UNLOCKING THE COMMUNITY BIOENERGY POTENTIAL

D2.4 BECoop Toolkit – Final

OCTOBER 2022

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	D2.4 BECoop Toolkit - Final
Work Package	WP2
Task(s)	T2.2 Development of the BECoop toolkit
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Date	October 2022

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	05/10/2022	Draft version distributed for quality review	CIRCE
V0.2	20/10/2022	Internal quality review	WUELS, CERTH
V0.3	22/10/2022	Review by the project coordinator	WR
V1.0	25/10/2022	Final version submitted to the EC	WR

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About

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

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

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

Project partners

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Executive Summary

Note: D2.4 is registered as a website-type deliverable. The BECoop consortium decided to also develop a respective report, as presented herein, providing guidance on the toolkit's user interface and experience. The BECoop toolkit is accessible by visiting the BECoop project website or by directly accessing: https://becoop.fcirce.es/toolkit/

BECoop T2.2 aims to create **a toolkit of already existing tools that can work complementary to the support services offered by the project, specifically assisting towards the development and operation of community bioenergy and heating projects**. The aim of this deliverable is to provide an explanation about how this toolkit has been developed, how it should be used and what kind of tools can be found in it. The report's chapters are briefly presented below:

- In the first chapter an introduction can be found.
- Secondly, the methodology that was followed for the selection of the tools, as well as for the implementation of the toolkit is described.
- In the third chapter, a brief guideline is created so it can serve as a manual to potential users of the toolkit. Next, the toolkit is described. More specifically this section provides information regarding i) the structure of the toolkit ii) the categorization of the tools iii) and the way they are presented. This section serves as a summary that provides a clear picture of the most important information available.
- The fourth chapter outlines the major dissemination actions that were organised in order to disseminate the tool to the wider audience up until October 2022.
- The fifth chapter offers more information regarding the metrics of the BECoop Toolkit platform and the numbers of the visitors.
- Lastly, some conclusions were drawn regarding the aim of the toolkit, its updatable character, and the active collaboration between the partners in order to populate this toolkit with the most relevant tools in the bioenergy sector.

With respect to the first version of this deliverable (D2.3. BECoop toolkit – First) published in October 2021, D2.4 incorporates a series of enhancements as indicatively presented below:

- The second round of in-depth analysed tools, as well as the criterion for the selection of these tools. The in-depth analysis of the tools is also included in Annex II ***(chapter 2.3)***
- Update of the subcategories under which the tools are organised ***(chapter 3.2.2)***
- Addition of the searching option in the toolkit ***(chapter 3.2.3)***
- Addition of a survey to measure the user's satisfaction levels ***(chapter** Error! Reference source not found.**)***
- Production of a short video to be used as a guide for the BECoop toolkit ***(chapter** Error! Reference source not found.**)***
- Presentation of dissemination efforts for the wider promotion of the BECoop toolkit ***(chapter** Error! Reference source not found.**)***

For further information, an Annex section has been incorporated at the end of the document, including supplementary information (for instance, the complete list of tools and the in-depth study of the selected tools).

1 Introduction

The energy cooperatives model is a business model where citizens jointly own and participate in renewable energy or energy efficiency projects. They are also known as RESCoops. RESCoops bear a strong potential to lead the clean energy transition to energy democracy, while respecting 7 major principles, as outlined by the International Cooperative Alliance[1]. These principles include: voluntary and open membership; democratic member control; economic participation through direct ownership; autonomy and independence; education, training, and information; cooperation among cooperatives and concern for community. Some of the advantages of this model are the following: RESCoops keep money in the local economy, foster social acceptance for renewable energy, keep the individual investment affordable, benefit the local community, take action on energy or reduce the energy poverty[2].

Energy communities, that were recently introduced in the EU legislation, constitute a main focus area for the BECoop project. Energy communities organise collective and citizen-driven energy actions that will help pave the way for a clean energy transition, while moving citizens to the fore. They contribute to increasing public acceptance of renewable energy projects and attracting private investments in the clean energy transition. At the same time, they have the potential to provide direct benefits to citizens by advancing energy efficiency and lowering their electricity and/or heating bills. Moreover, by supporting citizen participation, energy communities can help in providing flexibility to energy systems through demand-response and storage[3].

However, while energy community is about to play a huge role for the future energy transition, bioenergy has a very slow development in decentralised energy production. BECoop's ambition is to foster a broad deployment of bioenergy technologies in the heating sector across Europe by providing all the necessary conditions and support tools for unlocking the underlying market potential of community bioenergy. By using the BECoop support services and tools, energy communities and authorities will be able to mobilise citizens around existing or new community bioenergy initiatives, boost local bioenergy demand by improving its image and social acceptance, and increase feasibility of their endeavours by identifying suitable technical, business and financial solutions, as well as by pooling expertise and partnerships from the wider EU bioenergy ecosystem.

To help improve the situation of this bioenergy sector in the European community area, several tools will be developed under the BECoop project. Specifically, **the toolkit described in this document is a repository of already existing tools, which have been identified as useful for any actor present in the bioenergy value chain or in the energy community model value chain.**

Currently in the BECoop toolkit, 65 tools have been identified, classified, studied, and summarised in order to present them to potential users in a simple and user-friendly way. The toolkit is presented in a web-based interface, and the tools have been classified in three pre-identified categories: Business model, community management and technical. The type of stakeholder to which these tools are addressed have also been identified. From the 65 identified tools, 13 of them have been studied in-depth, in order to create a user's manual. These have been selected via partner voting, selecting what the partners think the most useful tools are, for a bioenergy heating community use, and thanks to the inputs obtained from previous tasks of the project (T1.2 and T1.4).

[1] https://www.ica.coop/en/cooperatives/cooperative-identity
[2] The RESCoop model – RESCoop.eu
[3] Energy Communities – European commission. Available at: https://ec.europa.eu/energy/topics/markets-and-consumers/energy-communities_en

2 Methodology for the development of the BECoop toolkit

This section describes the tools' selection process and the contents that were chosen to be studied. A first search for tools related to bioenergy and community models was carried out. This list was shared with all project partners, so they could access all tools collected so far, and propose additional tools.

The full list of the tools identified so far can be found in Annex I. After a first research round, 40 tools were identified and registered. After the project partners' contribution, this number grew up to almost 70 tools. After the second period, 3 additional tools were included, but some of the firstly identified ones where no longer available. This ends up with a total of 65 tools finally included in the BECoop toolkit.

2.1 Descriptive structure for each tool

For each tool, a set of guiding information was developed.

This information includes:

- **Name:** Name of the tool
- **Logo:** Logo related to the tool
- **Link:** Link to the page where the tool can be found
- **Classification:** Tool's classification as business, technical, community model tool or related project.
- **Sub-category:** This categorises the tool by its main function – tool, calculator, map, database, policy, supply chain, report.
- **Type:** A first categorisation focused on the characteristics of the tool (assessment report, bioenergy relevant tool, digital innovation tool, economic tool, financing tool, financing books, food info, observatory, geographic information system, policy catalogue, good practices example, project publications, report and support services, soil impact calculation, technical and business model, policy, technical calculator). *This first type-categorisation takes place to internally organise the tools, so in further steps they are easier to be classified – this part, so far, is not implemented in the web page.*
- **Summary:** A brief summary that gives the main information and evaluation of the tool.
- **Main objective:** The main outcome of the tool, the information that can be obtained thanks to its use.
- **Target user:** Classification of the pre-identified stakeholders that can benefit from the use of this tool: biomass owners, biomass management companies, equipment manufacturers, Energy Service Companies and installers, associations, cooperatives / energy communities / RESCoops, investors, research centres / universities, public institutions, end users (as consumers of bioenergy).

- **Organisation developing/maintaining the tool:** The company/companies, project or organisation that has developed or is in charge for the maintenance of the tool.

An example of the analysis done for each tool is depicted in Figure 1

Tool	Logo	Link	Type (digital social innovation tools, bioenergy relevant tools, etc.)	Technical, community model, business.	Subtype	Summary of the Tool
BERST: BioEconomy Regional Strategy Toolkit	BERST Building Regional BioEconomies	https://berst.vito.be/about_berst	Policy catalogue, good practice examples	Business	Policy	Policy database, search by countries, type of measure, feedstock, product targeted....

Main objective	End user	Organisation/project that developed /maintains the tool
This Catalogue of Instruments & Measures provides information on: 1) Instrument & Measures per country of relevance to BBE. Beside the same regulation and policy information per country it also contains information on regional case studies and good practice examples.	Public institutions (regional, national EU) Consumers of bioenergy, Investors, Research Centers	WR (coordinator), Asociación Madrid Plataforma de la Biotecnología, Fundación Parque Científico de Madrid, Region of Western Macedonia, Keski-Suomen Itto, Westland / Zuid Holland, BioCampus Straubing GmbH, Biobased Delta, Cambridge Econometrics Limited, Imperial College of Science, Technology and Medicine, Flemish Institute for Technological Research, Centre for Research and Technology Hellas, University of Ljubljana, Fachagentur Nachwachsende Rohstoffe e.V./ Agency for Renewable Resources, JAMK University of Applied Sciences

Figure 1. Example of information gathered about each studied tool

2.2 In depth analysis – 6 tools by M12

Asides from a brief description for each identified tool, 6 tools from the full list were further studied in depth. The responsible partners for this were WUELS and CIRCE. In order to decide the most interesting tools, a voting between the partners was held (5 votes per partner). The results of this voting are shown in Table 1.

Table 1. Preference results for the in-depth study of the tools

Number	Name of the tool	Why do you think this tool could be helpful	Number of votes	Organization								
1	RESCoop Handbook	It looks nice in order to have a first idea for the invetsmenet schemes	5		White Research	SEV		CERTH/ESEK	WUELS	OBS		
4	Hotmaps	Interesting in order to examine the possibilities/potential of an area.	5		White Research	SEV	Goiener		WUELS	OBS		
5	BioEnergy Association: Best practice guideline for life cycle analysis of heat plant projects	Interesting for financial risk analysis	5	CIRCE	White Research	SEV	Goiener			OBS		
10	BioRaise	Tool to organize the logistics of the supply chain of the created bioenergy projects as it shows the biomass availability of different biomass types and can calculate some basic collection costs	4	CIRCE				CERTH/ESEK	WUELS	OBS		
9	uP_Runing Observatory		3				Goiener	CERTH/ESEK	WUELS			
11	S2Biom	A tool to investigate the biomass potential at different areas of interest where we would like to develop a bioenergy community project. Has more functionalities that would be interesting when creating new bioenergy community projects such as BIO2Match (atch etween biomass resources and conversion technologies), BeWhere (where new biomass conversion installations can be built), biofuel database and more, but need free registration in order to access them.	3					CERTH/ESEK	WUELS	OBS		
2	Phyllis2	Very easy to use. A lot of information that can be used	2	CIRCE	White Research							
3	Agrobiomass Observatory: Agrobioheat	Very good for searching for partners and networking	2		White Research			CERTH/ESEK				
6	BEAT2	Techno, environment assessment of different biotechnologies	1				Goiener					
7	AGRIFORVALOR	Techno economic calculations	1				Goiener					
8	BioTrade 2020+		1				Goiener					
12	BERST: BioEconomy Regional Strategy Toolkit	Contains a lot of information of policies and regulations filtered by country, type of biomass, etc. Relatively easy to use. Policy tool kit	1	CIRCE								
13	Loomio	Collaborative decision making tool	1	CIRCE								

Once the tools were selected, the next step was to decide the scope of the in-depth analysis. A tentative template was created and shared with WUELS, and after gathering their feedback, the final template to be filled in is shown in Table 2.

Table 2. Template to be completed for each chosen tool for the in-depth analysis

Name of the tool	
Logo	
Link	
Brief Description	A short and clear description on what are the benefits and why they could be beneficial for bioenergy cooperative projects
Type of tool	Digital social innovation, bioenergy relevant tool, policy, business model.
Subtype	Report, maps, tool, template, spreadsheet.
Related to	Environmental information, technical information, business model, policy information, social management, supply chain.
Most valuable information that can be obtained	
How does the tool work / manual of the tool	
Who is this tool destined to (potential users)	
How can this tool affect/benefit or help a relevant stakeholder?	
Additional information of the tool	How useful do you find it, from the end user point of view? What else can be added to make the tool more complete? Any complementary information needed?
Organisation/project that developed/manages the tool	
Responsible for the study of the tool and organisation	

Finally, the chosen tools for the in-depth analysis, along with the responsible partner are shown in Table 3.

Table 3. Tools studied in-depth by each organization

WUELS	CIRCE
BioEnergy Association: Best practice guideline for life cycle analysis of heat supply projects	***Hotmaps***
Handbook on Investment schemes for RESCoop projects	***Loomio***
-	***S2Biom***
-	***BioRaise***

These in-depth analyses are presented in Annex II. A screenshot of how these tools are displayed, under the BECoop toolkit web interface, is provided below.

For all the tools for which an in-depth analysis is performed by BECoop partners, a user manual will be available for all respective toolkit users and visitors. They will be able to access such additional information by clicking on the "*Detailed info*" button, as shown in Figure 2.

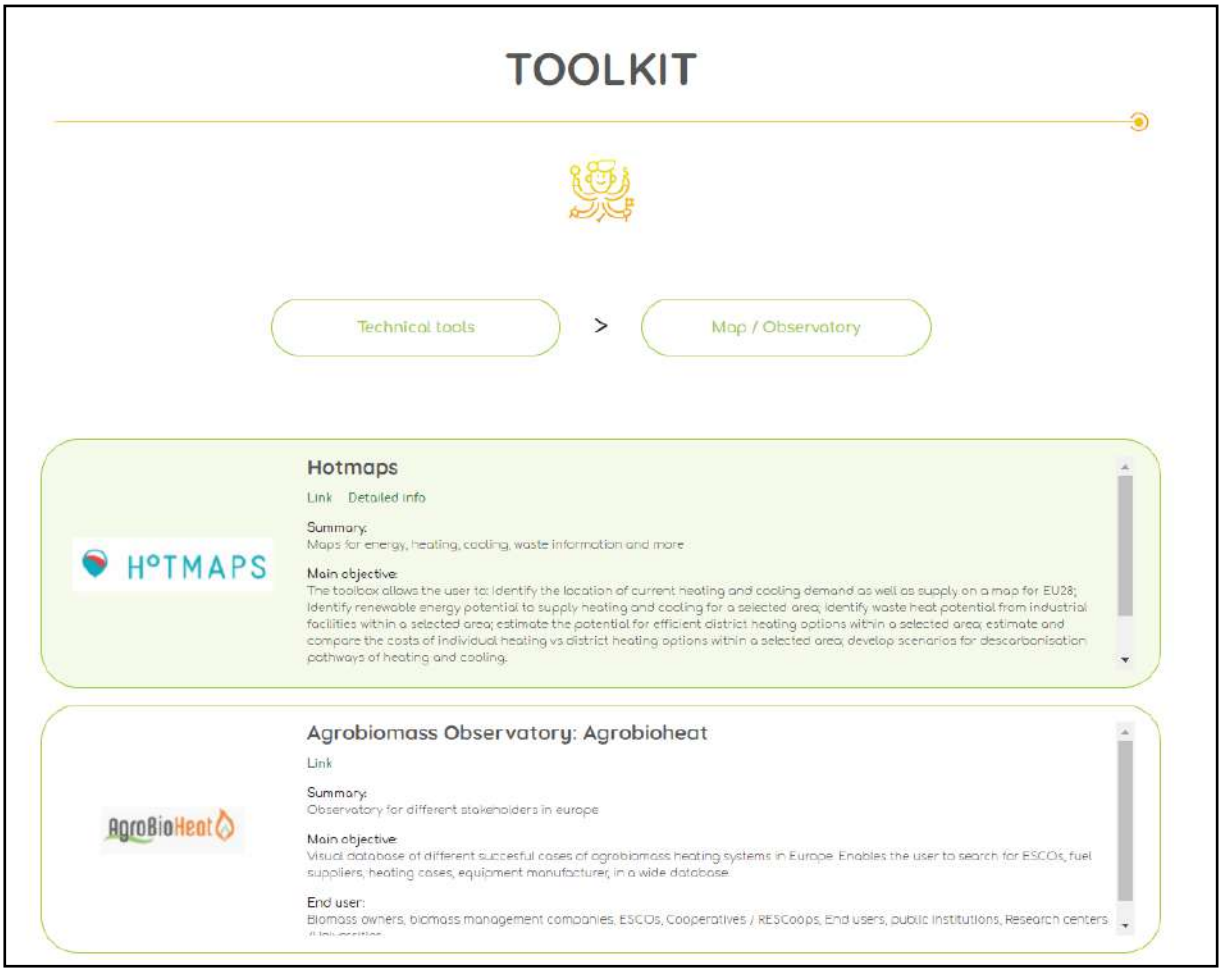


Figure 2. Example of highlighted and detailed info of one of the studied tools

2.3 In depth analysis – 6 additional tools by M24

Six additional tools have been deeply studied during the second period. Additionally, and by taking advantage of a webinar performed by the developers of the identified tool (BioPlat) - in which the main functions and outcomes were explained - it was decided to complete an extra in-depth analysis (as this tool was not initially selected). This way, the set of the in-depth studied tools grew and provided valuable information to the users. The responsible partners for this in-depth analysis, similar to the first period, were WUELS and CIRCE.

