available until October 2022.
- **Distribution of electricity and thermal energy:** in this case the potential user will consider purchasing electricity and thermal energy (from different suppliers) and selling them to their associates/clients. This case will be also implemented in the self-assessment tool, but it will not be available until October 2022.

Consumption

In this group of activities the user consumes one or more from the following: solid biofuels, thermal energy or both thermal energy and electricity.

- **Consumption of solid biofuels:** The stakeholder in this case intends to use solid biomass fuels for covering his/her energy demands (mainly heat).

Some examples related to this type of initiative are:

- Neighbourhood/final users considering joining the energy cooperative in order to cover their domestic energy demands.

- **Consumption of thermal energy:** The user interested in this activity will seek to cover the energy demands by consuming the heat and/or cold.

Some examples related to this type of initiative are:

- Neighbourhood considering purchasing bioenergy to cover their energy demands (for instance through a district heating managed by an ESCO)

- **Consumption of electricity and thermal energy:** This type of user consumes electricity and thermal energy to cover its energy demands. This case will be also implemented in the self-assessment tool, but it will not be available until October 2022.

Example on Resources + Activities: An example of a filled template for the resources type "*agricultural resource*" and the activity "*district heating*" can be found in **Annex I.**

3.1.3 Examination of key aspects

Once, an activity is selected, 4 different key aspects will then be displayed for further investigation. Each examined aspect is accompanied by a set of multiple option questions. The under-exploration aspects are introduced below.

Key partners

*Note: This questions-category is associated to the "**User engagement**" tool indicator*

To goal of this questions-category is to assess and provide an overview of all the stakeholders that should/could be engaged or contacted in order to implement a community bioenergy heating initiative. The category includes:

- Between 3-5 questions from which:
  i) 1 question related to the energy community
  ii) 1 question which focuses on the suppliers' identification
  iii) 1 question aiming to retrieve information regarding the final consumer of the product

Key technical aspects

*Note: This questions-category is associated to the "**Technical solution maturity**" tool indicator*

Key technical aspects that the user should consider while developing a community bioenergy heating initiative. The category includes:

- Between 3-5 questions from which:
  i) 1 question related to power of the plant/power heat needed/…
  ii) 1 question related to technology to be implemented
  iii) 1 question retrieves information regarding the technical experience

Key business aspects

*Note: This questions-category is associated to the "**Business solution maturity**" tool indicator*

This questions-category aims to assess and highlight key business and financial aspects that the user should consider while developing an initiative. The category includes:

- Between 3-5 questions from which:
  i) 1 question related to the energy community
  ii) 1 question related to the financial resources
  iii) 1 question retrieves information regarding the knowledge level of the targeted market/s and its potential profitability

Key social and environmental aspects

*Note: This questions-category is associated to the "**Social and environmental impact"** tool indicator*

This questions-category highlights social and environmental aspects that the user should consider while developing an initiative. The category includes:

- Between 3-5 questions from which:
  i) 1 question related to social aspects
  ii) 1 question related to environmental aspects
  iii) 1 question related to the energy community

Important: The detailed **self-assessment methodology**, that is all questions together with possible answers and recommendations, is presented in a dedicated document (**Supplementary Data**) which accompanies D2.1. At the same time, an assessment exercise example can be found in Annex 1.

3.1.4 Recommendations and links

Project's tailored recommendations that are generated and displayed depending on each chosen answer. These suggestions may help tool users to evaluate the current status of their initiative and include hints on capacity building around each topic.

Moreover, aside from targeted recommendations, when applicable, **links will be provided** that could be helpful for potential users to carry out the development of the initiative. The links will allow the user to increase his/her knowledge regarding specific topics. These links will be based on the results that have been/will be obtained during the project's lifetime, for instance public deliverables, but also the BECoop Toolkit, the BECoop Knowledge Exchange Platform and the project's e-market platform. Additionally, a literature review has been carried out to include, when possible, other public references that can contribute to promote the market uptake of these initiatives.

3.1.5 Rating scheme and status visualization

The rating process reflects the state of readiness of the initiative to achieve a successful implementation. Rating scores are assigned at two different levels:

A. Questions associated to each category

Within each category, questions are raised and rated, taking into account that the sum of weights assigned to all questions adds up to 1. Each question is rated (weight) according to its importance within the respective category. Key questions obtain a higher rate while questions that are, although relevant, not essential in first instance are linked to a lower score.

B. Answers provided for each question

Rates (weights) are also assigned to the answers provided for each question. The tools' questions have been formulated in a way so that the user can only select one possible answer each time. As such, rates assigned to all possible answers are varied. The minimum score for an answer is 0.25 and the maximum is 1.0. Best suitable answers, corresponding to well-developed initiatives, ready for market uptake, obtain a higher score, while answers corresponding to the initial stage of an initiative in which, for instance, the engagement with actors involved in the value chain has not started yet, should get a

bottom level score of 0.25. Other answers regarding intermediate situations are rated between 0.3 and 0.8. Although unusual, it could be possible that different answers provided for the same question have the same rate assigned. See example in Figure 6.

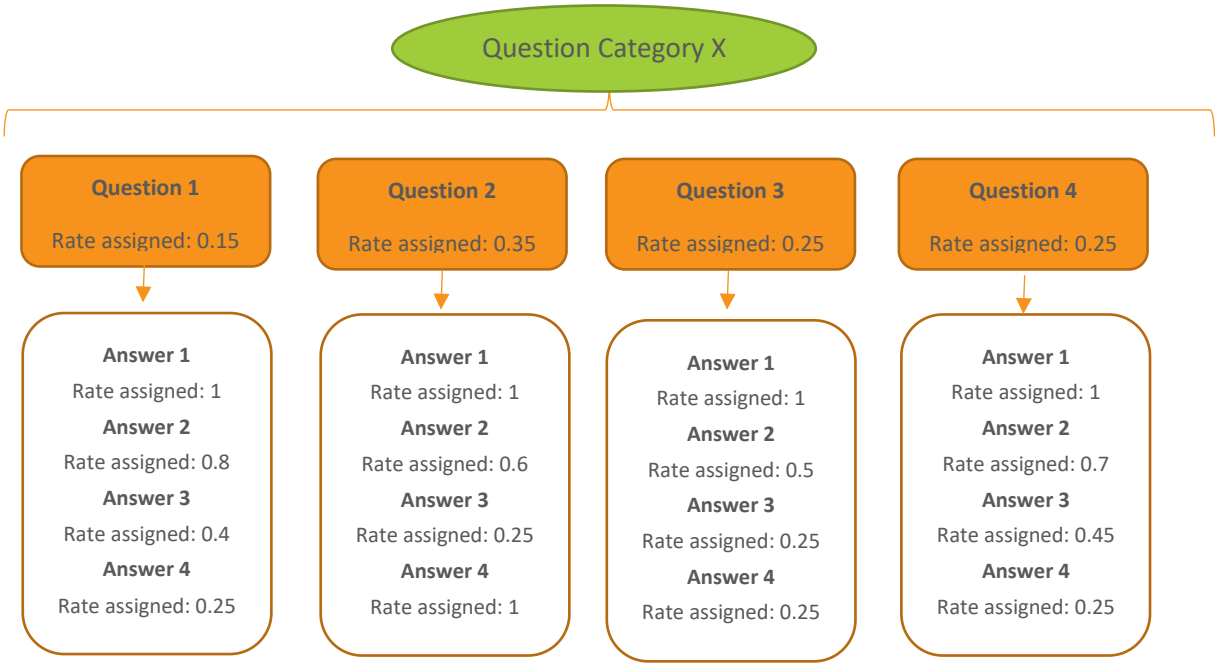

Figure 6. Rating scheme example

Regarding the scoring, it is important to mention that if the user's answers are "he doesn´t know" in most cases, the score obtained will be low. This does not always mean that the initiative cannot be implemented successfully; however, it implies that it is necessary to compile more information and work on the initiative business model planning, etc. and then carry out again the self-assessment, once this information has been gathered and compare how the final score reached has improved.

When all tool questions are answered, total scoring results will be presented in the form of a spider-net, taking into account the average rate obtained for each tool-indicator (*Knowledge regarding the resource; User engagement; Technical solution maturity; Business solution maturity; Social and environmental impact)*.

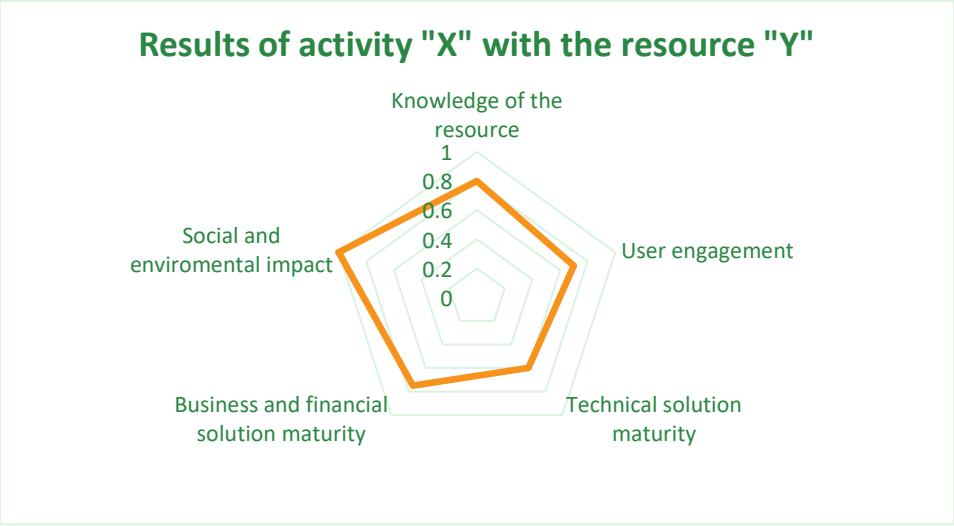

Figure 4. - cited from report's chapter 2 – Tool Brief Overview

A detailed analysis of user-specific ratings, scored in all major question categories is also provided (concept depicted below).

Figure 7: Self-assessment evaluation - Detailed user scoring

It is important to highlight that **the tool provides different recommendations and scores according to the answers selected by the user.** This aspect allows for instance to assess the initiative progress throughout a timeline by carrying out different diagnoses, once the recommendations that were pointed out have been addressed.

4 Tool's output analysis – assessment examples

Explanations are provided in this chapter to help the user better understand the results, the recommendations and links provided by the BECoop self-assessment tool. Towards this aim, an example of the answers selected by a user and the corresponding results reached will be thoroughly discussed herein.

In the examples presented below, a user with an average knowledge of the resource and activity to be undertaken is considered.

In Annex I, an example of a complete case is depicted including the resource (*agricultural biomass*) and one activity (*produce heat in a district heating*) sections, including all the questions, answers, recommendations, additional explanations, and links associated to the case presented.

4.1 Resources assessment

Table 1 shows an example of a self-assessment and the output provided by the tool regarding the resources category. This section depicts the answers that correspond to what a potential tool user chose when posed a series of relevant questions. All questions/answers can be found in the Annex I.

Table 1. Self-assessment exercise example - biomass resources

Resource: Agricultural crops	
1º question	***Do you know the main characteristics of the agricultural biomass that you are interested in?***
Additional comment	Fuel characteristics include moisture content, low heating value, Cl, N and S content, ash content, ash composition, etc. These characteristics will considerably affect the following operations to be carried out.
Answers selected	**Recommendation and link proposed**
B: Yes, I have a preliminary idea	The information gathered regarding the biofuel characteristics will contribute to select the most appropriate valorisation pathway. Be aware that not all the agricultural crops have the same fuel characteristics, for instance the herbaceous biomass normally has higher values of Cl (that could cause higher corrosion occurrence in boilers) than woody agricultural biomass.
	Link: BECoop catalogue of fuel characteristics of different biomasses.
2º question	***In general bases, agricultural resources are seasonal, which means that in a short period of time (1-3 months) they should be collected and stored. Do you know in which period the pruning operations take place for the agricultural crops that you are interested?***

Additional comment	
Answers selected	**Recommendation and link proposed**
B: I don´t know	It is important to know when the pruning operation of each agricultural crops are carried out, especially if you want to oversee the logistic operations, since the biomass needs to be collected in a short period of time, but also this information will allow to position yourself in a good place for the acquisition of these biomasses. The average period where each biomass from agricultural crops is collected will depend on several aspects such as the weather conditions, that can slightly change each year. Generally (although sometimes this operation is performed several times during the year), for instance vineyard pruning are collected between December and February, olive pruning between February and April, fruit pruning and plantation removal are performed between October and January, wheat straw between July and August and corn stalk between October and November.
	Link: N/A
3º question	***Do you know the availability of the agricultural resource in your area?***
Additional comment	In order to know the resource availability, not only the potential of the biomass in the surrounding area (preferably radius lower than 30 km) should be considered but also how much biomasses can be collected by reaching agreements with the farmers/cooperatives, considering difficulties associated to the slope of the field, type of land (irrigated or not), productivity of biomass per ha, etc…
Answers selected	**Recommendation and link proposed**
B: I know the potential surface, but I don´t know the availably of biomass.	If you know the potential surface in your area dedicated to the targeted biomass but you don´t know its availability, in order carry out a preliminary estimation, you can use the tool Bioraise which can be found in the toolkit of BECoop. Additionally, it is highly recommended to get in contact with some owner of the biomass (farmers, cooperatives) and logistic operators in order to assess their current practice. Also, you can check the catalogue of BECoop about fuel characteristic of biomass in which you can see a first estimation of the average productivity that you can obtain per ha for different types of biomasses. Also, you can check the Up_running observatory where several field measurements of the pruning yields were performed in different regions of Europe.
	Link: "BIoraise" in BECoop toolik. BECoop catalogue Fuels characteristics. uP_running Observatory: https://www.up-running-observatory.eu/en/.
4º question	***Are you aware of the current use of the targeted resource?***

Additional comment	In most cases, the owners of the agricultural biomass are the farmers or the cooperatives. In general, they use this resource as organic matter to improve soil conditions, as biomass for energy purposes either for self-consumption or to be sold to consumers or this biomass is seen as a residue in which case they are normally burnt in the field.
Answers selected	**Recommendation and link proposed**
B: The owners of the biomass are not using this resource	If the owners of the biomass are not using this resource, probably this resource is a problem for them and normally they will have to invest time and money in order to get rid of it (as for instance burning on the field). In this case, they will probably welcome this initiative , but with the consideration of collecting the biomass as soon as the pruning operations are carried out.
	Link: N/A
5º question	***Do you know the possible needs and challenges that you will have to face when working with this product vs other biomasses?***
Additional comment	Properties of the biomasses and therefore their behaviour when valorised for different purposes will differ, according to the type of biomass, the land where it is cultivated, logistic operations carried out, pre-treatment process, etc. Thus, before developing an initiative based on this type of biomass it is important to anticipate the possible needs and challenges that you will most likely have to face.
Answers selected	**Recommendation and link proposed**
B: No, I don´t know	The fuels characteristics and the size distribution of agricultural crops are different from forestry biomass (the most frequently used biomass), because of that some people think that it is not a valid biofuel for energy purposes. However, it is a suitable fuel, even though it requires to install the proper combustion technology in order to achieve an efficient operation. You can consult the deliverable 1.4 of BECoop in which some proposed action to tackle the critical needs and challenges are mentioned by each stakeholder.
	Link: Deliverable 1.4 BECoop
Final score of the indicator (from 0 to 1)	Knowledge of the biomass → 0.55

This category intends to assess user-knowledge regarding the chosen resource type, as the broader the knowledge of the resource the higher the guarantee of success. According to the answers provided in this example, the final score obtained is 0.55 (from 0 to 1), which means that the user has an intermediate knowledge regarding the resource. This could be increased by different actions that are recommended by the tool. The above-mentioned answers are analysed:

- First question is based on the knowledge of the fuel characteristics of the resource. This can considerably affect the future activities to be carried out. In this case, the user has indicated that he/she has a preliminary idea of the fuel characteristic, but he/she is not sure about that. In this case and taking into account that there is a huge range of possible agricultural resources with different properties each, it is desirable before proceeding with the initiative implementation to achieve better knowledge concerning the resource. In this sense, a link is provided to the factsheet related to fuel characteristic developed in BECoop aiming to clarify some characteristics aspects.

- Second question is based on the seasonality of the agricultural resource since this biomass should be collected in a short period of time. In this case the user does not know the period in which the biomass is collected, therefore the recommendation provided indicates a range of months when these operations are usually carried out, even though, this range of time can vary according to the weather and crop. Thus, the collection period can change within the same country and from one country to another in the EU.

- Third question is based on the availability of biomass. This aspect is critical in order to successfully carry out a bioenergy initiative. In this case, the user has indicated that he/she doesn´t know the biomass availability in the region or area, but he/she has a preliminary idea of the surface covered by these agricultural resources. For this reason, the tool recommended to take a look at the factsheet of fuel characteristic where productivity of biomass per ha is indicated or to check the "uP_running observatory"[3] where productivity for different agricultural biomass is included. Also, the user can check the potential of biomass through the "Bioraise"[4] tool (SIG tool). In any case, it was also indicated that further conversation with the owners of the biomass (farmers and cooperatives) should take place seeking to assess its willingness to give this biomass to others.

- Fourth question is based on the current use of the biomass. This aspect is important since it will facilitate the negotiation with the biomass owners. In this case, the user has indicated that the biomass owner is not using this resource, in fact sometimes it might intend of getting rid of them, therefore this initiative will be very welcomed.

- Fifth question is based on possible needs and challenges that the user will have to face. In this case the user has indicated that he/she doesn´t know. In this case, the recommendations provided depict some examples of needs and challenges but also a report produced by BECoop project is proposed.

[3] https://www.up-running-observatory.eu/en/
[4] http://bioraise.ciemat.es/Bioraise

4.2 Key partners assessment

Table 2 shows a user-specific tool output generated regarding the key partners category for the District Heating activity.

Table 2. Self-assessment exercise example - biomass resources – key partners category

Category: Key partners	Activity: District Heating
1º question	***Do you know if there are any biomass suppliers for heating purposes in your region?***
Additional comment	Biomass distributors may provide forestry, agricultural and waste biomass from the region. The biomass provider can be a farmer as well as a biomass logistic distributing company.
Answers selected	**Recommendation and link proposed**
A. Yes, I know.	You can contact a biomass distributor to find out detailed information (e.g. how much biomass is available (tonnes per year)?, what kind of biomass it is (forestry, agricultural or waste)? In which format is the biomass (raw biomass, pellets, wood chips, briquettes, logs) supplied? What are the physicochemical properties of the material?). You need to know if the company is able to provide the amount and quality of biomass you need. Link: N/A
2º question	***Do you know if there is a heat demand close to your DH?***
Additional comment	You need to keep in mind that heat cannot be distributed for long distances. The potential consumers must be located close to the DH. Heat infrastructure requires a certain number of consumers.
Answers selected	**Recommendation and link proposed**
C. There isn´t / I don´t know.	Look for the possible consumers of produced heat (industrial companies using heat in their processing). Consult the municipality office about the future investment plans close to your DH (new houses, housing estate). You must perform market research. Link: BECoop toolkit of the tool "Hotmaps"
3º question	***Do you know if there is a heat network in your neighbourhood?***
Additional comment	Heat network enables you to transfer the heat to the final consumers. It can facilitate your activity and lower the investment costs. From the other hand, it means that there is also another player on the market (your competitor). So, you must be competitive to induce customers to change of heat providing company.