In order to decide on the most interesting tools, a voting process took place again (5 votes per partner). The results of the second round of voting are shown in Table 4.

Table 4. Preference results for the second round of the in-depth study of the tools

Number	Name of the tool	What necessity does this tool help in [Write here what identified necessity does this tool involves, keeping in mind the BECoop cases and new energy communities]	Number of votes	Institution that votes for this tool								
1	uP_Runing Observatory	An easy-to-use tool where mainly agricultural residues (APPR/ Agricultural Pruning Plantation Removals) experiences are recorded, as a means to increase the awareness and knowledge about agricultural biomass use in Europe. The Observatory records APPR biomass productivity from field sampling, mechanized collection experiences and success cases of related value chains. The Observatory can be useful for practitioners and entrepreneurs, energy communities interested in APPR biomass exploitation.	2	CERTH			SEV					
2	Agrobiomass Observatory: Agrobioheat	Visual database of different succesful cases of agrobiomass heating systems in Europe. Enables the user to search for ESCOs, fuel suppliers, heating cases, equipment manufacturer, in a wide database. Can be useful for actors starting/ ehancing biomass exploitation value chains, as a tool for searching partners and for networking.	8	CERTH	ESEK	WR	SEV		CBS	GOI	WUELS	Q-PLAN
3	Phyllis2	Database of a great variety of biomasses where you can find a detailed analysis of their composition and properties (macroelements, heating value, trace elements...) plus classification, literature. Can be useful when setting up biomass value chains with new feedstocks for which you need some initial basic information.	3	CERTH	ESEK		SEV					
4	AGORA VOTING	Open-source online voting software that protects the privacy of the vote and makes elections end-to-end verifiable	1			WR						
5	Your Priorities	Connects citizens and government. Ideas can be debated, with points awarded for and against and debate points prioritised.	4			WR		CIRCE	CBS		WUELS	
6	BioGrace I and II - GHG	Challenge identified in D1.4: Decrease life cycle GHG and air quality impacts of BE. The tool can support assessing the GHG emissions of different projects. Harmonises the European calculations of biofuel GHG emissions that have to be made to comply with the Renewable Energy Directive and the Fuel Quality Directive	3					CIRCE	CBS		WUELS	
7	THERMOS	**Interesting to include business models tools.** The software is designed to optimise local district energy network planning processes and sustainable energy master planning to facilitate the deployment of new low-carbon heating and cooling systems and a fast upgrade, refurbishment, and expansion of existing systems.	2					CIRCE		GOI		

During this second round of in-depth analysis of the tools, the eligible tools were selected and presented to the partners based on the identified needs of the pilot initiatives, and by trying to include a representative for each one of the categories (Technical: Agrobiomass Observatory, Phyllis2, BioGrace I & II; Business model: THERMOS – although it has been categorised as a technical tool, it also includes a series of assets that can help developing an effective business model for a new or existing community; and Community model: YourPriorities). The tools that were included in the voting process were selected based on the knowledge gained in previous tasks of the project (D1.2. Regional and EU framework and value chain conditions affecting community bioenergy uptake; and D1.4. Definition of community bioenergy heating uptake needs and challenges). Thanks to these previously submitted deliverables, a series of supporting, as well as hindering factors and challenges that the bioenergy community energies are facing, were identified and categorised. Finally, the list of tools has been selected aiming to address these challenges and boost the identified supporting factors. These factors are presented in Table 5,

Table 6 and Table 7.

Table 5. Identified hindering factors addressed by the selected tools

Identified hindering factors that can be solved or approached by the use of certain tools, based on those included in D1.2, section 2.2 - Desk research at EU level		
Tool	**Expected hindering factor to face**	**Type**
uP_Runing observatory	The use of biomass for energy purposes may involve non-ecological production of biomass for other purposes	Technical
	Solid biofuels require relatively large space for storage.	
AgroBioMass Observatory	The use of biomass for energy purposes may involve non-ecological production of biomass for other purposes	Technical
	Solid biofuels require relatively large space for storage.	
Phyllis 2	The use of biomass for energy purposes may involve non-ecological production of biomass for other purposes	Technical
AgoraVoting	RESCoop development depends on national and regional governments policy	Political
BioGrace - GHG	Emissions from biomass combustion	Technical
	Lower heat and electricity final costs from fossil fuels.	Economic
YourPriorities	Trust between local community and people leading the initiatives can boost participation in energy community projects	Social
	Civic minded behaviour and memories from the community's past can shape citizens perceptions	
	RESCoop development depends on national and regional governments policy	Political
THERMOS	Lower heat and electricity final costs from fossil fuels.	Economic
	Building a heating network in an existing infrastructure is complex.	Technical
	The build a central heat and power plant is complex.	Technical

Table 6. Identified supporting factors addressed by the selected tools

	Identified supporting factors that can be solved or approached by the use of certain tools, based on those included in D1.2, section 2.2 - Desk research at EU level	
Tool	**Expected support factor to empower**	**Type**
uP_Runing observatory	Promotion of activities increasing the environmental awareness of society.	Political
	Step by step RESCoops creation in the energy transformation of the region.	Political
	Presence of organisations with experience in the functioning of the energy communities	Legal
	Lack of promotion of energy communities in individual EU Member States that would reach the local community, especially those living in rural areas.	Social
	There is a wide range of machines and devices available on the market, at every stage of the logistics chain, necessary for the operation of energy communities based on solid biofuels	Technical
AgroBioMass Observatory	Promotion of activities increasing the environmental awareness of society.	Political
	Step by step RESCoops creation in the energy transformation of the region.	Political
	Presence of organisations with experience in the functioning of the energy communities	Legal
	Lack of promotion of energy communities in individual EU Member States that would reach the local community, especially those living in rural areas.	Social
	There is a wide range of machines and devices available on the market, at every stage of the logistics chain, necessary for the operation of energy communities based on solid biofuels	Technical
Phyllis 2	Requirements and exploitation conditions for boilers fired by solid fuels.	Technical
AgoraVoting	Trust between local community and people leading the initiatives can boost participation in energy community projects	Social
	The EU strives to promote international cooperation among energy communities.	Political
	Promotion of activities increasing the environmental awareness of society.	Political
BioGrace - GHG	The combustion of fossil fuels leads to a surplus of CO2 emissions.	Environmental
	The GHG emission related to biomass logistics is lower in comparison to fossil coal	Environmental
YourPriorities	Calling to transpose the new directives into EU members national law within a period of 2 years, that is by 2021	Political
	Trust between local community and people leading the initiatives can boost participation in energy community projects	Social
THERMOS	Requirements and exploitation conditions for boilers fired by solid fuels.	Technical

Table 7. Identified challenges addressed by the selected tools.

Identified challenges that can be solved or approached by the use of certain tools, based on those included in Annex I of D1.4		
Tool	**Expected challenge to face**	**Type**
uP_Runing observatory	Improve social poor perceptions about bioenergy benefits	Social
	Motivation to use more environmentally friendly solutions such as biomass	Social
	Local representation of all type of stakeholders along the value chain	Economic
	Tackle difficulties regarding biomass final transportation, storage and management	Technical
AgroBioMass Observatory	Improve social poor perceptions about bioenergy benefits	Social
	Motivation to use more environmentally friendly solutions such as biomass	Social
	Local representation of all type of stakeholders along the value chain	Economic
	Tackle difficulties regarding biomass final transportation, storage and management	Technical
Phyllis 2	Ensure an optimal fuel quality (humidity, homogeneity and energy density)	Technical
AgoraVoting	Improve social poor perceptions about bioenergy benefits	Social
	Local representation of all type of stakeholders along the value chain	Economical
	Increase low social cohesion, voluntary movements and perception of common goods for	Social
	Engage/reach citizens from vulnerable communities	Social
BioGrace - GHG	collective actions / cooperatives	Ecological
YourPriorities	Engage the local administration/government to commit to long-term BE project development.	Political
	Convince habitants to take care about the environment.	Ecological
	Administrative and procedural barriers (energy market integration, legal status, grant applicati	Legal / Administrative
	Clarification of legal status of energy communities to market heat	Legal / Administrative
	Handle uncertainty regarding BE regulatory framework	Legal / Administrative
THERMOS	Economic viability, investment risk (high initial investment, lack of demand)	Economical
	Achieve a sustainable and clear business model for all actors in the value chain	Economical

Similar to the first period, the partners were able to vote for the tools they found most useful for the initiatives, and even propose new ones. Differently from the first period, the number of votes admitted per partner were restricted to three. This way, the final in-depth studied tools for the second period are the following:

- Agrobiomass Observatory
- YourPriorities
- BioGrace I & II
- Phyllis2
- THERMOS

Two important facts need to be clarified here. In the first case, as explained previously, an additional tool (BioPlat) has been analysed taking advantage of a webinar presented by the developers of the tool. In the second case, as it can be seen in Table 4, the voting resulted in a tie between two tools (uP_runing observatory and THERMOS). The favourable decision towards THERMOS was accorded due to the similarity of the uP_runing observatory to the Agrobiomass observatory, as, for instance, both of them are web based geographical information systems that provide successful use cases for the use of agricultural prunings and plantation removals (in the uP_runing case) and for the use of agricultural biomass for energy (in the Agrobiomass observatory case). In this sense, and, in order to provide a wider range of options to the users, to gain a deeper knowledge and to be able to transfer it to the pilot areas, the THEMOS tool was identified as a more adequate solution.

The final chosen tools for the in-depth analysis, along with the responsible partner are shown in

Table 8.

Table 8. Tools studied in-depth by each organization during the whole period

WUELS	CIRCE	
BioEnergy Association: Best practice guideline for life cycle analysis of heat supply projects	Hotmaps	First round of analysis
Handbook on Investment schemes for RESCoop projects	Loomio	
	S2Biom	
	BioRaise	
Phyllis 2	Agrobiomass observatory	Second round of analysis
	BioGrace I	
	BioGrace II	
	Thermos	
	YourPriorities	
	BioPlat	Additional analysis

These in-depth analyses are presented, alongside with those developed in the first period, in Annex II.

3 BECoop Toolkit overview

The BECoop toolkit is a repository of already existing tools related to community and/or bioenergy projects, that will be accessible through the project's web page. The toolkit can work complementarily to the support services offered by the project, assisting the development and operation of community bioenergy and heating projects.

As it is shown in Figure 3, on the website of BECoop project (https://www.becoop-project.eu/) there is a direct link that transfers the user to the main page of the developed toolkit.

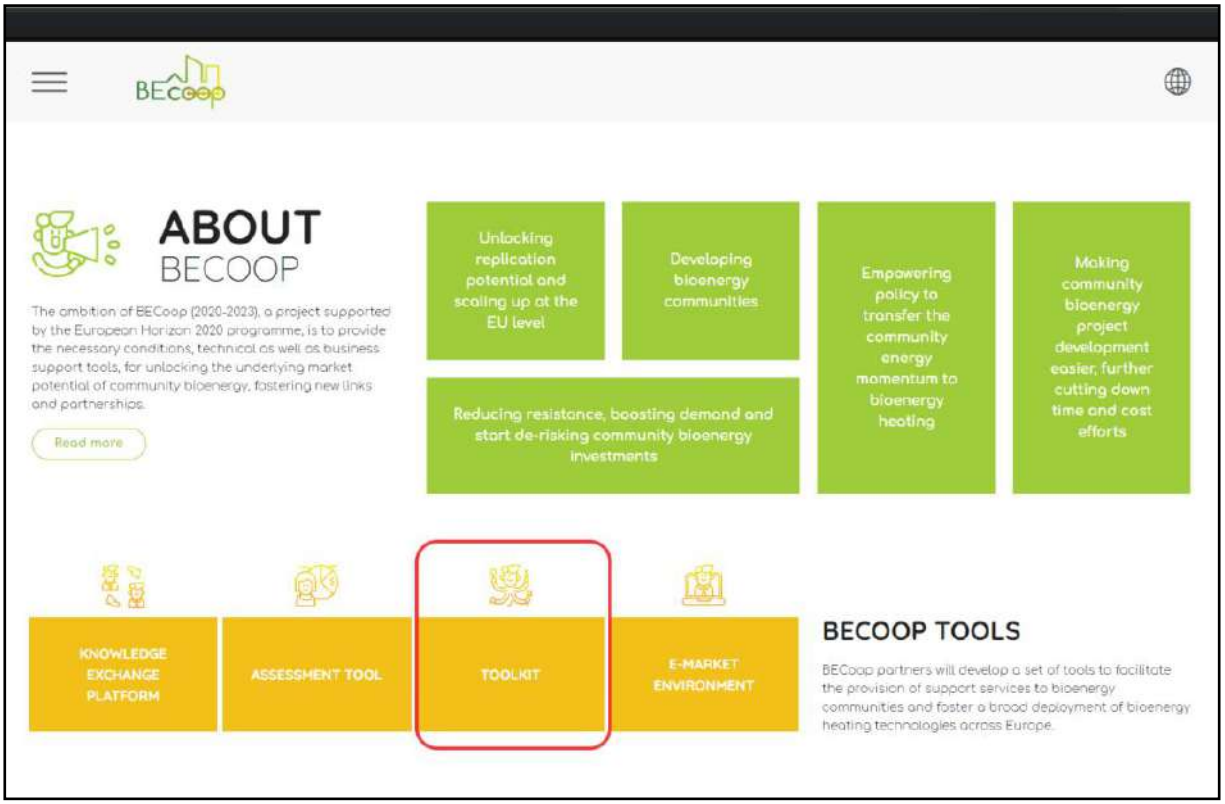


Figure 3. Access to the BECoop toolkit from the BECoop web page

The tool can also be accessed via the BECoop Knowledge Exchange Platform (KEP)

3.1 Main page

Once the user clicks the "Toolkit" link, he/she is directed to the welcome page of the BECoop toolkit. In this page, two different sections may be found, as shown in Figure 5. In the right side, five buttons will appear. In the left side, a description panel about the task and general information about the project can be found.

The description panel includes the following sections:

- **Welcome to the BECoop toolkit:** Context and description of the toolkit.
- "During the last months, the BECoop project (Grant Agreement № 952930), has been studying a set of tools identified as useful for the energy communities and bioenergy sectors. In this sense,

we have compiled and classified all of these tools so we can create a user-friendly web where you can find a solution for all of your previously identified problems!"

- **What can you find here*:*** i) Main toolkit's categories and brief explanation ii) link to the self-assessment tool also developed by the project (in the framework of T2.1).

"You will find four main categories of tools, and a direct link to the self-assessment tool, also developed by the BECoop project. These main categories include:

  - Technical tools: Destined to solve all kinds of technical issues.
  - Business model tools: Related mainly to financial models and supply chain issues, as well as policy databases or strategic planning's.
  - Community model tools: Community building tools that can help discuss and deal with difficult communication and management issues, in addition to voting tools.
  - Related projects: Projects related to renewable energies, energy communities, energy efficiency or circular economy."