Answers selected	Recommendation and link proposed
B. No, there isn't. / I don't know.	Find out if there is an interest to use your heat. You need to perform the cost analysis of investment in the heat network. Check the possibility of heat network building.
	Link: N/A
4º question	***Would you say there is an interest in RES cooperatives creation in your region?***
Additional comment	The RES cooperatives are still not well known. Thus, local communities may not be conscious of such possibilities in heat production and delivery to the consumers. They have no idea how it works and what is the role of the consumers and members of the RESCoop.
Answers selected	**Recommendation and link proposed**
A. Yes, there is a high interest.	It is a very good opportunity to start communication with the local community and preparations for RESCoop creation. You need to prepare a business plan, determine the heat demand, and look for a DH location. Elaborate a strategy step by step to establish a RESCoop.
	Link: N/A
Final score of the indicator (from 0 to 1)	User engagement → 0.625

This category aims to assess the current status regarding the engagement of the different stakeholder that should be part of the initiative. According to the answers provided in this example, the final score obtained is 0.625 (from 0 to 1), which means that the user has an intermediate vision of possible stakeholders that can contribute to the success of the initiative. This could be increased by implementing different actions such as the ones provided as recommendations by the tool. In the above example, two answers were related with "*no there isn´t / I don´t know*", so after getting more knowledge about that, these answers can change, and therefore the final score of this category can be shifted (given that the tool is re-used). The above-mentioned answers are analysed:

- The first question is related to the necessity of having a supplier of the biomass (in some cases the suppliers could be the same that manage the DH). In this example, the user has answered that he/she knows some suppliers, so the tool recommends to obtain more detailed information such as the amount of biomass that the supplier can supply, the fuel characteristic, size distribution, etc. This information is critical and should be examined before signing a contract.
- The second question is linked to the potential consumers, in order to determine if there is an existing demand of the heat generated by the DH. The user has indicated that "There isn´t / I don´t know", so in this case the recommendation (mainly related with the answer I don´t know) mentions the importance to discuss with potential clients in order to assess the current demand

and their opinion about the initiative. Also, in order to have a preliminary idea, the "Hotmaps"[5] tool was indicated as a potential tool that can help to assess the heating and cooling demand.

- The third question is related to the possible competitors in the nearby area. The user has indicated that "*No, there isn´t / I don´t know*", so the tool recommends to assess society's interest and to guarantee the profitability of the DH if the demand to be achieved is feasible.
- The fourth question is linked to the interest of the society to be involved in a RESCoop or energy community. The user has indicated that there is high interest, so the recommendations address the final engagement of the potential stakeholders and the development of the feasibility and business plan of the DH.

4.3 Key technical aspects assessment

Table 3 shows a user-specific tool output generated regarding the key technical aspects category for the District Heating activity.

Table 3. Self-assessment exercise example – technical aspects category

Category: Key technical aspects	Activity: District Heating
1º question	***Have you considered the heat production capacity of your DH plant?***
Additional comment	Production capacity means the maximum amount of heat that your plant can produce.
Answers selected	**Recommendation and link proposed**
B. No.	You should determine the production capacity of your DH plant taking into consideration the heat demand on the market and possibilities of biomass delivery to your plant and the resource available in the surrounding area. Find out, if there is an interest to buy heat from your potential DH.
	Link: N/A
2º question	***Do you know the importance of the certification of the origin of the heat?***
Additional comment	Depending on the region there are possibilities to obtain financial support for heat production from RES.
Answers selected	**Recommendation and link proposed**
A. Yes, I know.	Certification may help you to raise the profitability of your business and increase the chance of final consumer acquisition thanks to the environmental awareness and delivery of heat from RES. Keep in mind that the procedure might be complicated and time-consuming.
	Link: N/A

[5] https://www.hotmaps.eu/map

3º question	***Do you or your community have experience in the management and/or operation of a DH plant based on biomass energy?***
Additional comment	Experience in the management in this field is important as it provides information about the understanding of this specific technology, environmental awareness and relations existing in this whole logistic chain (biomass supplier – heating unit – consumer)
Answers selected	**Recommendation and link proposed**
D. No, we don´t have experience in the generation of renewable energies or other industrial plants.	The experience in the management and operation of a DH plant is important in order to guarantee the efficient and successful operation of the plant. Probably you should consider hiring a person with this expertise. Keep in mind the bio-based plants require biomass acquisition from local suppliers and the fuel characteristics may vary in the wide range. You need to know that DH plants are planned/built for 25-30 years of operation. So, it is a long time investment.
	Link: N/A
4º question	***Have you ever considered the local possibilities to create a logistic chain for a DH plant based on biomass energy?***
Additional comment	DH plant requires the preparation of the biomass delivery logistic chain (amount of biomass, storage issues, supply guarantee etc.) as well as heat sell system organisation (heat network creation, determination of the heat demand etc.)
Answers selected	**Recommendation and link proposed**
A.Yes, I have considered.	If these possibilities are high, try to compare the validity of your study with existing logistic chains. Let's find bottlenecks in them to eliminate this problem in your plant in the future. Compare your vision with Best Available Techniques (BAT).
	Link: N/A
Final score of the indicator (from 0 to 1)	Technical solution maturity → 0.625

This category aims to assess the basic technical considerations that should be taken into account before starting the initiative implementation. According to the answers of the example, the final score obtained is 0.625 (from 0 to 1), which means that the user has an intermediate knowledge regarding the basic technical aspect to be considered, which could be increased by different action such as the one provided as recommendations by the tool. The above-mentioned answers are analysed:

- The first question is based on the capacity of the DH plant. The size of the DH is a key information since it will determine the investment required. The user has indicated that he/she doesn´t know the capacity of the plant, so the recommendation proposed deals with the assessment of heat

capacity based on two main factors: energy demand of the potential consumers and availability of biomass to feed the installation.

- Second question is based on the certification of the sustainable origin of the heat, in line with what is very frequently done with the electricity. The user has indicated that he/she is aware of this type of certification, so the recommended action is based on the advantages (profitability, consumer acceptance, etc) and disadvantages (procedure might be complicated and time-consuming) that they can face in this process.
- Third question is based on securing a good operation and maintenance of the plant in order to avoid future complaint and bad experiences associated with the use of DH feeding with biomass. The user has indicated that in the area or region there aren't experiences with this type of installations or scheme (energy community), therefore the recommendations highlight the importance of accounting with a staff with sufficient expertise, in order to avoid bad experiences and extending the life of the plant.
- Fourth question is based on a complementary action associated with the possibility of being in charge of the supply of the biomass that will be needed to feed the DH. This is a relevant issue (when feasible) since some of the future problems that would be possible to face are linked to the quality of the biomass fed. The user has indicated that he/she has considered this option, so the tool recommends continuing with this initiative (if/when feasible) since it will contribute to avoiding possible related problems in the future.

4.4 Key business and financial aspects assessment

Table 4 shows a user-specific tool output generated regarding the key business and financial aspects category for the District Heating activity.

Table 4. Self-assessment exercise example – business aspects category

Category: Key business and financial aspects	Activity: District Heating
1º question	***Do you know the investment needed to build and operate a DH plant?***
Additional comment	Financial aspects are crucial in this subject as it requires significant investments and costs in the long time.
Answers selected	**Recommendation and link proposed**
B. No, I don´t know.	The investment of a heat plant should be taking into account from the first moment, since it is significant. Obviously, it will depend on the amount of the heat to be produced as well as the technology provided, and the characterization of the burned biofuel. If a decision is made it is difficult to stop/resign without serious financial losses.
	Link: N/A
2º question	***Do you know if there is a biomass heat market in the region?***

Additional comment	Considering the EU strategy for the coming years, the heat market from RES is expected to grow especially in the areas where the bituminous coal for heat purposes is in use.
Answers selected	**Recommendation and link proposed**
B. There is a market of heat but not from RES.	If there is a market of heat in your area based on fossil fuels, you should implement the environmental policy and towards to introduce RES from local resources, which can be used to cover the energy demands. The education of local society is a key point to success.
	Link: N/A
3º question	***Are you able to describe the barriers that may have a direct or indirect consequence for the financing of DH plant in your region?***
Additional comment	
Answers selected	**Recommendation and link proposed**
B. I don't know any barriers.	Brainstorm this topic or talk to the local community. Read also about decommissioned biomass power plants. What was the cause of this? Obtain information about legal aspects and future perspectives of bio-based DH in your area. Keep in mind that this kind of investment has an exploitation period of 25-30 years.
	Link: N/A
4º question	***Do you think that your investment into biomass heating can diminish energy poverty in your region?***
Additional comment	Adequate heat, cooling, lighting and the energy to power appliances are essential services needed to guarantee a decent standard of living and citizens' health. Energy poverty occurs when a household suffers from a lack of adequate energy services at home (source: https://www.energypoverty.eu/). From a financial point of view if you pay more than 10% of your incomes for heating (on an annual basis) you are suffering to energy poverty.
Answers selected	**Recommendation and link proposed**
A. I am sure that local biomass should be a solution to solve the problem of energy poverty.	Please consider investments in district heating using biomass. If you are a policy maker please see the link below and get familiar with EU policy. Consider promoting Rescoop or subsidizing as other activities to raise the living standard of your society.
	Link: https://www.energypoverty.eu/
Final score of the indicator (from 0 to 1)	Business solution maturity → 0.475

This category aims to assess the business and financial aspects that should be considered before starting the implementation of an initiative. According to the answers of the example, the final score obtained is 0.475 (from 0 to 1), which means that the user has a low-intermediate knowledge regarding the business and financial aspects., The above-mentioned answers are analysed:

- The first question is based on the investment needed to develop and operate a DH plant. This aspect is critical in order to assess the feasibility of the initiative. The user has indicated that they don´t know the CAPEX and OPEX of the plant, so the recommendation deals with the main parameters that should be provided to an ESCO or engineering company to obtain an average budget. For instance, the thermal demand per year and biofuel to be consumed. The invested time to carry out this analysis is a very important parameter since once the installation is built and performing, a slightly change with respect to the initial design could imply a huge challenge.
- The second question is based on the identification of the potential consumers and therefore clients of the DH network. The user has indicated that there is a heat market, but currently it is based on fossil fuels, so in this case the tool recommends transferring to the possible consumers the information regarding the current policy and goals of the RED II, Green Deal, and how a DH fed with biomass could be a suitable solution for reaching this goal. For this reason, it is mentioned that the education of local community is a key point to achieve success.
- The third question is based on the previous knowledge of the financial barriers that the user could face when thinking on the implementation of a DH. The user has indicated that doesn´t know any barrier, so the recommendation deals with the collection of this information through brainstorming with the local community, other experiences, legal and policy regulations, etc.; always taking into consideration that a DH has a minimum exploitation period of 25-30 years.
- The fourth question is based on the energy poverty and how the stability of biomass prices versus other fossil fuel resources can be positive. The user has indicated that he/she is sure that local biomass is a solution to energy poverty, so in this case the recommendation is to reinforce this idea and a report which indicates how a RESCoop can contribute to this goal is suggested.