- **Who is this toolbox for:** What is the main target of the toolkit – main actors that can be benefited from it.

"This toolkit, developed in the frame of the BECoop project, supports developers and operators of community bioenergy and heating projects. It is developed to support your bioenergy community's journey from the starting point to the growing stages and its operational steps. It can also help to scale energy community initiatives in your neighbourhood."

- **How can I use the toolkit?** Brief explanation of the categorisation and structure of the webpage.

"This toolkit is a user-friendly tool. It has been designed in a very intuitive way. Do you have a previously identified problem? Just go to the section that fits your problem the most! There you will be able to explore the differently categorised tools and select the one that suits you the most! The tools include a brief description, so you don't have to deeply study all of them to find your solution.

The toolkit is alive! It will keep evolving as the project advances, so keep in touch!"

An explanatory video has been included in this section, in order to facilitate the comprehension and navigation of the users through the webpage. An image of this section with the embedded video can be seen in Figure 4.

Figure 4. "How can I use the toolkit" section and the embedded video

- **About BECoop:** Project's description destined mainly to those who access the toolkit webpage from an outside link (not the BECoop webpage).

"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 tole 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 potentially 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 gran agreement No 952930."

At the same time, the links on the right side of the page correspond to the 4 pre-identified categories of the BECoop Toolkit. 1 additional box redirects visitors to BECoop self-assessment tool developed in T2.1.

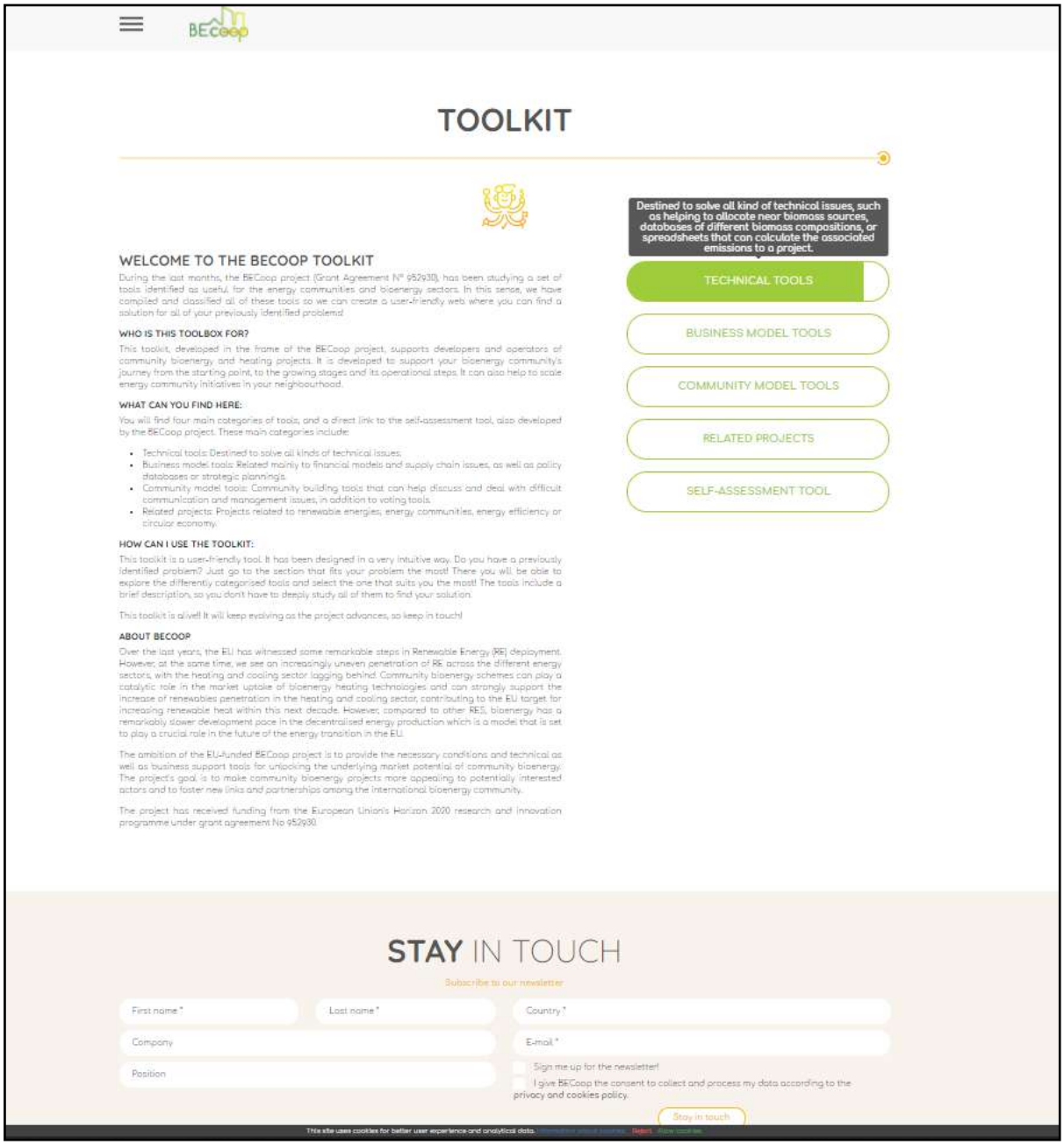


Figure 5. Main categories of the toolkit - selection page

3.2 Toolkit's navigation experience

The BECoop toolkit has been designed as a user-friendly environment where browsing is easy and genuine. It has a simple and intuitive menu, based on the 4 pre-identified categories under which the tools have been classified (technical tools; business model tools; community model tools; related projects). Once the user is aware of the kind of problem they have, it's only a matter of time to find a tool that fits their solution.

It's important to note that the tools that are listed are not developed by the BECoop project. **This toolkit serves just as a repository of already existing tools that might be helpful for bioenergy community projects.**

As it has been mentioned in the previous section, **thirteen of the tools have a detailed analysis, provided by the project, that gives a deeper insight of the utilities of the tools, as well as a user manual.** The analysis of the tools was developed during the two first years of the project, as it is stated in sections 2.2 and 2.3,

Table 8.

3.2.1 Tools' categorisation

When the mouse is hovered mouse over the links, a brief description of each tool category will appear (Figure 5). Indicatively, the main categories, together with the short description are also provided below:

- **Technical tools:** *Destined to solve all kind of technical issues, such as helping to allocate near biomass sources, databases of different biomass compositions, or spreadsheets that can calculate the associated emissions of a bioenergy project.*
- **Business model tools:** *Related mainly to financing models and supply chain issues, as well as policy databases or strategic planning.*
- **Community model tools:** *Community management tools, such as forums or communication solutions, that can help in discussing and dealing with difficult communication and management issues, as well as in decision making in democratic organizations.*
- **Related projects:** *Projects related to renewable energies, energy communities, energy efficiency or circular economy.*
- **Self-Assessment tool:** *The self-assessment tool is a tool developed in BECoop project for non-specialised users that want to start an initiative of a new community bioenergy project and assess the current situation of their project. The results of the tool provide a clear picture of the situation of the project, stating highlighting the strengths and weaknesses, and proposing a series of recommendations for further developing the bioenergy initiative.*

3.2.2 Tools' subcategories

The next step is the subcategory selection. This is a second layer of tools' classification in order to better differentiate them and help users find what best fits their needs. Here, tools are grouped based on their functionality. Tool's subcategories classification is presented in detail in Table 9. This structure is also depicted in Figure 6. In the case that the user selects the "self-assessment tool", he/she will be directed to the respective webpage. More information on the self-assessment tool can be found in Deliverable 2.1: "Self-assessment tool for evaluating current regional status and future potential".

Note: This subcategorization has suffered some minimal changes since the first version of this deliverable (D2.3 – BECoop Toolkit – First)

Table 9. Categories and subcategories of the tools

Categories	Subcategories
Technical tools	**Calculation resources:** Category that includes tools that allow to carry out a calculation related to technical aspects of bioenergy (for example: wet - dry basis converter, CO_2 emission calculator, calorific value calculator...). **Database:** Structured sets of data regarding biomass compositions, or supply volume

Categories	Subcategories
	Geographic information systems: Environment for collecting, managing, and analysing data. Rooted in the science of geography, GIS integrates many types of data, in this case focused on bioenergy and community energy. It analyses spatial location and organises layers of information into visualisations using maps and 3D scenes. With this unique capability, GIS reveals deeper insights from data, such as patterns, relationships, and situations, helping users make smarter decisions. **Observatory:** Web based solutions that allocate facilities or products in a map, thus allowing to monitor the state of different solutions or facilities, and the new developments that are deployed. **Bioenergy relevant tools:** Different types of software that offer a variety of solutions: technology exploring, mass and energy balances, spreadsheets, nutrient recuperation for soils, etc.
Business model tools	**Business relevant information:** Different types of software that offer a variety of solutions: Modelling to plan, develop and expand local area heating and cooling systems, development of private investment systems or guidelines for life cycle analysis of heat plant projects, among others. **Database:** Structured sets of data regarding business and finance, policy planning, etc. **Policy:** Catalogues of the different policy strategies presented in a web-based platform. **Report:** Documents whose purpose is to communicate a set of information collected and previously analysed according to business models. **Supply chain:** It allows access to assess the network of all the individuals, organisations, resources, activities and technology involved in the creation and sale of bioenergy, biomass, or anything related to a renewable energy community.
Community model tools	**Communication software:** Such as forums or open participation, decision making software. **Report:** Piece of information developed by other project, association or company that encompasses relevant information on how to create, develop or run a community, specially focused on RESCoops and renewable energy communities. **Tool:** Application that helps to develop a community, and assess the development, maturity and growth of an energy community.
Related projects	**Other projects:** Projects that share specific topics in common, such as community building, heating projects etc., and whose generated knowledge can be valuable for the toolkit users.

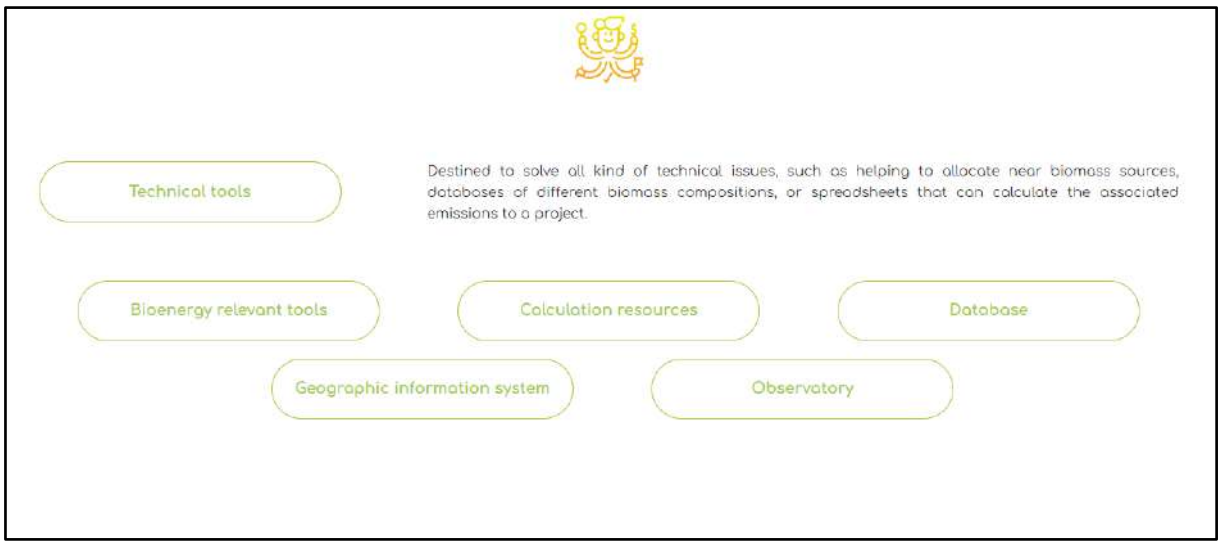


Figure 6. Subcategories of the studied tools

3.2.3 Tool's searching button

During the second period of the project, it was also developed an easier alternative for searching the tools included in the toolkit. More, specifically, a browsing option has been included so that, when a user knows which tool desires to use, or search it by name, can do so in an easier way. This solution is depicted in Figure 7.

Figure 7. Searching button added in the second period

3.2.4 Online presentation of the tools

Once the user selects a tool category/subcategory that best fits his/her needs, then a detailed list appears next with the specific tools that lie under the chosen options path, as shown in Figure 8.

The toolkit itself does not provide or generate any results. Instead, it provides this set of tools that can be separately used for the development or market uptake of bioenergy community projects.

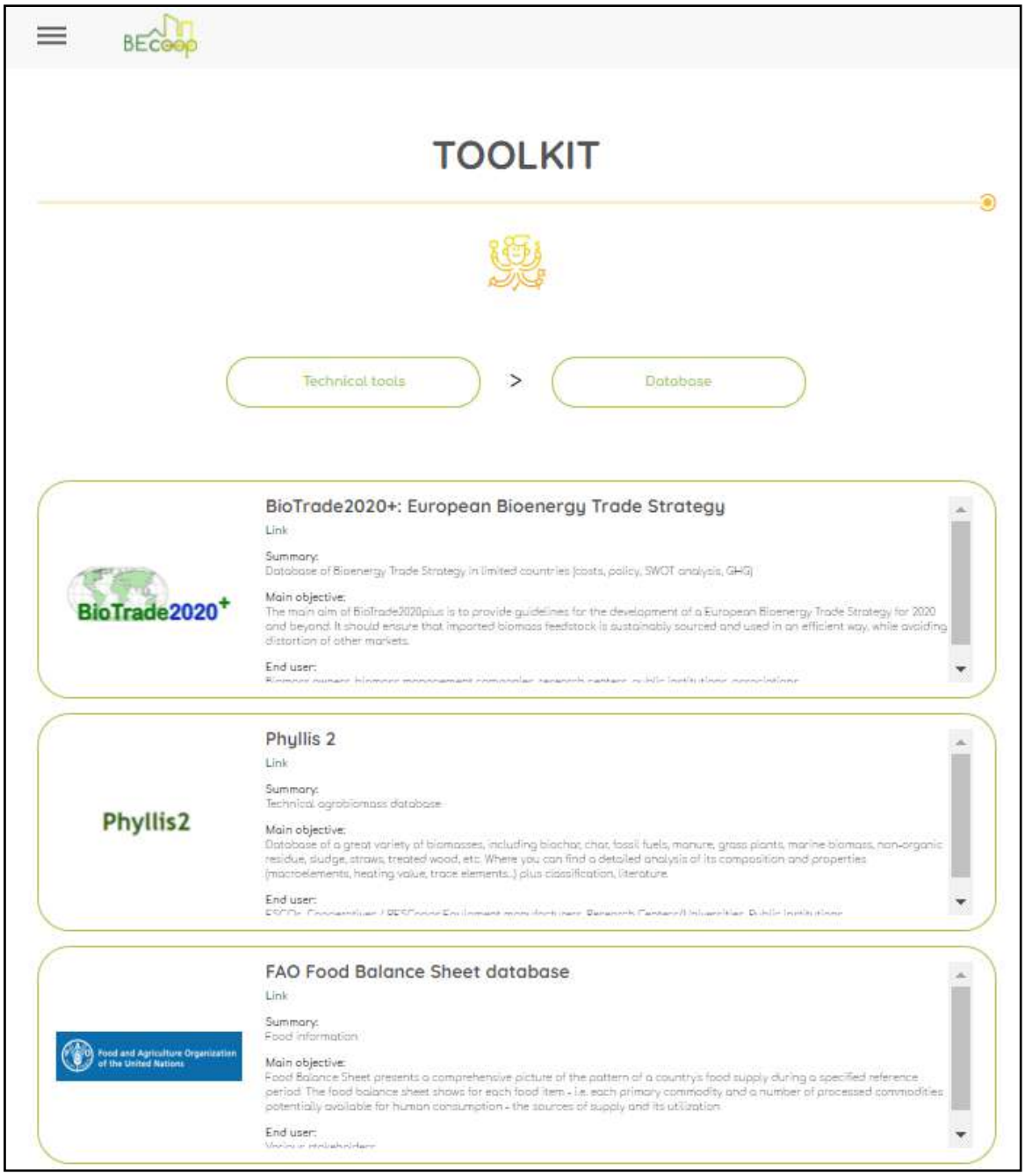


Figure 8. Presentation of the tools

Note: Tools studied in-depth and for which a manual and a user guide have been drafted can be found in Annex II of the current deliverable.