4.5 Social and environmental aspects assessment

Table 5 shows a user-specific tool output generated regarding the key social and environmental aspects category for the District Heating activity.

Table 5. Self-assessment exercise example – social and environmental aspects category

Category: Key social and environmental aspects	Activity: District Heating
1º question	***Are there any actions organised in your area in order to promote the use of biomass in district heating?***
Additional comment	In many countries/regions the people are very often used to heat their households by an energy source being very popular since generations (there are habits among society).
Answers selected	**Recommendation and link proposed**

B. The region is not active in this topic.	Initiatives like using biomass for energy purposes are new in the region. Communication and dissemination regarding using biomass for energy purposes could contribute to the social acceptance. Consider promotion actions and education in the area of RES utilisation/application, especially biomass.
	Link: N/A
2º question	***Do you know the GHG savings that you can achieve compared with the use of this energy by fossil fuels?***
Additional comment	A greenhouse gas (or GHG for short) is any gas in the atmosphere which absorbs and re-emits heat, and thereby keeps the planet's atmosphere warmer than it otherwise would be.
Answers selected	**Recommendation and link proposed**
B. No, I don't know.	The GHG benefits achieved with this type of initiatives should be communicated to the general public to raise awareness. In order to do a first estimation, you can use the online tool Biograce II. The education actions should help to change this situation.
	Link: Biograce II tool
3º question	***Do you know the influence of DH plant based on biomass on energy poverty of local society?***
Additional comment	Energy poverty - a household doesn't have enough energy to meet its basic daily needs: heating / cooling, cooking, lighting, etc.
Answers selected	**Recommendation and link proposed**
A. Yes, I do.	You can consider implementing RESCoop to support diminishing energy poverty. You can play the role of policy maker/activist in the area of biomass promotion for heating purposes.
	Link: https://www.energypoverty.eu/
4º question	***What is the feeling of the local society regarding using RES such as biomass for household heating?***
Additional comment	Knowing how the community feels and attitudes to heat sources is important to understand the reasons for the current situation and to take appropriate measures to change this view.
Answers selected	**Recommendation and link proposed**
A. Renewable energy initiatives are very	In principle it seems that the initiative will have social backup. As a result, the proposition of RESCoop creation should involve interest and be accepted by local society.

welcomed in the region.	Link: N/A
5º question	Are there any other energy communities in your area?
Additional comment	Knowing how the community feels and attitudes to heat sources is important to understand the reasons for the current situation and to take appropriate measures to change this view.
Answers selected	**Recommendation and link proposed**
B: No	Previous experience with energy communities plays a key role for the acceptance of your initiative by the general public. Good success examples of the past could act as a driver for the acceptance of the project as people are already familiar with the concept and trust has been already established. People are also aware of the positive impact that energy communities may have in their area (e.g. creation of new jobs, reduced energy bills etc.). From the other hand, bad previous examples could act as a barrier for the initiative as citizens will be hesitant and skeptical to join or accept the new project. In case there is no previous experience it is important to start by establishing a good communication path with the community and involve the citizens throughout the organisation and implementation phase of the project. Procedure's transparency will create trust and will strengthen community's acceptance.
	Link: N/A
Final score of the indicator (from 0 to 1)	Social and environmental impact →

This category aims to assess the social and environmental aspects that should be taken into account before starting the initiative implementation. According to the answers of the example, the final score obtained is 0.58 (from 0 to 1), which means that the user has a feeling that there is an intermediate social and environmental knowledge regarding this type of initiative, which could be increased by implementing different actions such as the one provided as recommendation by the tool. The above-mentioned answers are analysed:

- The first question is based on the social promotion of the biomass as green energy source in the area, since this aspect can facilitate the introduction of biomass. The user has indicated that the region is not active in this topic, so the proposed recommendation deals with promotion and education actions in the area in order to broadcast all the advantages of using biomass versus other fossil fuels.
- The second question is based on the environmental aspect, which in many cases corresponds to the reduction of greenhouse gases. The user has indicated that he/she doesn´t know the percentage of GHG reductions. The tool highlights the importance of this information , as it can be used to raise awareness in the region about the environmental advantages of biomass, while can be also considered when applying to obtain a financial support. A link that can be utilised for

this aim (GHG calculations) is provided by the self-assessment tool, this tool (Biograce)[6] can be also found in the BECoop toolkit.

- The third question is based on how the exploitation of local energy resources (as biomass), together with the exploitation of business model of an energy community, can deal with the energy poverty of local society. The user has indicated that he/she knows the importance of this aspect, so the recommendation points out the importance to continue promoting the energy community, while also suggests that the user can be a biomass activist in the area. More information resources around energy poverty are provided to increase user's knowledge about this topic.
- The fourth question is based on the social perceptions around the use of biomass for heating. The support of the maximum number of citizens (and in this case also the support of the potential consumers of the DH network) is very important for the success of the initiative. The user has indicated that renewable energy initiatives are very welcomed in the region, so the tool indicates that the initiative will have social backup and therefore should take into consideration the interests of the local community in order to reach public acceptance
- The fifth question intends to assess if other energy communities have already been implemented in the area in the past. Previous positive or negative experiences can be very critical for the success of other energy communities. The user has indicated that there is no other energy community in the area, so in order to strengthen the community's acceptance, the suggestion is to start promoting the concept of "energy community".

4.6 Initiative's overall status assessment

After carrying out the self-evaluation process the user will have an overview of the scores obtained for each category through a spider-net (see Figure 8). In this way, the user can explore and identify the categories in which he/she should put more effort, in order to develop the initiative.

Moreover, an automatic report will be generated with the possibility of being downloaded, which will include all the questions, answers selected by the user, the recommendations, links suggested, and the final scores obtained in each category.

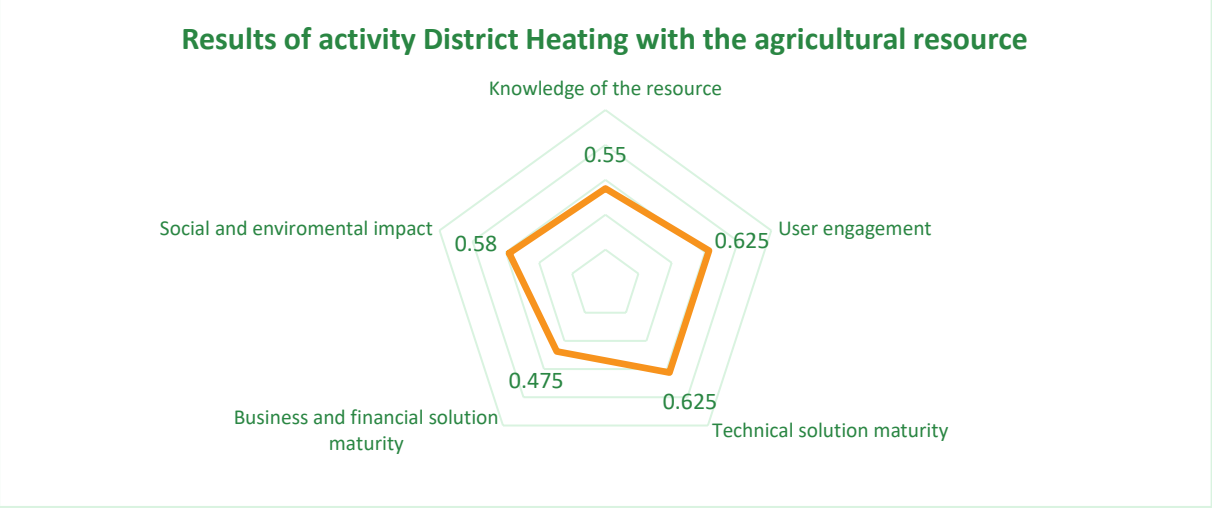

Figure 8. Overview of all the scoring for each category of the case selected.

[6] https://www.biograce.net/biograce2/

5 Online tool - user guideline

This chapter will mainly focus on giving clear instructions that complement the previous information to the tool users in order to support them through the different steps of the online self-assessment tool, making sure that the guideline is clear, and all the steps are explained in an understandable and concise way.

5.1. Where can the user find the self-assessment tool?

The self-assessment tool can be found in BECoop webpage, more specifically in the following link: https://www.becoop-project.eu/tools/assessment-tool/.

Figure 9. Site of the self-assessment tool

5.2. Initial steps of the tool

Once, the user accesses the tool, the first screen that the user will see includes a brief tool description. Additionally, in case the user has doubts or wants to know more about the methodology applied or a detailed guideline, he can find more information by clicking on this site :https://www.becoop-project.eu/resources/reports/, which links to the present deliverable. Then a registration window then appears (depicted below). Based on the project's initial planning, the registration step is currently optional.

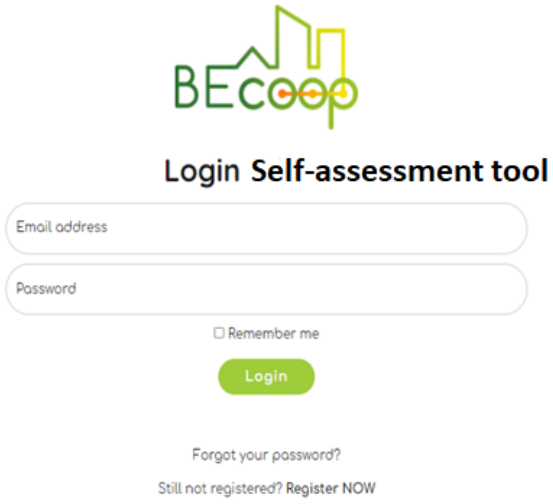

Figure 10. Optional registration for the self-assessment tool

5.3 Self-assessment of biomass resource

After reading the description of the self-assessment tool, and carrying out the registration process, the user officially enters the tool. Initially, the user should select the biomass resource of his/her interest, among the five biomass resources that have been identified for the tool (previously described in 3.1.1). Before clicking in each resource, the user will have the chance to read a brief description of the biomass resource just by placing the mouse over each of the biomass resource, with the aim of facilitating the decision-making.