The tools' classification (technical, business model, community model or related project) and subcategory (database, calculator, atlas, etc.) will always be visible, in the upper menu navigation part of each page. Thus, inside the toolkit, it is really easy to go from one section to another. Once the mouse is hovered over the tool categories, a drop-down list will appear, allowing the user to change the section and the type of tools that are shown. This function is presented in Figure 9.

Figure 9. Drop-down menu in the tools categories

In Figure 9, the first tool (Hotmaps) is highlighted. Other tools, in other section are highlighted too. These are the tools that have been chosen and studied in a deeper approach and for which a manual and a user guide have been created.

Finally, as a piece of additional information, the final distribution of the tools per category is shown in Figure 10.

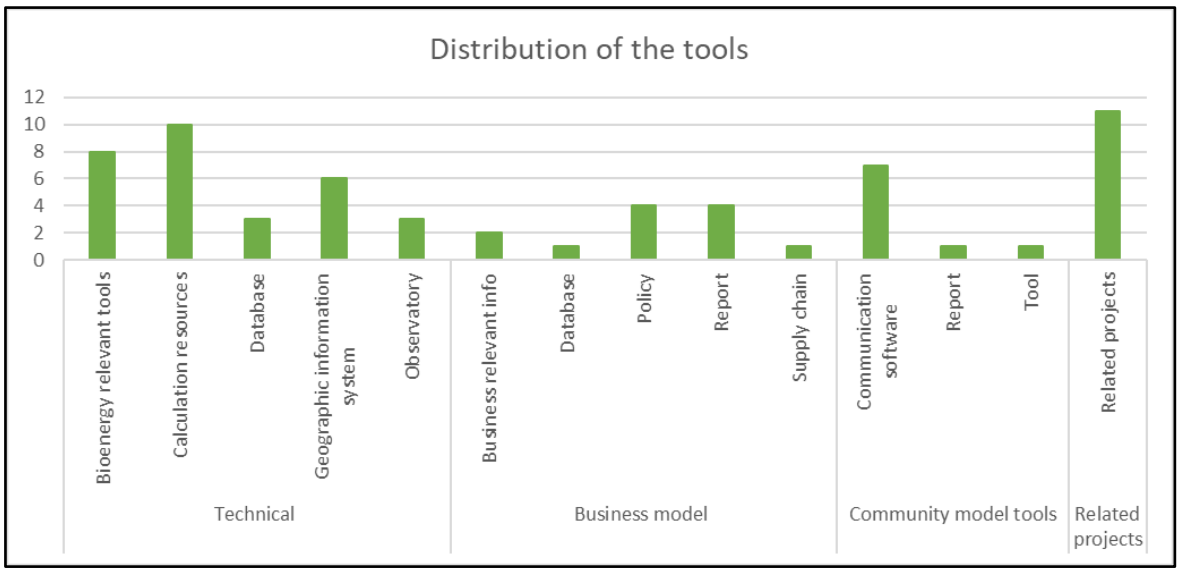


Figure 10. Final distribution of the tools per category

3.2.5 Users' satisfaction survey

At all times while the toolkit is being explored, a button will be visible in the right bottom corner of the web page, with the text: "*Give us your feedback*". The questions were added in order to capture users' feedback and their degree of satisfaction, as well as giving them the option of suggesting new ideas to improve or adjust the toolkit.

Figure 11. Feedback button

Once the user clicks on the feedback button, a pop-up window will appear, as shown in Figure 12, with the following content:

- **Question 1:** The first one is a 5 star-ranking question that aims to capture in an easy to grasp way the satisfaction levels of the BECoop toolkit users.
- **Question 2:** The second question is the following: "*How much has the BECoop toolkit helped you to reduce the risk for an investment decision?* The question offers the option to answer by sliding a colored bar from red to green (and depicts the degree of received support from 1-10) making the process easy for the users.
- **Question 3:** Thirdly, a Yes/No question is presented: "*Would you recommend this toolkit to other entrepreneurs?"* In the case the answer is negative, it is requested to further explain.
- **Suggestion box:** Finally, a suggestions box is added to give the user the possibility to suggest any changes or improvements they think will help the Toolkit to be more useful for its purpose.

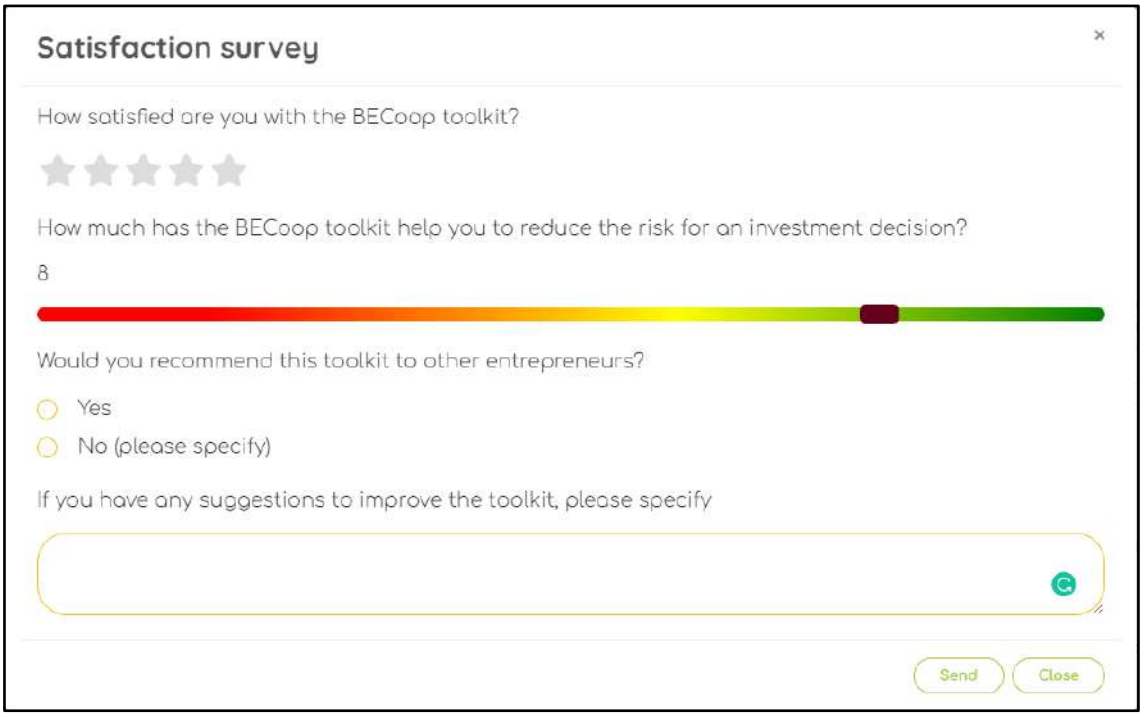


Figure 12. Feedback pop-up window

3.2.6 The BECoop toolkit in a video

A short webinar video has been produced, explaining the working principle of the toolkit, and how the categorization of the tools has been made. In addition, it presents what the user can find in each of the sections, what tools are contained in each one of the categories and what is the most valuable information and outcomes that can be obtained from each one of the categories. It is worth mentioning that it has been agreed to produce a short-duration video in order to keep the interest of the viewer, since a more than 10-minute video wouldn't be useful. For this reason, the tools have not been extensively explained in this video, to keep the duration adequate. If a user finds the in-depth analysis insufficient, a link can direct him/her to the specific tool in order to search for more information. The video can be found online here: Video guideline YouTube link

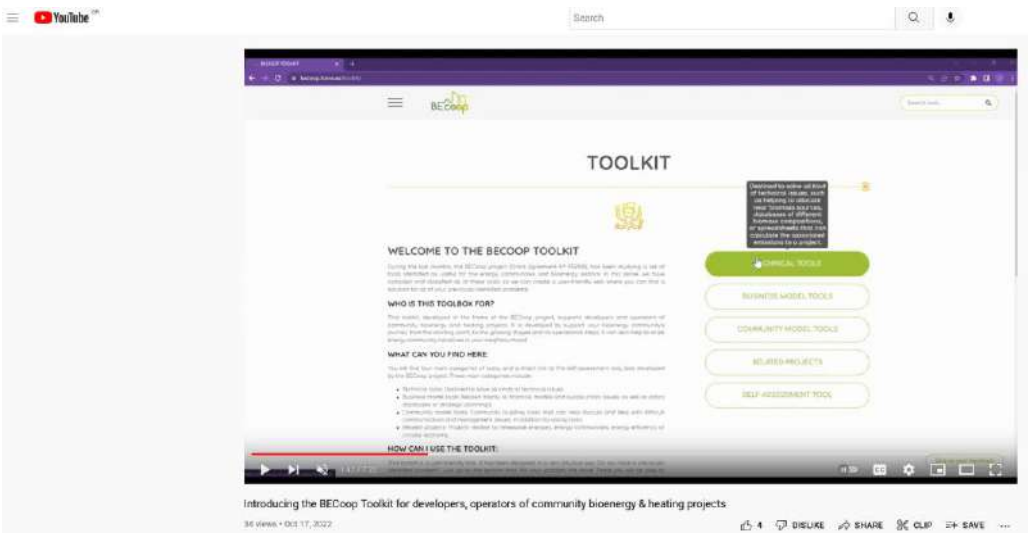


Figure 13. Video demonstration of the BECoop toolkit

4 BECoop toolkit dissemination

In order to give more visibility to the tools developed by the project, including the BECoop toolkit but also the e-market environment (T2.3) and the Self-Assessment tool (T2.1), it has been decided to proceed with some dissemination actions.

Event: From setting up energy communities to making them thrive: What are the tools available?

An event co-organized by the BECoop project and by other 8 H2020 projects (DECIDE, EC^2, E-Crew, COME RES, W4RES, Newcomers, UP-STAIRS and POWERPOOR) presented 18 developed tools that can help local citizens, communities and other stakeholders to learn more, plan, start and grow their energy communities across Europe. The event was called ***"From setting up energy communities to making them thrive: what are the tools available?"***. The event grouped the presented tools in three categories to make sure stakeholders know where to go when they have a need, based on which stage of developing a community energy initiative an actor is:

- **Inform yourself** – Prior to starting a community energy initiative – understanding the basic concepts, researching and information collection.
- **Test your market, your ideas, technologies** – Organising and planning a community energy initiative – testing the market, which technologies to use, which business model and legal framework and follow others good examples.
- **Let's act** – get people involved and grow – Growing and improving an existing community initiative – Getting more people involved, engaging different social groups, data and energy sharing, one-stop shops.

Taking advantage of this opportunity, a brief overview of the toolkit was presented to more than 60 participants (Figure 14).

Figure 14. Screenshots of the toolkit presentation in the "From setting up energy communities to making them thrive: what are the tools available?" event

A video of the event, as well as the PowerPoint presentation, can be found in the following link:

https://www.becoop-project.eu/project-news/after-event-material-from-setting-up-energy-communities-to-making-them-thrive-what-are-the-tools-available/

Event: 30th EUBCE – European Biomass Conference and Exhibition

Additionally, all the tools developed by the project were presented in a European congress about bioenergy: 30th EUBCE – European Biomass Conference and Exhibition. For this purpose, a poster (Figure 15) and a proceedings paper (Figure 16) were prepared and presented under the "*Biomass bio-based products and bioenergy integration (3CV4.4)"* topic, and subtopic 3.1 – *Biomass integration into energy systems.* The poster was called "*Tools for increasing the penetration of bioenergy technologies in community energy"* and was presented on a live session on May 10th, 2022.

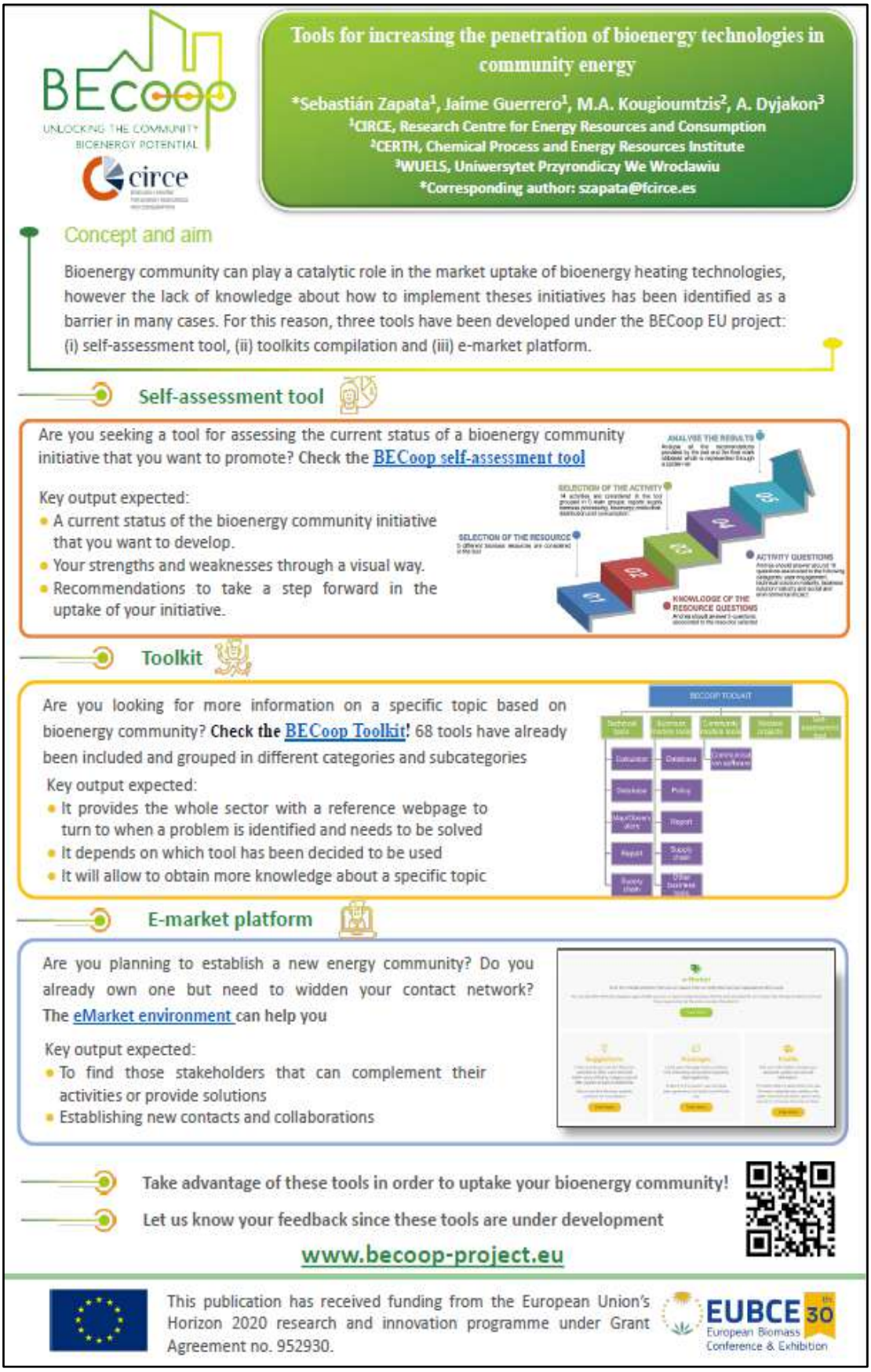
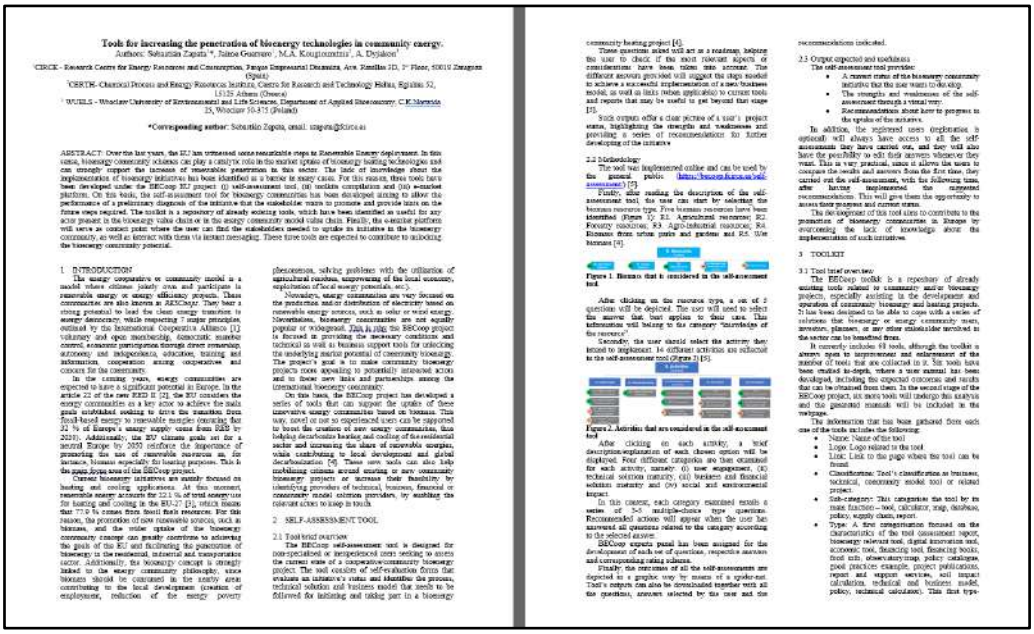


Figure 15. Poster presented for the 30th EUBCE



Tools for increasing the penetration of bioenergy technologies in community energy.