An example is shown in Figure 11 for agricultural resources.

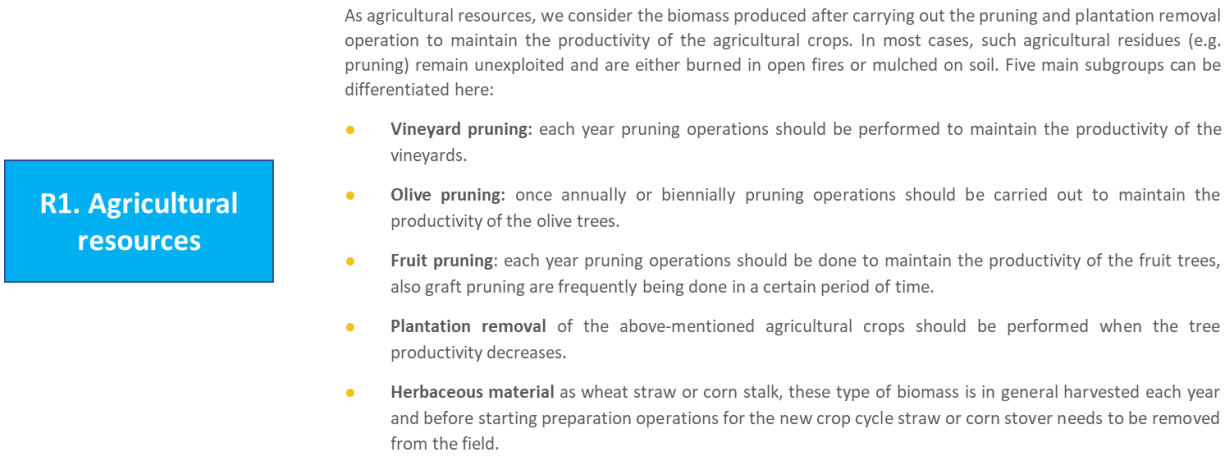

Figure 11. Tool screenshot - selection of biomass resources.

After clicking the resource, the tool will display five questions regarding, for instance, the fuels characteristics, biomass availability, when these raw materials are placed in the market, current use and possible needs and challenges that they must tackle.

Hereafter, the user will have the option to continue with the selection of the activity they want to implement (previously described in 3.1.2) or perform the same self-assessment for another biomass resource. This possibility is especially practical when the user is considering the use of several biomass resources.

5.4 Self-assessment of the bioenergy activity

The following step, once the questions associated to the resource are finished, focuses on the definition of the main activity the user wants to implement.

Similar to the resources, just one activity can be selected. In case the user aims to develop several activities (such as the logistic supply, the generation and the consumption) will fill in each one of these cases independently. Also, before clicking in each activity, the user will have the chance to read a brief description regarding the activity together with some examples (this information was described in section 3.1.2) just by placing the mouse over each one of the activities. An example is presented in Figure 12 for the district heating activity.

A3.1 District Heating

District heating: District heating is a system seeking to produce, and afterwards, distribute heat generated in a centralized location, mainly focused on residential sector and therefore avoiding the need of installing individual boilers by the end users. This system is becoming very popular, and the operation through an energy community is expected to increase in the coming years.

Some examples regarding this type of initiative are:

- RESCoop/ energy community that is trying to evaluate the feasibility to establish a district heating production unit to supply some of their associates.
- Neighbourhood that currently has a district heating unit that works with gas or other fossil fuel, trying to assess the investment required to switch to an equipment working with a renewable source, more specifically biomass.
- Municipalities (small villages) considering covering their thermal energy demands by means of renewable energy resource through district heating.
- A group of industrial companies inside the same industrial park (or the surrounding area) willing to create a community in order to produce heat for covering their thermal energy demands, and for sharing the excess heat with nearby buildings.

Figure 12. Tool screenshot - selection of the bioenergy activity to implement.

In this case, each activity is organized in four categories to oversee all the main aspects as was previously explained in section 3.1.3: i) key partners, ii) key technical aspects, iii) key business and financial aspects and iv) key social and environmental aspects.

Once all questions from each category have been answered, the user gets the proposed recommendations associated to each question together with a score obtained for each category (from 0 to 1). The user will always have the option to repeat the self-assessment in case he needs to address some mistakes performed during the process.

5.5 Final outputs

The obtained rates, scored through each questions-category and based on the user-specific answers, are further visualised in the form of a spider net (as previously described in point 3.1.5). In case the user selects several resources and activities, then each selected combination can be visualised within the spider-net plot. Figure 13 shows an example of several combinations.

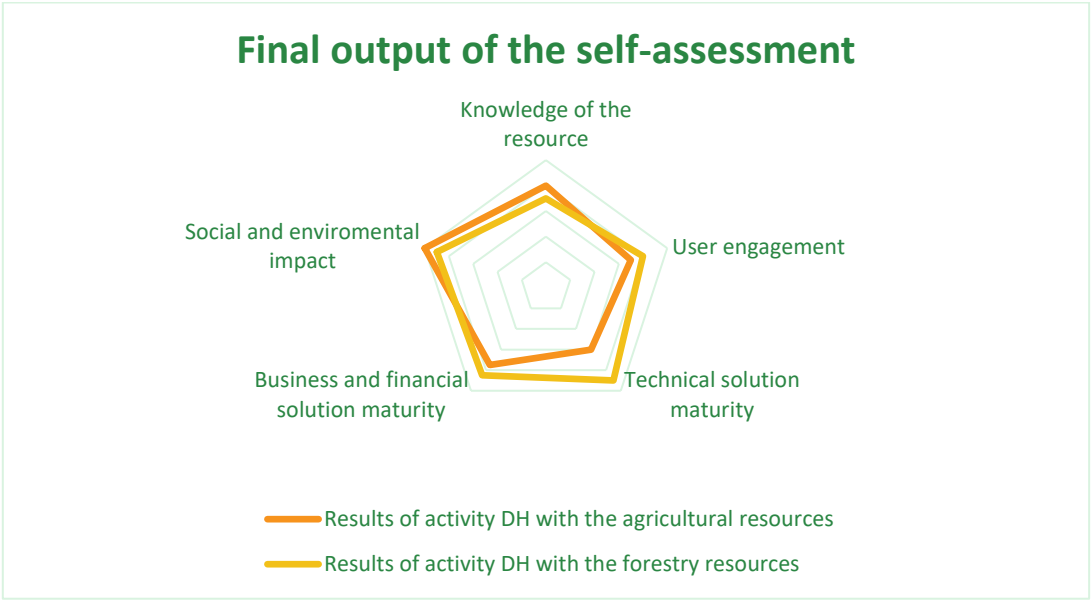

Figure 13. Final output of several combinations carried out in the self-assessment.

The registered users will always have access to all the self-assessments they have carried out, and they will also have the possibility to edit their answers whenever they want. This is very practical, since it allows the users to compare the results and answers from the first time, they carried out the self-assessment, with the next time, after having implemented the suggested recommendations. This will give them the opportunity to assess their progress and current status.

Finally, two questions will be displayed in order to retrieve feedback from the tool users regarding their degree of satisfaction and their perceptions related to the time saved in the decision-making process. Additionally, the user will be able to enter suggestions that will be taken into consideration for the improvement of the tool.

6 Conclusions

The information included in this report allows to understand how the bioenergy community self-assessment tool, developed under BECoop project, works, as well as the bioenergy resources and activities that can be found and the outputs obtained. Additionally, an example is presented that explains the outcomes of the tool and clarifies the recommendations provided and how they should be interpreted.

The development of this tool aims to contribute to the promotion of bioenergy communities in Europe by overcoming the lack of knowledge about the implementation of such initiatives. Also, the tool will not only provide recommendations and links, but as the project progresses it will also direct the user to the reports and the other tools that will be developed in the framework of the project (toolkit, e-market environment and knowledge exchange platform).

This tool will be used to endorse the supporting actions developed under WP4 that will be provided to the new initiatives in the framework of BECoop project, but it will be also used by other stakeholders (outside of BECoop consortium) that want to assess their current situation regarding bioenergy community initiatives.

It should be pointed out that this report describes the preliminary version of the tool, which will be improved and completed with new resources and activities by October 2022. In any case, the tool is already operative, whereas reaching a high number of users utilising the tool, will imply that more feedback will be retrieved (after finalising each self-assessment case the user can indicate suggestions to the developers of the tool) and therefore a better optimisation process can be carried out.

As previously mentioned, the final version of the tool will be published in October 2022. Accordingly, an update of this report will be also submitted including all changes and improvements performed.

Annexes

Annex I: Example of one case of resource and bioenergy activity

This section presents an example of a filled template for the resource "agricultural resource" and the activity "district heating". The detailed self-assessment methodology, that is all questions together with possible answers and recommendations, is presented in a dedicated document (Supplementary Data) which accompanies D2.1.