Figure 16. Proceedings presented for the 30th EUBCE

Physical events

Finally, the BECoop toolkit was presented in events and workshops that were held in the framework of the BECoop project or other relevant projects in which CIRCE is involved (such as AgroBioHeat).Up until October 2022, the tools have been presented in two events, but their promotion in relevant events will be further explored in our future activities. These events are:

- The training workshop (in the framework of T3.2) that took place on September 26th in the village of Llodio (Basque Country – Spain) – 9 participants.
- An AgroBioHeat event that took place in the city of Teruel (Aragon – Spain), on April 20th, named: "*Conference on biomass as a heat source in rural areas*" - 30 participants.
- Finally, up to date, the tools will also be presented in one of the ten webinars that will be performed under T3.2 Deployment of capacity building to key actors; and in a second training session that will take place on October 26th in Irurtzun (Navarra, Spain).

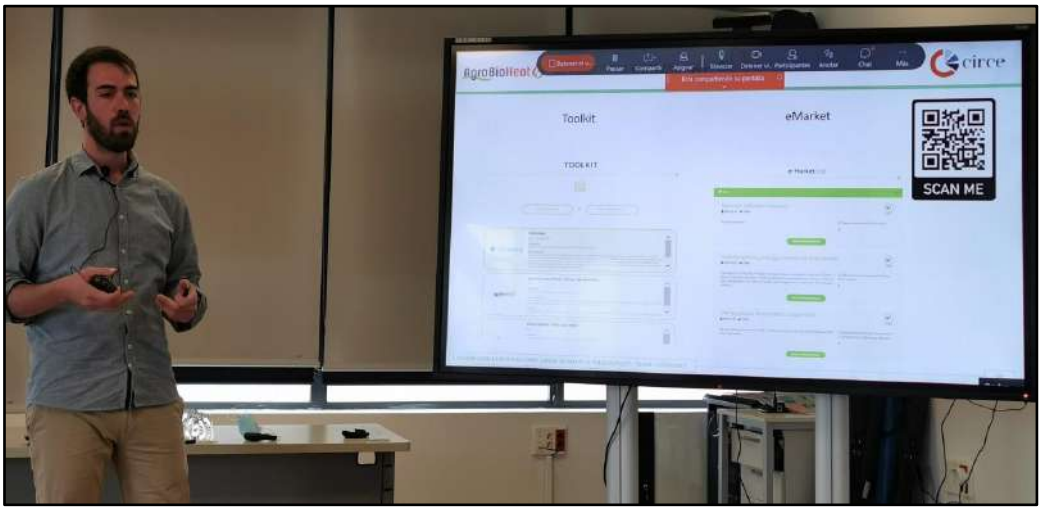


Figure 17. Presentation of the BECoop tools in the "Conference on biomass as a heat source in rural areas"

Supporting the tool's further promotion with the distribution of internal promotional material

It is worth to be mentioned that a PowerPoint presentation has been uploaded to the project's Google Drive in order to help the pilot partners to disseminate the tools in local events and activities.

5 Toolkit metrics: online traffic and analytics

The access to the tool is via the BECoop project website (as indicated in section 3). Some key outcomes from the monitoring are reported below:

The BECoop toolkit can be accessed online either thought the **project's website** or through the **BECoop Knowledge Exchange Platform** (KEP), as indicated in chapter 3. A series of online tool metrics (traffic and impression analytics) is briefly presented below:

- **5,871** views on the BECoop toolkit, which come from **383** independent users (data from September 19th, 2022). It is interesting to highlight that each one of the users has visited the toolkit an average of 15 times. This fact indicates that the users found the tools useful.
- Based on the so far metrics, the BECoop Toolkit has the most views, compared to the other tools developed by the project. This could be attributed (a) to the popularity of this asset also broadcasted through the BECoop sister projects communication channel (T6.2) and (b) to the fact that the BECoop Toolkit can be directly used without the need for user registration. So, in order to attract as many users as possible it is better to avoid the mandatory registration unless it is totally necessary.

6 Conclusions

The main aim of the task was to develop the **BECoop toolkit as a repository of tools that can be relevant for bioenergy community projects, with a view to effectively deploy the concept of BECoop to its target audiences as well as to increase the support of the project to new and existing communities**.

The toolkit can also be used by other tasks of the project and more specifically for the assistance of the identified community cases that are supported by the pilot partners throughout the project (e.g., in WP4), as well as the replication cases that will be selected in T5.2. The developed toolkit, along with the activities and results of the project, will support these communities during and after the end of the project, for the definitive deployment and uptake of this new form of organisation.

All partners have collaborated to maximise the impact of this toolkit, by providing more tools to enrich the environment and by deciding which tool could be more useful for these energy communities. Other relevant stakeholders that are involved in the community energy supply chain can also see themselves benefited by this toolkit.

The toolkit is a living platform and is continuously being updated in line with the project's progress.

The information provided about each tool will be adjusted, in order to increase and improve the project's capability to help the targeted stakeholders and better convey the BECoop vision to the European community. **The overall analysis has been presented as a workshop session, recorded and uploaded to the toolkit, to be used as a guideline for the selection of the most beneficial tool in each specific case.**

Annexes

Annex I: Complete list of tools under the BECoop toolkit

The complete list of the 65 studied tools is presented below:

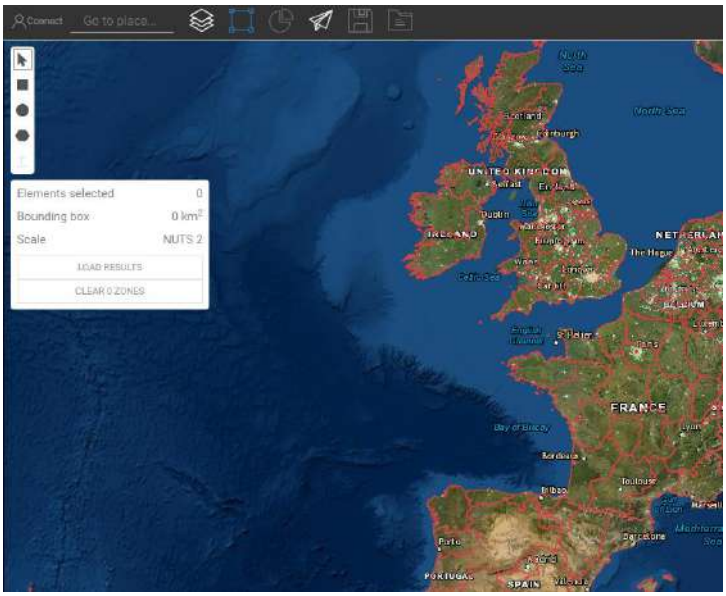
Table 10. Complete list of studied tools

Technical tools	Business model tools	Community model tools	Related projects
• S2BIOM • BEAT2 • The Bioeconomy Tool Shed • BioESoil • BioGrace-I GHG • BioGrace-II GHG • CFPAN tool and database FeedPrint • BioTrade2020+: European Bioenergy Trade Strategy • Biomass yards • BioSAT • FAO Food Balance Sheet database • Biomass Geo-Wiki • GYGA (Global Yield Gap Atlas) • GenLess:Wood Energy Calculator: • Hotmaps • Phyllis 2 • Agrobiomass Observatory: Agrobioheat • uPRuning Observatory • Heat Roadmap Europe • BIOPLAT • REPLACE • Becool • Flemish Bioeconomy Dashboard • Systemic • SOPHENA by Carmen eV. • Smallbiogas • ENABLING • BSAT Power4Bio • Heizomat: Heating costs calculator • BioPlat • Irena • Bio2Match • AgroFossilFree	• BIORAISE • VALERIE • DataM • TRASE: Transparent supply chains for sustainable economies • WISDOM: "Woodfuel Integrated Supply/Demand Overview Mapping" • BioEnergy Association: Best practice guideline for life cycle analysis of heat plant projects • RESCoop Handbook • Heat Roadmap Europe • THERMOS • bio • SUCELLOG • SRC+ • SCORE F-PI • Energy Management Self Assessment Tools • PublEnEF: Energy Efficiency Policy Support	• Loomio • GraphCommons • Discourse • AGORA VOTING • Your Priorities • Consul • Freecoin • Rural Energy Community Advisory Hub	• VinyesXCalor • Twecom NWE • ARBOR NWE • Graskracht • BiogasAction • BIOMASUD PLUS • EU-GUGLE • AgroFossilFree

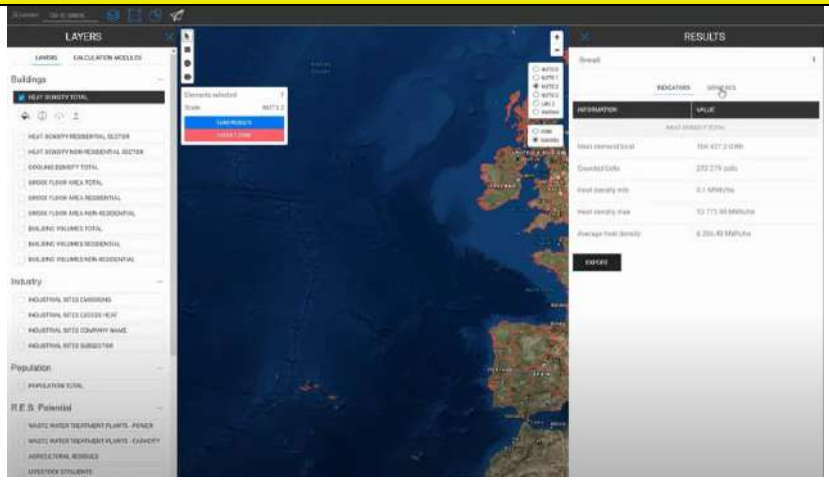
Annex II: In-depth tools' study

6.1.1 Hotmaps

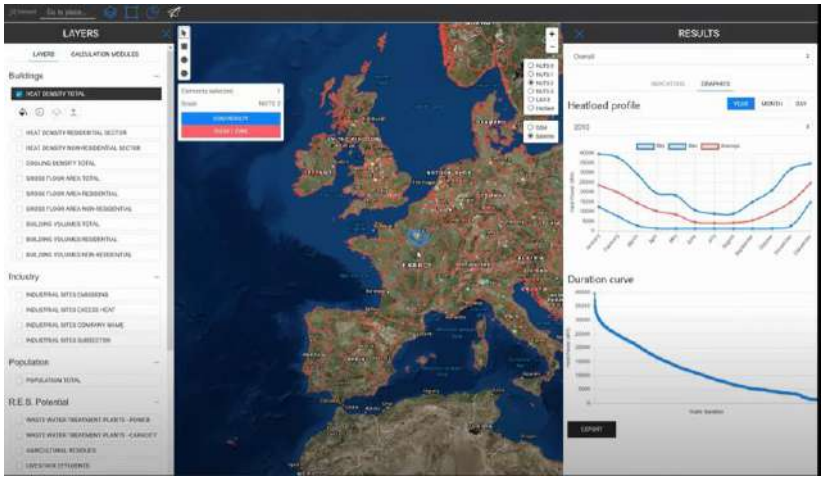
Name of the tool	HOTMAPS
Logo	
Link	https://www.hotmaps-project.eu/
Brief Description	The overarching goal of Hotmaps is the development of an open source heating / cooling mapping and planning toolbox and to provide default data for EU28 at national and local level. These data and tool allow public authorities to identify, analyse, model and map resources and solutions to supply energy needs within their territory of responsibility in a resource and cost efficient way. Those results will help authorities to develop heating and cooling strategies on local, regional and national scale which are in line with RES and CO_2-Emission targets on national and EU level.
Type of tool	Bioenergy relevant tool
Subtype	Tool
Related to	Technical tool
Most valuable information that can be obtained	The toolbox allows the user to: • Identify the location of current heating and cooling demand as well as supply on a map for EU28; • Identify renewable energy potential to supply heating and cooling for a selected area; • Identify waste heat potential from industrial facilities within a selected area; • Estimate the potential for efficient district heating options within a selected area; • Estimate and compare the costs of individual heating vs. district heating options within a selected area; • Develop scenarios for decarbonisation pathways of heating and cooling.
How does the tool work / manual of the tool	The Hotmaps toolbox allows you to provide within 5 minutes a first estimation of heating and cooling demand in your region and the potentials of local renewable energy to cover this demand. Subsequently, by using data that are more detailed and applying calculation modules of the toolbox, you are able to elaborate much more comprehensive heating and cooling strategies.

Name of the tool	HOTMAPS
	Quick introduction into the toolbox: As a starting point, the Hotmaps toolbox provides a wide range of relevant data for heating and cooling planning in EU-28 countries. This data can be visualized on the toolbox. Once you open the toolbox, you see the map of Europe. In order to visualize the data in the toolbox, you should open the “LAYERS” window from the Hotmaps toolbar.  The default data sets are categorized in “Building”, “Industry”, “Population”, “R.E.S. potential”, “Climate” and “Electricity”. The symbology helps you to understand the meaning of colours on the map. Also for additional information about the layer, you can use the information button. You may download the whole data set, or just select an area and download the corresponding data for your selection. The selection tool allows for administrative boundary selection and flexible selection including rectangular selection, circular selection, and free selection. If you wish to select and administrative boundary, you should first determine the zoom level on the pan provided on the top-right corner of the toolbox.  For flexible selection types, you should choose the Hectare zoom level. You can also select or deselect multiple areas in each zooming level. For example, you can select a number of areas or deselect some of them. With the Hotmaps toolbox, not only you can visualize and download data, but also you can get some indicators of your area of interest. Once you select an area, you can press on the “LOAD RESULTS” button and see the corresponding indicators and graphics in the “RESULTS” window.

Name of the tool	HOTMAPS



The values on the "RESULTS" window update as you select or deselect areas.



In addition, new indicators appear to the RESULTS window as you select more layers. The user account allows the user to upload data to a confidential, secure space on the platform, compare own data or other data sources with the existing Hotmaps data sets or just visualize them, perform calculations, safe working sessions and much more. Click on the "connect" button on the Hotmaps toolbar.