Resource: Agricultural resources		
Rate 1º question: 0.25		
1º question	Do you know the main characteristics of the agricultural biomass that you are interested in?	
Additional comment to understand the question (if needed)	Fuel characteristics include moisture content, low heating value, Cl, N and S content, ash content, ash composition, etc. These characteristics will considerably affect the following operations to be carried out.	
Answers	**Elaborated recommendations for each answer**	**Rate of each answer**
A: Yes, I know	The information gathered regarding the biofuel characteristics will contribute to select the most appropriate valorisation pathway. You should consider the fuel characteristic in order to identify your market audience, linked to the appropriate combustion and feeding technology.	1
	N/A	
B: Yes, I have a preliminary idea	The information gathered regarding the biofuel characteristics will contribute to select the most appropriate valorisation pathway. Be aware that not all the agricultural crops have the same fuel characteristic, for instance the herbaceous biomass normally has higher values of Cl (that could cause higher corrosion occurrence in boilers) than woody agricultural biomass.	0.6
	Link: BECoop catalogue of fuel characteristics of different biomasses.	
C: No, I don´t know	The information gathered regarding the biofuel characteristics will contribute to select the most appropriate valorisation pathway. Be aware that not all	0.25

	the agricultural crops have the same fuel characteristic, for instance the herbaceous biomass normally has higher values of Cl (that could cause higher corrosion in boilers) than woody agricultural biomass.	
	Link: BECoop catalogue of fuel characteristics of different biomasses.	
Rate 2º question:	0.10	
2º question	In general bases, agricultural resource are seasonal, which means that in a short period of time (1-3 months) they should be collected and stored. Do you know in which period the pruning operations take place for the agricultural crops that you are interested?	
Additional comment to understand the question (if needed)		
Answers	**Elaborated recommendations for each answer**	**Rate of each answer**
A: Yes, I know	Taking into account the period in which the agricultural biomass is collected is important. Once the biomass is placed in the market, this information will allow you to plan the logistic operations (storage area needed, flow of trucks weekly, etc.) or to position yourself in a good place for the acquisition of these biomasses.	1
	Link: N/A	
B: I don´t know	It is important to know when the pruning operation of each agricultural crops are carried out, especially if you want to oversee the logistic operations, since the biomass needs to be collected in a short period of time, but also this information will allow to position yourself in a good place for the acquisition of these biomasses. The average period where each biomass from agricultural crops is collected will depend on several aspects such as the weather conditions, that can slightly change each year. Generally (although sometimes this operation is performed several times during the year), for instance vineyard pruning are collected between December and February, olive pruning between February and April, fruit pruning and plantation removal are performed between October and January, wheat straw between July and August and corn stalk between October and November.	0.25
	Link: N/A	

Rate 3º question:	0.25	
3º question	Do you know the availability of the agricultural resource in your area?	
Additional comment to understand the question (if needed)	In order to know the resource availability, not only the potential of the biomass in the surrounding area (preferably radius lower than 30 km) should be considered but also how much biomasses can be collected by reaching agreements with the farmers/cooperatives, considering difficulties associated to the slope of the field, type of land (irrigated or not), productivity of biomass per ha, etc…	
Answers	**Elaborated recommendations for each answer**	**Rate of each answer**
A: Yes, I know	Knowing the availability of the biomass in the area is key to determine if the existing and available resource are enough to successfully implement the business model of the initiative planned. You should also know if there are others agricultural service companies that could be a competence. Link: N/A	1
B: I know the potential surface, but I don´t know the availably of biomass.	If you know the potential surface in your area dedicated to the targeted biomass but you don´t know its availability, in order carry out a preliminary estimation, you can use the tool Bioraise which can be found in the toolkit of BECoop. Additionally, it is highly recommended to get in contact with some owner of the biomass (farmers, cooperatives) and logistic operators in order to assess their current practice. Also, you can check the catalogue of BECoop about fuel characteristic of biomass in which you can see a first estimation of the average productivity that you can obtain per ha for different types of biomasses. Also, you can check the Up_running observatory where several field measurements of the pruning yields were performed in different regions of Europe. Link: BIoraise in BECoop toolik. BECoop catalogue Fuels characteristics. uP_running Observatory: https://www.up-running-observatory.eu/en/.	0.5
C: I don´t know	Knowing the availability of the biomass in the area is key to determine if the existing and available resource are enough to successfully implement the business model of the initiative planned, since independently of your role as logistic operator, manufacturer or consumer, if the potential does not exist or it is limited, this fact can compromise the viability of the initiative. In order carry out a preliminary estimation, you can use the tool Bioraise	0.25

	which can be found in the toolkit of BECoop, or you can check the Up_running observatory where several field measurements of the pruning yields were performed in different regions of Europe. Additionally, it is highly recommended to get in contact with some owner of the biomass (farmers, cooperatives) and logistic operators in order to assess their current practice (burning, soil incorporation, energy valorisation or other).	
	Link: BIoraise in BECoop toolik. uP_running Observatory: https://www.up-running-observatory.eu/en/.	
Rate 4º question:	0.2	
4º question	Are you aware of the current use of the targeted resource?	
Additional comment to understand the question (if needed)	In most cases, the owners of the agricultural biomass are the farmers or the cooperatives. In general, they use this resource as organic matter to improve soil conditions, as biomass for energy purposes either for self-consumption or to be sold to consumers or this biomass is seen as a residue in which case they are normally burnt in the field.	
Answers	**Elaborated recommendations for each answer**	**Rate of each answer**
A: The owners of the biomass are currently using this resource	If the owners of the biomass are currently using the biomass for instance, as organic matter for their own field or they are currently selling this biomass to others, it will be more complicated to convinced them. Anyway, in some cases leaving the organic matter on the field can lead to plant infections.	0.35
	Link: N/A	
B: The owners of the biomass are not using this resource	If the owners of the biomass are not using this resource, probably this resource is a problem for them and normally they will have to invest time and money in order to get rid of it (as for instance burning on the field). In this case, they will probably welcome this initiative, but with the consideration of collecting the biomass as soon as the pruning operations are carried out.	1
	Link: N/A	
C: Both situations	If both situations are taking place, firstly you should consider if the potential related with the biomass that is currently not used will be enough to operate the business, if this fact happens you should focus on speaking with these owners. In case it does not, you should consider also	0.5

	speaking with the owners that are currently using this biomass in order to know if they are open to negotiate.	
	Link: N/A	
D: I don´t know	It is importance to know the current practice in the area in order to assess if this resource are currently available or not.	0.25
	Link: N/A	
Rate 5º question:	0.2	
5º question	Do you know the possible needs and challenges that you will have to face when working with this product vs other biomasses?	
Additional comment to understand the question (if needed)	Properties of the biomasses and therefore their behaviour when valorised for different purposes will differ, according to the type of biomass, the land where it is cultivated, logistic operations carried out, pre-treatment process, etc. Thus, before developing an initiative based on this type of biomass it is important to anticipate the possible needs and challenges that you will most likely have to face.	
Answers	**Elaborated recommendations for each answer**	**Rate of each answer**
A: Yes, I know	It is very relevant to identify the particularities that the biomass targeted has comparing to other types of biomasses in order to properly carry out the future activities to commercialize/valorise this product. It might be useful to consult the deliverable 1.4 of BECoop in which some action to tackle the critical needs and challenges that have been identified by each stakeholder are proposed.	1
	Link: Deliverable 1.4 BECoop	
B: No, I don´t know	The fuels characteristics and the size distribution of agricultural crops are different from forestry biomass (the most frequently used biomass), because of that some people think that it is not a valid biofuel for energy purposes. However, it is a suitable fuel, even though it requires to install the properly combustion technology in order to achieve an efficient operation. You can consult the deliverable 1.4 of BECoop in which some proposed action to tackle the critical needs and challenges are mentioned by each stakeholder.	0.25
	Link: Deliverable 1.4 BECoop	

Category: Key partners	Activity: District Heating	
Rate 1º question: 0.3		
1º question	Do you know if there are any biomass suppliers for heating purposes in your region?	
Additional comment to understand the question (if needed)	Biomass distributors may provide forestry, agricultural and waste biomass from the region. The biomass provider can be a farmer as well as a biomass logistic distributing company.	
Answers	**Elaborated recommendations for each answer**	**Rate of each answer**
A. Yes, I know.	You can contact a biomass distributor to find out detailed information (e.g. how much biomass is available (tonnes per year)?, what kind of biomass it is (forestry, agricultural or waste)? In which format is the biomass (raw biomass, pellets, wood chips, briquettes, logs) supplied? What are the physicochemical properties of the material?). You need to know if the company is able to provide the amount and quality of biomass you need. Link. N/A	1
B. No, I don't know.	You need to find information about potential biomass provider/supplier. You can ask the local municipality office. Try to find farmers specialised in agricultural crops or contact with forestry management institutions. Look for the biomass logistic operators. You can consult the BECoop platform in order to identify some relevant stakeholders. Link: e-market platform.	0.25
Rate 2º question:	0.3	
2º question	Do you know if there is a heat demand close to your DH?	
Additional comment to understand the question (if needed)	You need to keep in mind that heat cannot be distributed for long distances. The potential consumers must be located close to the DH. Heat infrastructure requires a certain number of consumers.	
Answers	**Elaborated recommendations for each answer**	**Rate of each answer**
A. Yes, there is high.	Find out if there is an interest to be connected to your heat network. Check the heat demand of potential users. Try to	1

	estimate the number of customers to be connected to insure profitability of your business.	
	Link: N/A	
B. Yes, there is low.	Look for the possible consumers of produced heat (industrial companies using heat in their processing). Consult the municipality office about the future investment plans close to your HP (new houses, housing estate).	0.6
	Link: BECoop toolkit of the tool Hotmaps	
C. There isn´t / I don´t know.	Look for the possible consumers of produced heat (industrial companies using heat in their processing). Consult the municipality office about the future investment plans close to your DH (new houses, housing estate). You must perform market research.	0.25
	Link: BECoop toolkit of the tool Hotmaps	
Rate 3º question:	0.2	
3º question	Do you know if there is a heat network in your neighbourhood?	
Additional comment to understand the question (if needed)	Heat network enables you to transfer the heat to the final consumers. It can facilitate your activity and lower the investment costs. From the other hand, it means that there is also another player on the market (your competitor). So, you must be competitive to induce customers to change of heat providing company.	
Answers	**Elaborated recommendations for each answer**	**Rate of each answer**
A. Yes, there is.	Contact the owner of the heat network if there is a possibility to use it for heat distribution. Contact the final user (connected to the heat network) if they are interested to change the heat supplier. Estimate the heat demand. Work on the good offer preparation to get clients.	1
	Link: N/A	
B. No, there isn't./ I don't know.	Find out if there is an interest to use your heat. You need to perform the cost analysis of investment in the heat network. Check the possibility of heat network building.	0.25
	Link: N/A	
Rate 4º question:	0.2	
4º question	Would you say there is an interest in RES cooperatives creation in your region?	

Additional comment to understand the question (if needed)	The RES cooperatives are still not well known. Thus local communities may not be conscious of such possibilities in heat production and delivery to the consumers. They have no idea how it works and what is the role of the consumers and members of the RESCoop.	
Answers	**Elaborated recommendations for each answer**	**Rate of each answer**
A	It is a very good opportunity to start communication with the local community and preparations for RESCoop creation. You need to prepare a business plan, determine the heat demand, and look for a DH location. Elaborate a strategy step by step to establish a RESCoop. Link: N/A	1
B	You need to perform the studies related to reasons of low interest. Think about the meetings organisation with the local community. Try to build a positive image of RESCoop. Link: N/A	0.6
C	You should start working from scratch. Probably, the local community needs basic information and education related to the RES, RESCoop and their characteristics. Link: N/A	0.25

Category: Key technical aspects	Activity: District Heating	
Rate 1º question:	0.3	
1º question	Have you considered the heat production capacity of your DH plant?	
Additional comment to understand the question (if needed)	Production capacity means the maximum amount of heat that your plant can produce.	
Answers	**Elaborated recommendations for each answer**	**Rate of each answer**
A. Yes, I have a preliminary idea.	If you have a preliminary dimension/capacity of your plant, you can start to contact heat consumers to find clients willing to buy heat you are going to provide. Perform the financial analysis of your business. Estimate the number of the heat consumers. Check the options of heat network building etc. Secure the biomass delivery for your business.	1

	Link: N/A	
B. No.	You should determine the production capacity of your HP/CHP plant taking into consideration the heat demand on the market and possibilities of biomass delivery to your plant and the resource available in the surrounding area. Find out, if there is an interest to buy heat from your potential DH	0.25
	Link: N/A	
Rate 2º question:	0.3	
2º question	Do you know the importance of the certification of the origin of the heat?	
Additional comment to understand the question (if needed)	Depending on the region there are possibilities to obtain financial support for heat production from RES.	
Answers	**Elaborated recommendations for each answer**	**Rate of each answer**
A. Yes, I know.	Certification may help you to raise the profitability of your business and increase the chance of final consumer acquisition thanks to the environmental awareness and delivery of heat from RES. Keep in mind that the procedure might be complicated and time-consuming.	1
	Link: N/A	
B.No, I don't know.	Search for local/national regulations related to heat certification options. Keep in mind that the procedure might be complicated and time-consuming.	0.25
	Link: N/A	
Rate 3º question:	0.2	
3º question	Do you or your community have experience in the management and/or operation of a DH plant based on biomass energy?	
Additional comment to understand the question (if needed)	Experience in the management in this field is important as it provides information about the understanding of this specific technology, environmental awareness and relations existing in this whole logistic chain (biomass supplier – heating unit – consumer)	
Answers	**Elaborated recommendations for each answer**	**Rate of each answer**
A. Yes, we have experience in management/operatio	Your experience in the management and operation of DH plant based on biomass energy will greatly help you in the implementation of this business. Consider local market	1

n of DH plants based on biomass energy.	research in terms of the bio-based heating system application/development. Link. N/A	
B. Yes, we have experience in DH plants based on other renewable energy sources.	Your experience in management/operation of DH plants based on other RES will help you in order to develop this project, but in any case, you should consider to specialise in the management and operation of DH plants based on biomass energy. You should cooperate with people who have experience in this field. Link. N/A	0.8
C. No, we don't have experience in operation/management of DH plants based on renewable sources of energy, but we have experience with other plants based on fossil fuels.	Your experience in other projects will help you in order to develop this project, but in any case, you must consider to specialise in the management and operation of DH plants based on biomass energy. You should cooperate with people who have experience in this field. Keep in mind the bio-based plants require biomass acquisition from local suppliers and the fuel characteristics may vary in the wide range. Link. N/A	0.5
D. No, we don´t have experience in the generation of renewable energies or other industrial plants.	The experience in the management and operation of a DH plant is important in order to guarantee the efficient and successful operation of the plant. Probably you should consider to hire a person with this expertise. Keep in mind the bio-based plants require biomass acquisition from local suppliers and the fuel characteristics may vary in the wide range. You need to know that DH plants are planned/built for 25-30 years of operation. So, it is a long time investment. Link. N/A	0.25

Rate 4º question:	0.2	
4º question	Have you ever considered the local possibilities to create a logistic chain for a DH plant based on biomass energy?	
Additional comment to understand the question (if needed)	DH plant requires the preparation of the biomass delivery logistic chain (amount of biomass, storage issues, supply guarantee etc.) as well as heat sell system organisation (heat network creation, determination of the heat demand etc.)	
Answers	**Elaborated recommendations for each answer**	**Rate of each answer**

A.Yes, I have considered.	If these possibilities are high, try to compare the validity of your study with existing logistic chains. Let's find bottlenecks in them to eliminate this problem in your plant in the future. Compare your vision with Best Available Techniques (BAT).	1
	Link: N/A	
B. No, I haven't considered.	Try to create elaboration. In your study please include access to the biomass resource, heat sell market and existing Best Available Techniques (BAT). Find out if there is an interest in heat use from biomass DH in the region.	0.25
	Link: N/A	

Category: Key business and financial aspects	Activity: District Heating	
Rate 1º question:	0.3	
1º question	Do you know the investment needed to build and operate a DH plant?	
Additional comment to understand the question (if needed)	Financial aspects are crucial in this subject as it requires significant investments and costs in the long time.	
Answers	**Elaborated recommendations for each answer**	**Rate of each answer**
A. Yes, I have a preliminary idea.	Knowing the investment is a first step. Now you should consider how are you going to finance this investment, through the community? Will you need an investor/bank? Crowdfunding between your associates? Supporting programs? EU funds?	1
	Link: N/A	
B. No, I don´t know.	The investment of a heat plant should be taking into account from the first moment, since it is significant. Obviously, it will depend on the amount of the heat to be produced as well as the technology provided, and the characterization of the burned biofuel. If a decision is made it is difficult to stop/resign without serious financial losses.	0.25
	Link: N/A	
Rate 2º question:	0.3	
2º question	Do you know if there is a biomass heat market in the region?	

Additional comment to understand the question (if needed)	Considering the UE strategy for the coming years, the heat market from RES is expected to grow especially in the areas where the bituminous coal for heat purposes is in use.	
Answers	**Elaborated recommendations for each answer**	**Rate of each answer**
A. Yes, there is such a market.	A well-developed market will provide the adequate frame for new products but it also implies higher competence. Existing bio-based market means that there are potential consumers/final users. The potential client is conscious of this kind of fuel, it facilitates first contact and discussion in this field. Link: N/A	1
B. There is a market of heat but not from RES.	If there is a market of heat in your area based on fossil fuels, you should implement the environmental policy and towards to introduce RES from local resources, which can be used to cover the energy demands. The education of local society is a key point to success. Link: N/A	0.5
C. No.	If currently there are no markets of biomass heat in your area, firstly you should consider why. Which energy sources are used for covering the thermal demands? Are people closed minded about changes? Do you know the people that in some cases there are incentives for the use of renewable energies? All these questions can help you in order to assess if the market could be achieved in your area. The implementation of the education strategy among local society is strongly recommended. Link: N/A	0.25
D. I don´t know.	It is key to perform a market analysis and define the new heat source potential. Link: N/A	0.25
Rate 3º question:	0.2	
3º question	Are you able to describe the barriers that may have a direct or indirect consequence for the financing of DH plant in your region?	
Additional comment to understand the question (if needed)		

Answers	Elaborated recommendations for each answer	Rate of each answer
A. Yes, I know these barriers.	Try to identify which of them are key and may significantly threaten the development of your investment in DH based on biomass energy.	1
	Link: N/A	
B. I don't know any barriers.	Brainstorm this topic or talk to the local community. Read also about decommissioned biomass power plants. What was the cause of this? Obtain information about legal aspects and future perspectives of bio-based DH in your area. Keep in mind that this kind of investment has an exploitation period of 25-30 years.	0.25
	Link: N/A	

Rate 4º question:	0.2	
4º question	Do you think that your investment into biomass heating can diminish energy poverty in your region?	
Additional comment to understand the question (if needed)	Adequate heat, cooling, lighting and the energy to power appliances are essential services needed to guarantee a decent standard of living and citizens' health. Energy poverty occurs when a household suffers from a lack of adequate energy services at home (source: https://www.energypoverty.eu/). From a financial point of view if you pay more than 10% of your incomes for heating (on an annual basis) you are suffering to energy poverty.	
Answers	**Elaborated recommendations for each answer**	**Rate of each answer**
A. I am sure that local biomass should be a solution to solve the problem of energy poverty.	Please consider investments in district heating using biomass. If you are a policy maker please see the link below and get familiar with EU policy. Consider promoting Rescoop or subsidizing as other activities to raise the living standard of your society.	1
	Link: https://www.energypoverty.eu/	
B. I don't suffer from energy poverty and biomass heating is not a solution for me.	Please consider that biomass ecological heating can solve not only financial problems. It can bring a positive impact into the environmental and social areas of local community.	0.25
	Link: https://www.energypoverty.eu/	

Category: Key social and environmental aspects	Activity: District Heating	
Rate 1º question:	0.20	
1º question	Are there any actions organised in your area in order to promote the use of biomass in district heating?	
Additional comment to understand the question (if needed)	In many countries/regions the people are very often used to heat their households by an energy source being very popular since generations (there are habits among society).	
Answers	**Elaborated recommendations for each answer**	**Rate of each answer**
A. The region is very active in this topic.	Regional framework seems quite appropriate for the use of biomass for energy purposes. Consider start promoting RESCoop creation in this area. Link: N/A	1
B. The region is not active in this topic.	Initiatives like using biomass for energy purposes are new in the region. Communication and dissemination regarding using biomass for energy purposes could contribute to the social acceptance. Consider promotion actions and education in the area of RES utilisation/application, especially biomass. Link: N/A	0.25
C. I don´t know.	Awareness regarding using biomass for energy purposes could contribute to the social acceptance of initiatives seeking to fulfil such objectives. Consider promotion actions and education in the area of RES utilisation/application, especially biomass. Think about conducting the survey related to biomass and other renewables applications for purposes. Link: N/A	0.25
Rate 2º question:	0.2	
2º question	Do you know the GHG savings that you can achieve compared with the use of this energy by fossil fuels?	
Additional comment to understand the question (if needed)	A greenhouse gas (or GHG for short) is any gas in the atmosphere which absorbs and re-emits heat, and thereby keeps the planet's atmosphere warmer than it otherwise would be.	
Answers	**Elaborated recommendations for each answer**	**Rate of each answer**