If you already have the username and password, you can directly log into your account. Otherwise, you must register first. Registration is easy. You just need to write your name and email address. Then, a confirmation email is sent to your email address. You just need to follow the instructions in the confirmation email to register your account – really easy and usual method.

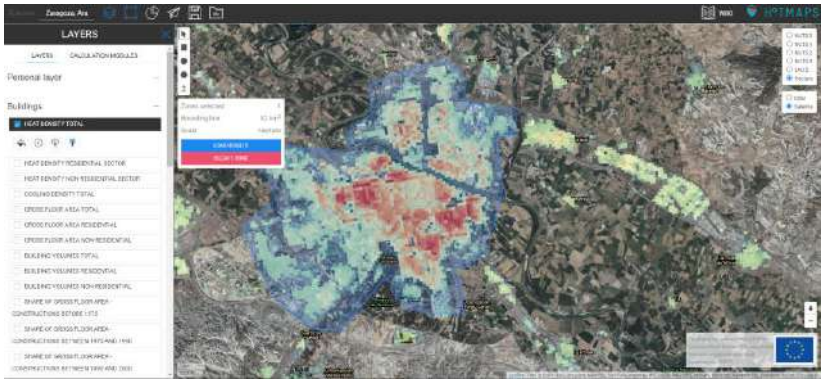
Once you are logged in, the "personal layer" category is added to the layers. Here, you see the list of your uploaded layers. To upload a layer, click on the connect button. Here, select the type of layer you want to upload and then, press the upload button. You can delete the uploaded layer any time you want by pressing on the delete button.

Now we are going to show an example of a practical calculation with the toolbox, after we have a first impression of it.

For example, as a heating and cooling planner, let's assume I am interested on knowing the district heating potential in the municipality of Zaragoza, in Spain. We

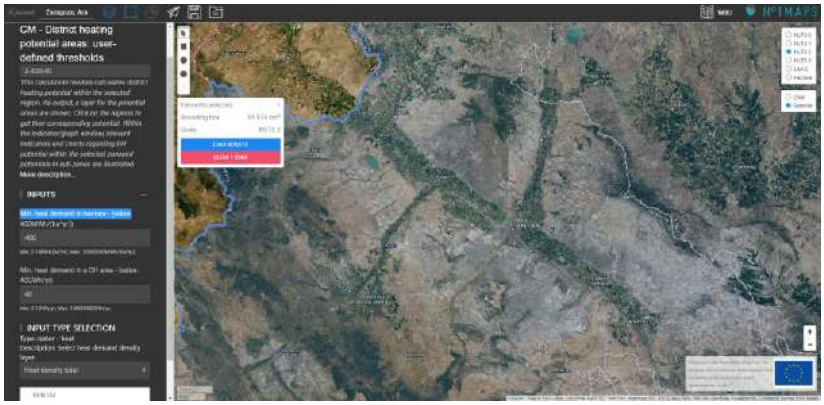
Name of the tool	HOTMAPS

can use the “Go to place” bar to find Zaragoza and zoom to it. Then, we select the part of the city that we are interested in.

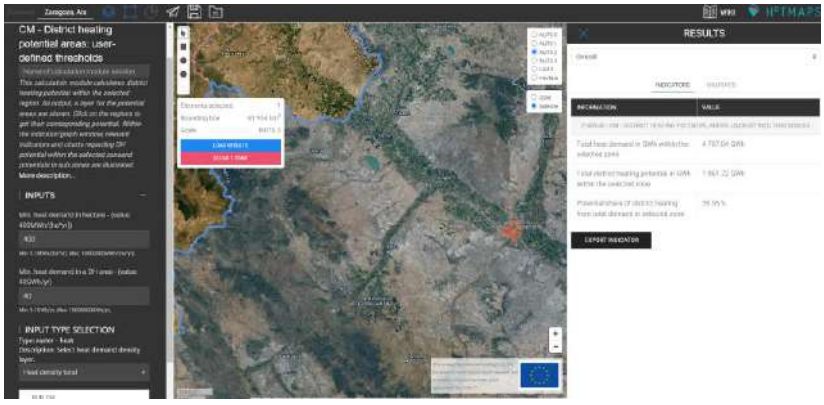


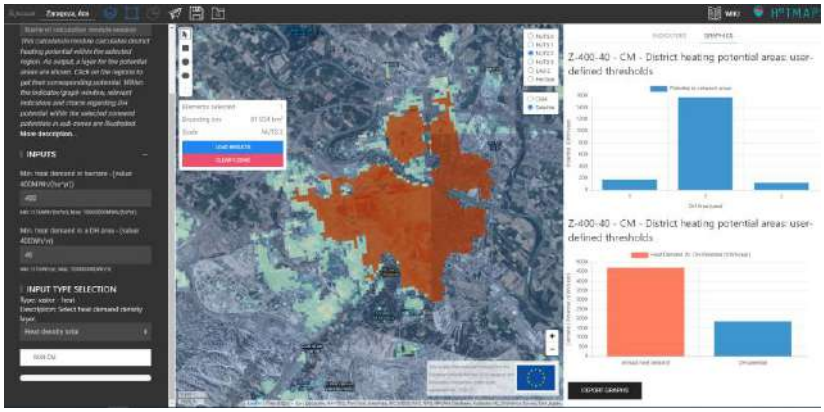
Now, let’s go to the “CALCULATION MODULE” tab and select the “district heating potential areas: user-defined thresholds” calculation module. The short explanation of the calculation module should help us understand the idea behind this calculation module. If you need further explanation about the methodology, concept, and running of the module, use the Hotmaps Wiki page.

For our case study, we want to see the district heating areas with minimum heating demand of 400 MWh/ha and minimum annual demand of 40 GWh in the area. Recommendation: Give a meaningful name to your running session – this name will appear for all output layers, therefore, you can be sure that you will not mix up different runs. Here, I write “Z-400-40”.



Now press the “Run CM” button and wait until the calculation is done. New graphics and indicators will appear to the results window. The name of the running session is shown also above them. In the indicator section, we can see the total heat demand and district heating potential in the selected area.



Name of the tool	HOTMAPS
	These two are also illustrated in graphics and you can see the potential in each district heating area with the labels given to them.  Additionally, the district heating area map is added to the maps and to the Layer window. If you click on the district heating area on the map, you see the label assigned to the district heating area potential. In the layer window, this layer appears under "calculation mode" category. The Hotmaps toolbox is still under development and many more features will be added to it. Meanwhile, you just can report your feedback by clicking in the Feedback button on the Hotmaps toolbar.  You just need to write your name and affiliation, set the feedback type, the title of your message and insert your feedback in the description field. You can also attach some screenshots to share it with the developers.
Who is this tool destined to (potential users)	Local authorities, Local economic players, RESCoops, Energy Communities, Research Centers, Investors.
How can this tool affect/benefit or help a relevant stakeholder?	Hotmaps is a **GIS-based online software** that supports authorities and energy planners to set up a **strategic heating and cooling plan** for their region. Hotmaps offers an open-source online software that supports the planning processes of the energy sector at local and national levels in a transparent manner. It is a website provides within 5 minutes a first estimation of the heating and cooling demand in any European region as well as the local renewable energy potential to meet this demand. Subsequently, by using more detailed data and applying Hotmaps calculation modules, much more comprehensive heating and cooling strategies can be elaborated. Thanks to this software, you will be able to make practical decisions in your area of interest (village, town, city, region, etc.). The applicability of Hotmaps has been proven and demonstrated in seven pilot areas. The same projects also includes the creation of two handbooks (Definition & experiences of strategic heat planning; Guidance for comprehensive assessment of efficient heating and cooling) which can be really useful for those who want to establish a new successful district heating case and do not have the required experience. It also includes a case description of strategic heat planning.

Name of the tool	HOTMAPS
Additional information of the tool	For additional supports on heating and cooling planning, please refer to the Hotmaps handbooks and to the Training Material page: • Summary of the Hotmaps Handbooks for strategic heat planning • Handbook 1 – Definition & experiences of strategic heat planning • Handbook 2 – Guidance for comprehensive assessment of efficient heating and cooling • Appendix report to the Handbook for strategic heat planning: Case descriptions • Training Material You can also find a Hotmaps Wiki, where the documentation, guidance and manual of the Hotmaps toolbox is hosted. It consists of the following main parts: • Data sets, • General toolbox functionalities, • Calculation modules, • How to apply the Hotmaps toolbox? • Developers. The **Data sets** section provides information about Hotmaps data set repositories as well as methodologies for gathering these data sets. The **General tool functionalities and structure** section guides the user through the interface of the toolbox. The section covers all general aspects of the toolbox, which are related to the user experience, e.g. navigating through different parts of the toolbox, layer selection, retrieving indicators, data upload and export functionalities etc. The **Calculation Modules** section provides an in-depth explanation of concepts and methodologies behind the calculation modules. Besides the explanation of the methodology, the provided examples and test runs for each calculation module help the user to obtain an understanding of input parameters and output results. Some calculation modules are integrated into the toolbox, while others are stand-alone. The section "**How to apply the Hotmaps toolbox?**" is one of the most important sections of the wiki. It helps Hotmaps users to perform heating and cooling planning with the Hotmaps toolbox and includes guidelines on using Hotmaps at the local and national levels, as well as training materials. This section illustrates how different calculation modules can be used to analyse different aspects of the heating and cooling system and different research questions. Furthermore, it shows, how the calculation modules can also be used as a chain of tools to derive scenarios for heating and cooling of certain areas. The **Developers** section contains all information required for developers to contribute to the Hotmaps toolbox or to understand how it works. It explains the IT infrastructure of the Hotmaps toolbox, data set integration, contribution in calculation module development, etc.
Organisation/ project that	The project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723677EEG - TU Wien: Lukas Kranzl, Mostafa Fallahnejad, Jeton Hasani

Name of the tool	HOTMAPS
developed/ manages the tool	• CREM: Thierry Bernhard, Lesly Houndole, Albain Dufils • e-think: Marcus Hummel, Andreas Müller, Giulia Conforto, David Schmidinger • EURAC: Pietro Zambelli, Giulia Garegnani, Simon Pezzutto • Fraunhofer ISI: Ali Aydemir, David Schilling, Lisa Neusel, Tobias Fleiter • HES-SO: Daniel Hunacek, Lucien Zuber, Matthieu Dayer • Planenergi: Anders M. Odgaard
Responsible for the study of the tool and organisation	Fundación CIRCE

6.1.2 Loomio

Name of the tool	LOOMIO
Logo	
Link	https://www.loomio.com/
Brief Description	Any organization or group looking to reduce email overwhelm, bring people together to make a decision, agree on an outcome, and keep a record of decision making can use this tool. Typical Loomio users include: • Boards • Professional service organizations • Membership organizations • Community groups Loomio supports community and volunteer organizations around the world by offering a low one-time payment for community groups to engage with as many people as they need, and for as long as they need. A free community lifetime subscription is included with annual Pro plan subscriptions so a business can sponsor a community organization of their choice. Important: It's not a free tool – There exists a free trial and special prices for non-profit organizations, but there is not a free version.
Type of tool	Digital innovation tool
Subtype	Tool
Related to	Community model
Most valuable information that can be obtained	You can create threads to discuss important organizational issues, bring new ideas or argue about identified problems, surveys to gauge widespread opinion or facilitate the decision making of the organization/community, and manage all the members accounts of your community. You can also create groups to differentiate participants from organization of the community or involve the adequate people in the adequate arguments.
How does the tool work / manual of the tool	User-friendly tool. • Starting threads: You can start a thread by clicking *New Thread* from a group page. When you start the thread, it will be visible to all of the group's members. Give your thread a title, try to keep it short and to the point. You can always update the title of the thread later. Use the thread context to introduce the topic. Give background information or links that people will need to participate and explain what kind of participation you're looking for. The context will always stay at the top of the thread, above the thread's comments, proposals and polls.

Name of the tool	LOOMIO
	It is also possible to create subgroups, as a way to send notifications to a specific set of people within the group settled for the thread. • Thread privacy: If your group privacy is *closed* or *secret*, then your threads will be private. Private means only members of the group are able to view the threads started in this group (except when you invite such people as an expert or any guest not currently part of your group). If your groups are *open* then all your threads will be public, meaning that anyone with the URL can view the thread. • Thread context: The *thread context* has special status within a thread. It's always at the top, and it's always visible on the page. Like a comment, you can format your text and attach files and images. Unlike a comment, anyone in the group can update the context (and the title of the thread) by default. This means you can enable anyone to pitch in and help keep things easy to understand and easy to find. The context is like the whiteboard in your meeting room, where you can write the agenda, the hopeful outcomes and how you aim to get there and take group notes. It is also possible to attach files from local drives to the thread, and to remove attachments by editing options. • Comments and replies: The most common activity in a thread is commenting. Comments are shared with everyone in the thread - usually this is just the members of your group. First look for *comment* and your user photo (or initials) – *Make sure that comment is highlighted, not proposal or poll.* Write your comment and press post to have your say. Replies are like comments except in that the author of the original comment will be notified of your reply. Click reply on the comment you would like to associate your comment with, as it will be nested underneath theirs – by default – in the thread in which you replied. You can reply to your own comment in order to nest your reply underneath the comment. Click the three horizontal dots to find reply in this case. You can also *react* to any comment or thread's context which means to quickly respond with an emoji. Notification will be sent within Loomio but not by email. They enable to acknowledge something someone has said without interrupting the conversation. Formatting comments: Use the formatting tools underneath the space in which you write (any form). Hover the mouse/cursor over each item to know what it is. Options are similar to regular text editors offering to stylize formats, add attachments or links. Moreover, it is possible to embed video links from hosting websites (YouTube, Vimeo…), create checklists that allow to cross out to-dos from the edit form of any context or thread. Comment revision history: If you have new information or are coming back after and extended period of time, just make a new comment, then people who have already read your comment will see that there is new information. Automatic Translation: useful for international communities or groups, Loomio can automatically translate content from one language into another just

Name of the tool	LOOMIO
	checking *Translate comment* option in the drop-down of the comment in question, from the three horizontal dots. • Category tags: Category tags (or just tags) let you group any number of threads by categories that you define. You can use them to make it easy to find threads of a certain type or topic. You can apply tags upon starting your thread. • Facilitation and decision tools: There are a selection of facilitation tools and decision tools available to you from within the thread. Proposals enable groups to respond and provide feedback on a specific topic in order to arrive to an outcome. Often, you can use proposals to bring the discussion to conclusion. They are there to help you see if there is agreement about a statement or course of action and surface the disagreement if that's what needs to happen. As in threads, it is possible to attach any supporting documents and set a duration for responses. Polls are useful to understand preferences of the group. All polls allow you to invite people, set a deadline with a reminder, and include options for anonymous voting. Several modes of poll are possible as time polls (find the best time for a meeting), ranked poll (vote for a preferred order of a series of options), Standard (similar to a multiple/single option survey). • Ask a question: Most productive conversations start with questions. Start a new thread for each new inquiry; an inquiry can include several related questions. Use open questions to explore and get more engagement. Engage people directly by @mentioning them and asking them specifically. If you can, name any clear, shared outcome or understanding that results. As with any thread, a clear, simple title will help people find answers to engage now and reflect on down the road. • Prepare for an event: Start one thread per event, edit the thread context to let people know what kind of participation is being asked, set some polls to arrange time meetings, pick a date, collaborate on agenda-setting and record actions. Embed videos, attached audios or links are interesting for whom missed the meeting. • Take a document to completion: Start one discussion thread and link or attach the key artifact in the context. Use proposal and outcomes so that everyone is clear on what's next.
Who is this tool destined to (potential users)	Non-hierarchical groups or organizations that aim to give all members voice in the process, non-traditional top-down decision-making communities, or consensus committees requiring every member point as: professional service firms, commercial boards, non-profits and government agencies
How can this tool affect/benefit or help a relevant stakeholder?	Loomio represents a simple, effective tool that helps groups to move aligned with their objectives, solving slow and inefficient group decision making. It offers a low one-time payment source tool for community groups to engage virtually with as many people as they need, and as long as they need.