A. Yes, I know.	Public awareness regarding the contribution to decrease GHG emissions with this type of initiative establishes an adequate framework for its implementation. You should disseminate these numbers.	1
	Link: N/A	
B. No, I don't know.	The GHG benefits achieved with this type of initiatives should be communicated to the general public to raise awareness. In order to do a first estimation, you can use the online tool Biograce II. The education actions should help to change this situation.	0.25
	Link: Biograce II tool	
Rate 3º question:	0.2	
3º question	Do you know the influence of DH plant based on biomass on energy poverty of local society?	
Additional comment to understand the question (if needed)	Energy poverty - a household doesn't have enough energy to meet its basic daily needs: heating / cooling, cooking, lighting, etc.	
Answers	**Elaborated recommendations for each answer**	**Rate of each answer**
A. Yes, I do.	You can consider implementing RESCoop to support diminishing energy poverty. You can play the role of policy maker/activist in the area of biomass promotion for heating purposes.	1
	Link: https://www.energypoverty.eu/	
B. No, I don't.	You should know that the use of local biomass for heating purposes increases job creation, has a positive impact on local development, health and state of environment. Finally, it can lead to the RESCoop creation.	0.25
	Link: https://www.energypoverty.eu/	
Rate 4º question:	0.2	
4º question	What is the feeling of the local society regarding using RES such as biomass for household heating?	
Additional comment to understand the question (if needed)	Knowing how the community feels and attitudes to heat sources is important to understand the reasons for the current situation and to take appropriate measures to change this view.	
Answers	**Elaborated recommendations for each answer**	**Rate of each answer**

A. Renewable energy initiatives are very welcomed in the region.	In principle it seems that the initiative will have social backup. As a result, the proposition of RESCoop creation should involve interest and be accepted by local society. Link: N/A	1
B. Neither support nor opposition can be expected.	Benefits achieved with this type of initiatives should be communicated to the general public to raise awareness. Consider the improvement of the communication form in the field of use of biomass for heating purposes and benefits for local society. Link: N/A	0.5
C. Social opposition can be expected.	Efforts should be allocated to present the environmental and social benefits associated to this type of initiatives and answer criticisms (e.g. rise of energy safety, influence on environment and health). Education seems to be necessary to change the way of thinking about biomass as a heat source. Link: N/A	0.25
D. I don´t know.	It is not a key to evaluate the acceptance of general society, but it will be good to achieve if this could be an alliance or a barrier for implementing your initiative. Education seems to be necessary to provide local citizens with knowledge about the role of biomass for heat production in the local area. Link: N/A	0.25
Rate 5º question:	0.2	
5º question	Are there any other energy communities in your area?	
Additional comment to understand the question (if needed)	Knowing how the community feels and attitudes to heat sources is important to understand the reasons for the current situation and to take appropriate measures to change this view.	
Answers	**Elaborated recommendations for each answer**	**Rate of each answer**
A: Yes	Previous experience with energy communities plays a key role for the acceptance of your initiative by the general public. Good success examples of the past could act as a driver for the acceptance of the project as people are already familiar with the concept and trust has been already established. People are also aware of the positive impact that energy communities may have in their area (e.g. creation of new jobs, reduced energy bills etc.). From	1.0

	the other hand, bad previous examples could act as a barrier for the initiative as citizens will be hesitant and skeptical to join or accept the new project. In this case action should be taken in order to restore citizen's trust by identifying the previous problems and proposing solutions or offering new information through an open and transparent process. Link: N/A	
B: No	Previous experience with energy communities plays a key role for the acceptance of your initiative by the general public. Good success examples of the past could act as a driver for the acceptance of the project as people are already familiar with the concept and trust has been already established. People are also aware of the positive impact that energy communities may have in their area (e.g. creation of new jobs, reduced energy bills etc.). From the other hand, bad previous examples could act as a barrier for the initiative as citizens will be hesitant and skeptical to join or accept the new project. In case there is no previous experience it is important to start by establishing a good communication path with the community and involve the citizens throughout the organisation and implementation phase of the project. Procedure's transparency will create trust and will strengthen community's acceptance. Link: N/A	0.4
C: I don't know	Previous experience with energy communities plays a key role for the acceptance of your initiative by the general public. Good success examples of the past could act as a driver for the acceptance of the project as people are already familiar with the concept and trust has been already established. People are also aware of the positive impact that energy communities may have in their area (e.g. creation of new jobs, reduced energy bills etc.). From the other hand, bad previous examples could act as a barrier for the initiative as citizens will be hesitant and skeptical to join or accept the new project. Before starting your initiative, you should first examine the experience of the local community with energy community projects. Link: N/A	0.25

Annex II: Initial brainstorming on users/cases where the tool could be relevant

The main goal of this "initial brainstorming" was to define the users of the self-assessment tool in order to develop a useful tool for the targeted audience and, at the same time, assessing and identifying the bioenergy activities and resources to be considered in the tool.

1. User A: Current or new RESCoops

Current or new RESCoop that are interested in assessing the feasibility of developing bioenergy heating solutions.

Examples	Technologies involved
RESCoop actor wiling to create a biomass logistic centre to process biomass and sell it to their associates.	Developing a pellet, briquettes or woodchips/hog fuel plant
RESCoop actor acting as intermediate in charge of biofuels supply (as pellets, woodchips, briquettes, …), storage and distribution to their associates.	No technologies involved, maybe they just need a warehouse to storage the biofuels
RESCoops, actor considering the feasibility of developing a biomethane plant and selling the biogas for some of their associates.	Biomethane plant
RESCoops, that are considering the feasibility of commercialize biomethane for their associates.	No technologies involved
RESCoop, actor considering the feasibility to establish a heating and cold energy production to supply some of their associates.	District Heating Co-generation Biomass boiler
RESCoop, actor currently producing electricity willing to produce also heating energy to cover all the energy demands of their associates.	PV, solar thermal, thermal storage, wind,… Cogeneration District Heating
RESCoops that are considering to install biomass boilers to associates' homes, or to public buildings, swimming pools, sports centres, etc.	Biomass boiler

2. User B: Neighbourhood, municipality, farmers, …

User B apply to a group of small entrepreneurs (such as neighbours, municipality, farmers …) considering the feasibility of creating a heating supply community.

Examples	Technologies involved
Neighbourhood considering joining the energy cooperative in order to cover their domestic energy demands.	District heating Co-generation Biomass boiler
Neighbourhood considering to purchase bioenergy to cover the energy demands (for instance through a ESCO)	No technologies involved for the community they just paid for kWh consumed
Neighbourhood that currently has a district heating/co-generation plant working with gas or other fossil fuel, seeking to assess the investment required to swich to a renewable source and work with biomass.	District heating Co-generation Biomass boiler
Municipalities (small villages) considering covering their energy demand by means of renewable energy resources (electricity and heating)	District heating Co-generation Wind, PV, solar thermal
Municipalities willing to use the biomass from garden cleaning parks, public forest or urban solid waste to cover their energy demands or the energy demand of public buildings For instance, the municipality could invest and install individual biomass boilers in public buildings, sports centres etc. and use the biomass from garden cleaning parks, public forest etc.	District heating Co-generation Biomass Boiler
Vineyard, fruits, olive, … farmers can join the energy cooperative in order to create a biomass logistic centre that would be located in the surrounding area where the biomass can be gathered after pruning and processed (woodchips, briquettes, pellets, …) and sold to the final consumers.	Developing a pellet, briquettes or woodchips/hog fuel plant
Farmers can build a value chain that exploits agricultural residues (prunings, plantation removal etc.) and invest in biomass boilers in public buildings or use them as fuel in District heating units (or even CHP unit).	District heating Co-generation Biomass boilers
Pig farmers face a relevant inconvenience associated with the large amount of slurries they need to dispose. They could join the energy cooperative in order to establish a biomethane plant (fed by the slurry) seeking to cover heating and electrical demand of the farms in the surrounding area.	Biomethane plant

3. User C: Other Cooperatives

Other cooperatives outside of the energy concept as for instance Agro-industrial Cooperatives that would like to create a new business line based on biofuel products.

Examples	Technologies involved
Cooperatives of animal food and feed sector, normally account with a pelletization plant, so they can be also a cooperative of biofuels pellet (for energy purposes) from herbaceous material (since this is the kind of material they are used to).	Developing a pellet, briquettes or woodchips/hog fuel plant
Cooperatives of olive oil sector can consider using the olive pruning for biofuels production.	Developing a pellet, briquettes or woodchips/hog fuel plant
Cooperative of fruit can consider using the fruit pruning and biomass obtained from the plantation removal for the biofuels production.	Developing a pellet, briquettes or woodchips/hog fuel plan
Vineyard cooperatives or distilleries can consider using the vineyard pruning for biofuels production	Developing a pellet, briquettes or woodchips/hog fuel plan
For the cooperatives with the prunings (vine, fruit, olives etc.) could be also that they invest in a local small CHP (for cogeneration) or on a District heating unit or install several individual boilers for heating in public buildings	District Heating Cogeneration Biomass boilers
Livestock Cooperatives can consider using the slurry for the production of biomethane. They have to deal with their residues in an environmentally friendly way (e.g. a dairy production facility or a production unit with livestock). Perhaps such actors can also be relevant potential community members in some cases.	Biomethane

4. User D: Industrial companies

Industrial companies looking for save cost and become more sustainable through a community business case.

Examples	Technologies involved
A group of companies inside of the same industrial park willing to create a community in order to cover their heating demands (heating, sanitary hot water, cold).	District heating Co-generation Biomethane

Examples	Technologies involved
A group of industrial companies inside of the same industrial park (or the surrounding area) willing to create a community in order to produce steam seeking to cover the thermal energy demands needed for their processes.	District heating Co-generation Biomethane
Perhaps a group of companies that start using biomass to cover their thermal energy demands and send the excess of heat to DH network?	District heating
Local industries can join with famers (for instance) and use the waste/biomass to produce biofuels or community bioenergy services	Developing a pellet, briquettes or woodchips/hog fuel plan District heating Co-generation Biomethane Biomass boiler