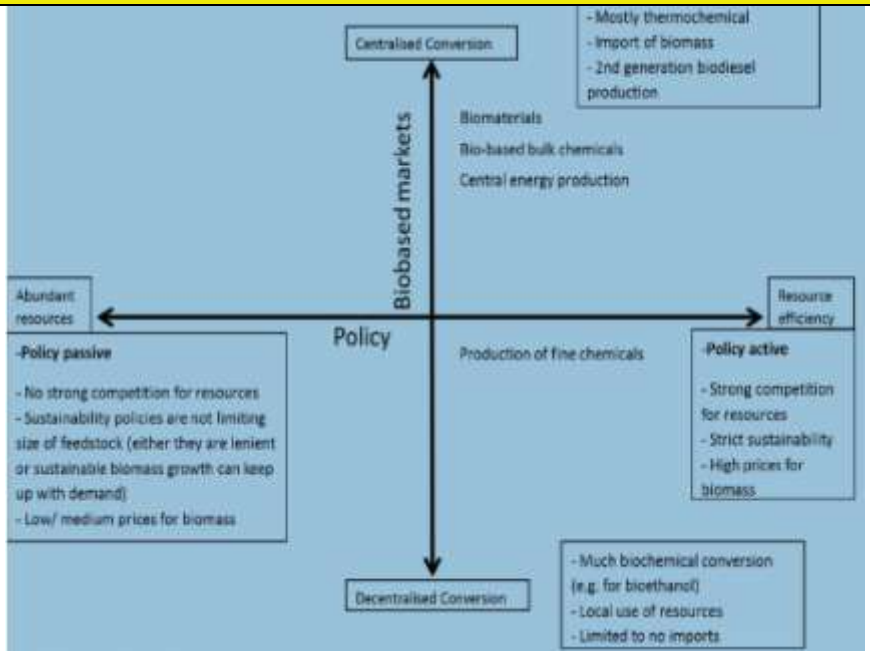
Name of the tool	LOOMIO
	Loomio's business model is operated sustainably by a small team, which offers customized guidance and support. Depending on subscription plan, Loomio will allow stakeholders to start making collaborative decisions with unlimited members, discussions, threads and subgroups integrating Slack and Microsoft Teams Software, to achieve faster positive outcomes with dedicated Loomio's expert training and implementation support. The enterprise plans include a tailored community design, which may perfectly suit contracting institution with personal Feature interface text configuration, private databases server residencies of choice, potential integration with other servers, analytics reports of tool's traffic and maintenance & technical support.
Additional information of the tool	For additional supports on Loomio online tool system, please refer to Loomio User Manual and Training Material page: • Loomio Blog | Loomio Blog • Overview | Loomio Help • User Manual | Loomio Help • Guides & Inspiration | Loomio Help • Subscriptions | Loomio Help • FAQs - Loomio • Contact - Loomio
Organisation/project that developed/manages the tool	"Loomio" is a registered trademark of Loomio Cooperative Limited. Loomio is not created by or affiliated with Slack Technologies Inc. or Microsoft Corporation. © 2021 Loomio Limited is a for-profit social enterprise owned by worker-owned Loomio Cooperative.
Responsible for the study of the tool and organisation	Fundación CIRCE

6.1.3 S2Biom

Name of the tool	S2Biom
Logo	
Link	https://s2biom.wenr.wur.nl/home
Brief Description	The S2Biom project - Delivery of sustainable supply of non-food biomass to support a "Resource-efficient" Bioeconomy in Europe - supports the sustainable delivery of nonfood biomass feedstock at local, regional and pan European level through developing strategies, and roadmaps that will be

Name of the tool	S2Biom
	informed by a "computerized and easy to use" toolset (and respective databases) with updated harmonized datasets at local, regional, national and pan European level for EU28, Western Balkans, Moldova, Turkey and Ukraine. It meant a collaboration of 31 Partners from 16 countries. Its objectives: -Analysis of the biomass potential and respective conversion pathways. -Analysis of political and policy framework conditions and application of sustainability criteria in EU28 and neighboring countries. -Development of transnational Strategies, Roadmaps and Toolbox for a resource-efficient bioeconomy in Europe. -Development of a web-based interactive tool and material for the support of the economy, research and policy for local, regional and national stakeholders.
Type of tool	Technical and business model, policy
Subtype	Supply chain
Related to	Technical
Most valuable information that can be obtained	The S2BIOM toolset contains all data, tools, documents and reports generated in the S2BIOM project. Under the different tabs in the main menu the user can click to get access to these different tools, data, documents and reports. The tools enable the user to interact with the results by making sub-selections for data of interest; or to design own biomass delivery chains and evaluate the performance; or to obtain to-the-point information on specific issues of relevance for developing biomass delivery chains. These can be key characteristics on logistical components, biomass conversion technologies, matching of biomass types with technologies, biomass potentials, cost and characteristics, biomass markets, sustainability issues, policies and regulations, and national biomass strategies.
How does the tool work / manual of the tool	User-friendly tool. **General data**: In S2BIOM **4 scenarios** were elaborated which serve as the basis for the assessment of future biomass demand and consumption patterns for energy and biobased products and cover EU28, western Balkans (WB), Moldova (MD), Ukraine (UKR) and Turkey (TR). **The 4 scenarios are:** 1) Centralised Europe scenario: Large biorefineries within Europe 2) Decentralised local scenario: Local/ regional decentralized units 3) Policy active scenario 4) Policy passive scenario

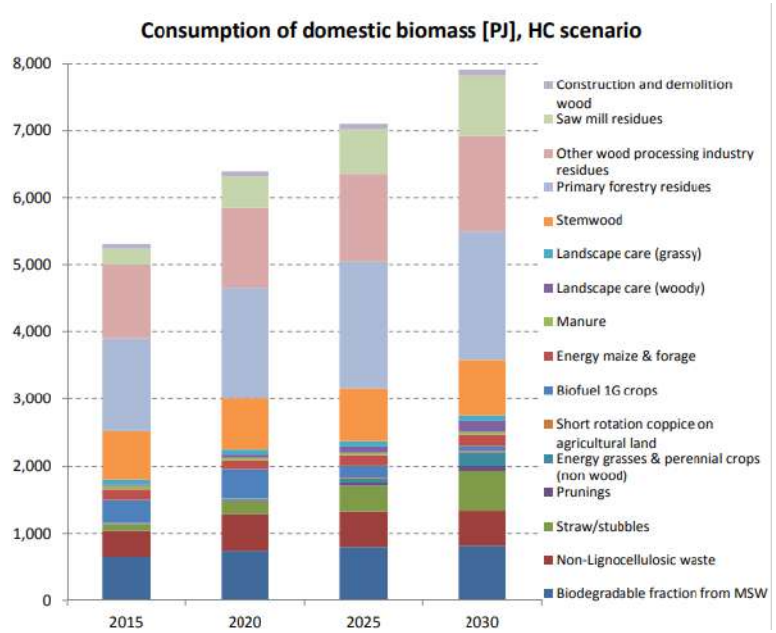
Name of the tool	S2Biom



The scenarios were used as a basis to assess with the ReSolve model, which were specified in a continuum of 2 key uncertainties: a) availability level of sustainable biomass, influenced by the strictness of sustainability criteria, policies or competition for resources b) extension of biomass production either large-scale centralize systems or small-scale decentralized units.

Result: assess to future biomass demand and consumption patterns

Biomass demand: information in form of text and links to documents from directory analysing current and future biomass from energy and biomaterial sector perspectives, assessed with ReSolve model for 4 scenarios.

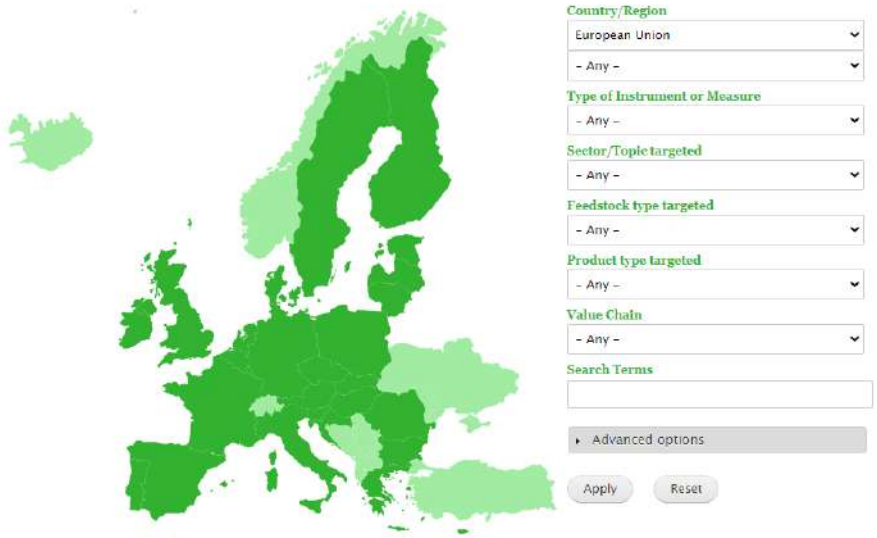


Regulatory and Financial frameworks: links to open documents from directory to a catalogue of policy instruments (agriculture, forestry, biofuels, emissions…) and measures, information on regulatory and financial frameworks impacting bioeconomy.

Regulatory Viewing Tool:

Name of the tool	S2Biom

Collects all data on regulations through interacting displayed Biomass Policy Tool map, were it is possible to search in a targeted way for Instruments & Measures that foster the development of regional bioeconomies.



You can filter the catalogue to only list the results relevant to your needs.

Example 1: Suppose you are interested in Economic or Financial instruments as a 'Type of Instrument or Measure', that are applicable to the Energy sector. Just select the corresponding "Type of Instrument or Measure" and "Sector/Topic targeted".

Clicking Apply, will give you the following result:

Short name of Instrument or Measure	ISO	Country/Region	Type of Instrument & Measure	Sector/Topic targeted
Clean Energy Services Programme		KENYA (JAMHURI YA KENYA)	Subsidies	Energy
Clean Energy Services Programme		KENYA (JAMHURI YA KENYA)	Subsidies	Energy
Clean Energy Services Programme		KENYA (JAMHURI YA KENYA)	Subsidies	Energy
Clean Energy Services Programme		KENYA (JAMHURI YA KENYA)	Subsidies	Energy
Clean Energy Services Programme		KENYA (JAMHURI YA KENYA)	Subsidies	Energy
Clean Energy Services Programme		KENYA (JAMHURI YA KENYA)	Subsidies	Energy
Clean Technology Fund		INDONESIA (REPUBLIK INDONESIA)	Investment Subsidies	Energy
Clean Technology Fund		INDONESIA (REPUBLIK INDONESIA)	Investment Subsidies	Energy
Clean Technology Fund		INDONESIA (REPUBLIK INDONESIA)	Investment Subsidies	Energy
Clean Technology Fund		INDONESIA (REPUBLIK INDONESIA)	Investment Subsidies	Energy

1 2 3 4 5 6 7 8 9 ... next › last »

Example 2: Alternatively, if you want to see all German Instruments and Measures that are currently In Force. Choose "Germany" in the 'Country/Region' select box. Additionally open the 'Advanced options' section and choose "In force" in the Status select box.

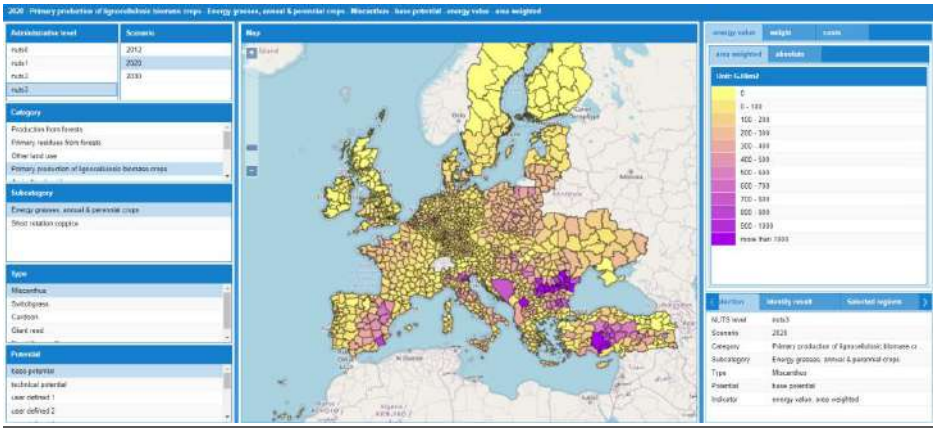
Clicking Apply, will give you the following result:

Name of the tool	S2Biom

Short name of Instrument or Measure	ISO	Country/Region	Type of Instrument & Measure	Sector/Topic targeted
Bio Innovation Growth mega Cluster	BE	VLAAMS GEWEST, NORDRHEIN-WESTFALEN, NETHERLANDS (NEDERLAND)	Platform	Clustering, co-operation and networking
Cross-Border Innovation Fund (GCS)	BE	VLAAMS GEWEST, NORDRHEIN-WESTFALEN, Limburg (NL)	Economic/financial instruments	Agriculture, Biotechnology, Climate, Clustering, co-operation and networking, Communication and information, Consumer and societal affairs, Economy, Environment (soil, water, air, nature, biodiversity,..), Health & public safety, Industry, enterprise and commerce, Mobility, transport and logistics, Products
Interreg IVB	BE	BELGIUM (BELGIQUE-BELGIË), GERMANY (DEUTSCHLAND), IRELAND, LUXEMBOURG, Utrecht, ENGLAND	Economic/financial instruments	Agriculture, Industry, enterprise and commerce, Products
Biovalley	CH	SWITZERLAND (SCHWEIZ/SUISSE/SVIZZERA), EST, BADEN-WÜRTTEMBERG	Platform	Clustering, co-operation and networking, Communication and information, Education, training and human ressource development, Industry, enterprise and commerce, Research and Innovation

(Note that the result will include all Instruments and Measures that are applicable to Germany as well as to any of its regions)

Biomass chain data tool:

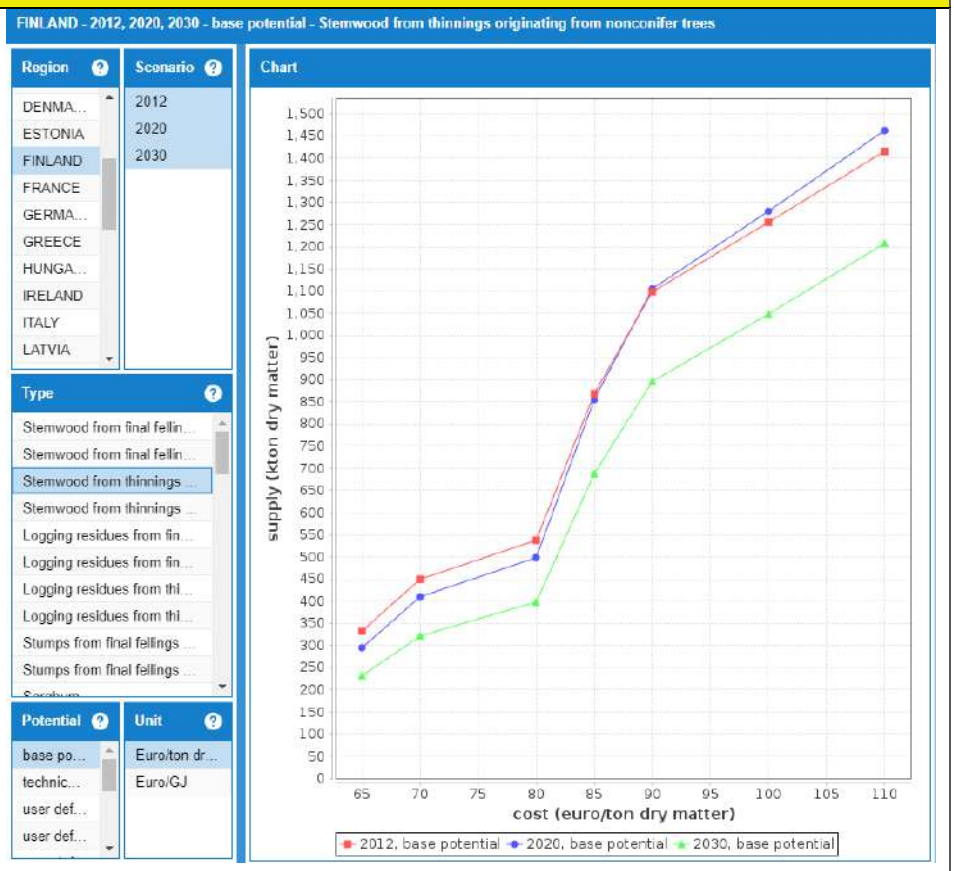


Under the item 'Biomass chain data' access is provided to all data included in the central S2BIOM database and this is accessed interactively through several viewing tools.

It is possible to visualise either overall number of biomass availability. Cost-supply per kton of defined biomass.

On the left side we can define which items cost and supply information we desire to collect. The information has been collected on 56 types of biomass, at various NUTS levels and for 2 to 9 types of potentials. The biomass types are divided into 9 categories with 15 subcategories. The geographical information is organised by the 2013 NUTS regions.

Name of the tool	S2Biom



Database for biomass conversion technologies: An overview of available conversion technologies and their properties is stored in the conversions table and related tables. The related tables are one-to-many sub-tables for output capacity and for additional input that might be needed for the conversion process. Finally, there are domain tables to store possible values for selected attributes.

The properties collected for conversion technologies belong to several categories:

1. General properties.

2. Technical properties.

Name of the tool	S2Biom

View details of Dry Batch Digestion (MSW)

TECHNICAL PROPERTIES

Capacity of outputs (typical values)

Power (MWe) 1					
Conversion efficiencies: net returns electricity(GJ/GJ biomass input)	typical: 0.2	min: 0.1	max: 0.4	typical in 2020:	typical in 2030:
Biogas (m3/hour) 700 LHV (GJ / m³) 19.7					
Conversion efficiencies: net returns fuel(GJ/GJ biomass input)	typical: 0.5	min: 0.2	max: 0.90	typical in 2020:	typical in 2030:
Methane (m3/hour) 420 LHV (GJ / m³) 32.8					
Conversion efficiencies: net returns fuel(GJ/GJ biomass input)	typical: 0.5	min: 0.2	max: 0.9	typical in 2020:	typical in 2030:

Data sources used to define conversion efficiencies in 2014:
Depends on biomass input type!

Data sources used to define conversion efficiencies in 2020:

Data sources used to define conversion efficiencies in 2030:

General data sources for technical properties:

External inputs (not generated by the biomass in the conversion process)

Power (kW): 1000	
Heat (useful, not process steam) (kW): 1000	
Indication: experience based data	Yes
Number of possible full load hours per year (hours)	5000
Number of typical full load hours per year (hours)	3500
Typical Lifetime of Equipment (years)	15

3. Biomass input specifications

View details of Dry Batch Digestion (MSW)

BIOMASS INPUT SPECIFICATIONS

Biomass input, common for the technology used:	HH MSW, Household waste; NACE MSW, Waste not from households; NACE Vegetal, Waste not from households; Grass, Abandoned grassland; Grass, Biomass (roadside Verges);
Biomass input, technically possible but not common:	Cardoon, Energy Grasses, Annual Crops, Perennial Crops; Sorghum, Energy Grasses, Annual Crops, Perennial Crops; Reed Canary Grass, Energy Grasses, Annual Crops, Perennial Crops; Maize, Straw/stubbles;

Traded form: Other (Black liquor, BMW, PO etc.)
Dimensions: Not applicable

Moisture content	(% wet basis) typical 50	max 70
Minimal bulk density	(kg/m³, wet basis) 500	
Maximum ash content	(% dry basis) 40	
Minimal ash melting point (= initial deformation temperature)	(°C)	
Volatile matter (only for thermally trated material, torrefied or steam explosed)	(VM%)	

Maximum allowable contents
Nitrogen, N (wt%, dry) Sulphur, S (wt%, dry) Chlorine, Cl (wt%, dry)

Optional attributes

Net caloric value	(MJ/kg) min	max
Gross caloric value	(MJ/kg) min	max
Biogas yield	(m³ gas/ton dry biomass) 50	% methane 50
Cellulose content	(g/kg dry matter) min 0	max 100
Hemicellulose content	(g/kg dry matter) min	max 100
Lignin content	(g/kg dry matter) min 0	max 100
Crude fibre content	(g/kg dry matter) min 0	max 100
Starch content	(g/kg dry matter) min 0	max 100
Sugar content	(g/kg dry matter) min 0	max 100
Fat content	(g/kg dry matter) min 0	max 100
Protein content	(g/kg dry matter) min 0	max 100
Acetyl group content	(g/kg dry matter) min 0	max 100

4. Financial and economic properties.

View details of Dry Batch Digestion (MSW)

FINANCIAL AND ECONOMIC PROPERTIES

Investments costs	in 2014 (€): 5000000	expected in 2020 (€):	expected in 2030 (€):	Labour needed	Operators (FTE): 1 Staff and engineering (FTE): 1

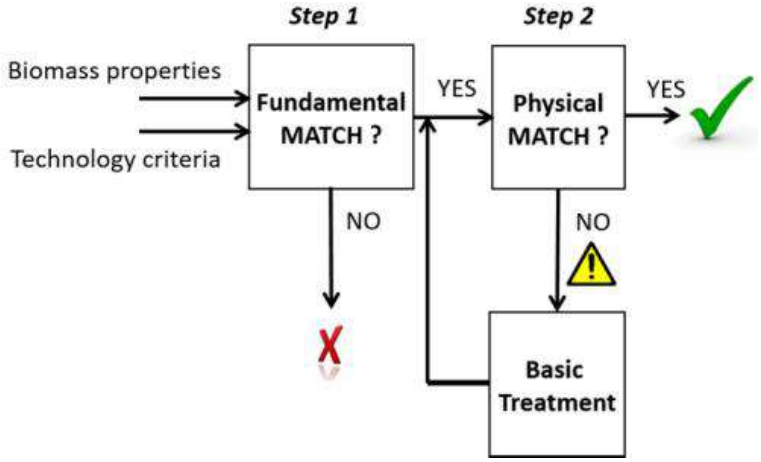
Same information and methodology are established for biomass logistical concepts.

The Biomass and Technology Matching Tool ‘Bio2Match’.

The tool can be used to find out:

- Which conversion pathways are appropriate for biomass in your region?
- Is there a need for biomass pre-treatment?

Name of the tool	S2Biom
	The methodology for the Bio2Match tool was defined on the basis of the classification system, with fundamental characteristics (which cannot easily be modified) and physical characteristics (which can easily be modified) for the biomass. The procedure that the tool utilizes for matching each biomass and each technology is schematically shown in the Figure below.



Depending on which type of technology is chosen (thermal, (bio-)chemical, anaerobic fermentation), the relevant fundamental properties of the biomass are first compared with the technology criteria (step 1). When each biomass property class has a lower or equal number than the technology criteria for those properties, there is a fundamental match, and the tool subsequently investigates the physical properties (step 2). When the values for the main physical properties also match, the tool generates the answer “there is a match”, indicated by a green traffic light symbol. When there is a fundamental match but no physical match, the tool generates the answer “there is a match, if the biomass receives basic treatment”, indicated by a yellow exclamation mark. When there is no fundamental match, the tool does not proceed to step 2, but generates the answer “there is no match”, indicated by a red traffic light symbol.

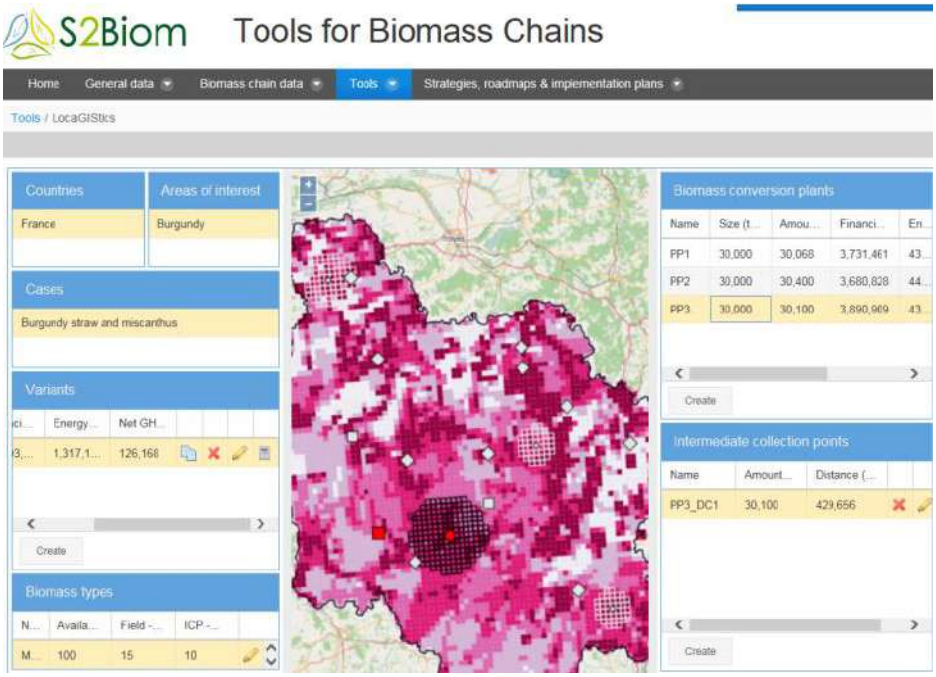
Full chain assessments:

1.BeWhere

The model BeWhere itself cannot be used by the end-users. Instead, the end-users can view & download the pre-run scenario results of BeWhere through the S2BIOM toolset. The users can choose in the viewing tool the scenario specifications for which to view results in the underneath menu. In the left pane you can specify and download BeWhere solutions for heat and power installations and in the right pane for biofuel installations.

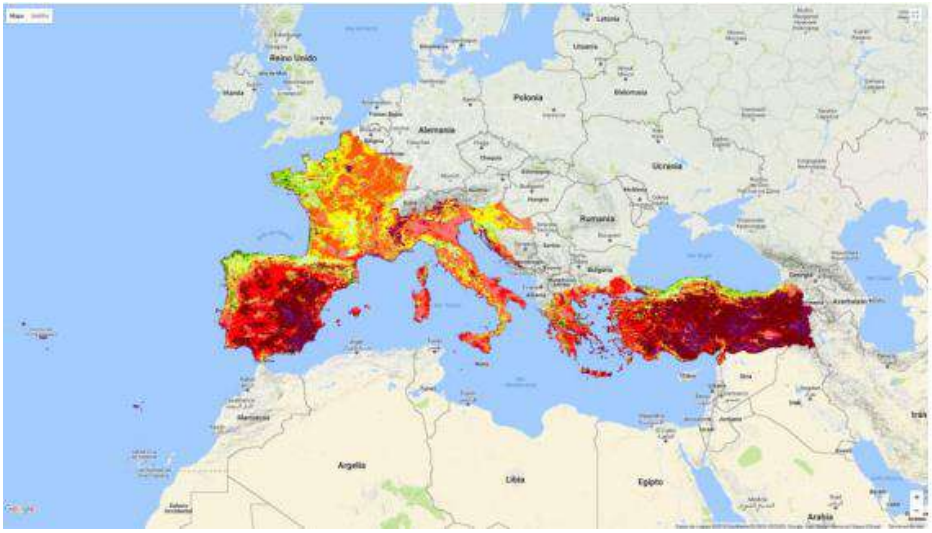
The users can choose the following scenario specifications:

1) The type of biomass feedstock you’re interested in (forest or agricultural (crops & residues) biomass)

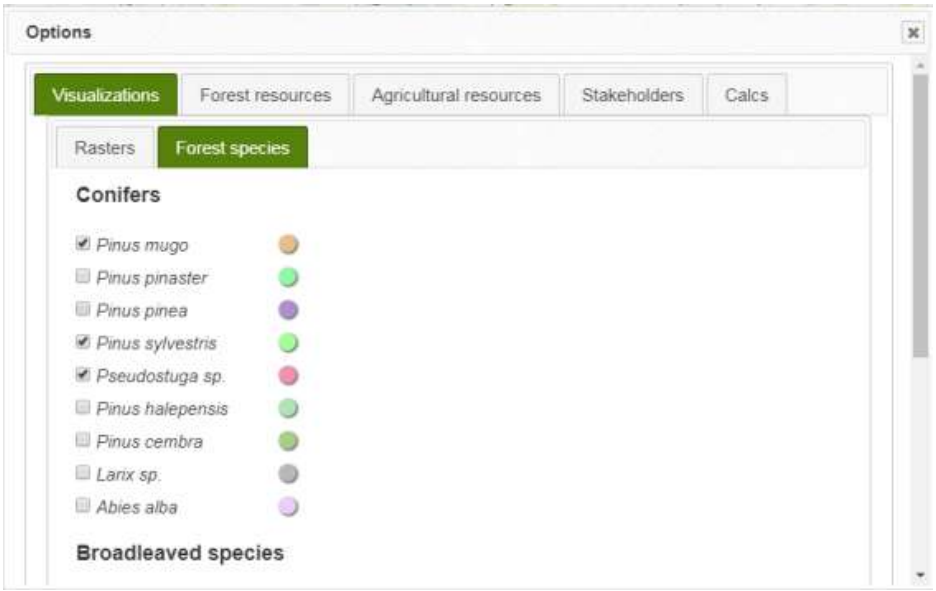
Name of the tool	S2Biom
	2) The carbon cost level BeWhere needs to take into account (0, 50, 100, 150 EUR/tCO2). This refers to the carbon tax level. 3) The fossil fuel cost level (0.25, 0.50, 0.75, 1.00, 1.25, 1.50 EUR/GJ): This refers to factor by which the fossil fuel cost is multiplied. The reference fossil fuel price used in BeWhere is from the year 2012. 2.LocaGIStics: An interactive tool LocaGIStics which is running in the S2BIOM toolset. It enables the user to design and evaluate different biomass delivery chains in regions for which information and data is included in the database.  This tool is the most complicated tool developed in the S2BIOM toolset in terms of functionalities, data integration, calculation upon user specifications. S2Biom Report Downloads: Downloadable deliverables during project execution of each WP Data Downloads: Database Directory of files
Who is this tool destined to (potential users)	To every economic actor such as households, companies, public or private organizations and corporations, as long as they have impact or participate at any point of the whole biomass delivery chain: from primary biomass to end-use of non-food products and from logistics, pre-treatment to conversion technologies. Stakeholders interested to integrate, design or evaluate optimal biomass delivery chains and networks at European, national, regional or local scale in order to support the development of best strategies for setting up a bio-based economy.
How can this tool affect/benefit or help a relevant stakeholder?	This tool will build up a concise knowledge base both for the sustainable supply and logistics of non-food biomass (quantities, costs, technological pathway options for 2020 and beyond), and for the development of technology and market strategies in order to support the development of a “resource efficient” bio-economy for Europe.
Additional information of the tool	For additional supports on S2Biom online tool system, please refer to Loomio User Manual and Training Material page: • User guidelines:

Name of the tool	S2Biom
	https://s2biom.wenr.wur.nl/doc/S2Biom_D4_11_User%20guide%20toolset_Ver%201_FINAL.pdf • Technical description: https://s2biom.wenr.wur.nl/doc/S2Biom_D4_10_technical%20description%20toolset_Ver%202_FINAL.pdf For further information about the project visit the S2BIOM website
Organisation/project that developed/manages the tool	S2Biom has received funding from the European Union's 7th Framework Programme for research, technological development and demonstration under grant agreement No FP7-608622. It was coordinated by FNR (Fachagentur Nachwachsende Rohstoffe e.V.), and the consortium included 31 partners from EU28, western Balkans, Ukraine and Turkey.
Responsible for the study of the tool and organisation	Fundación CIRCE

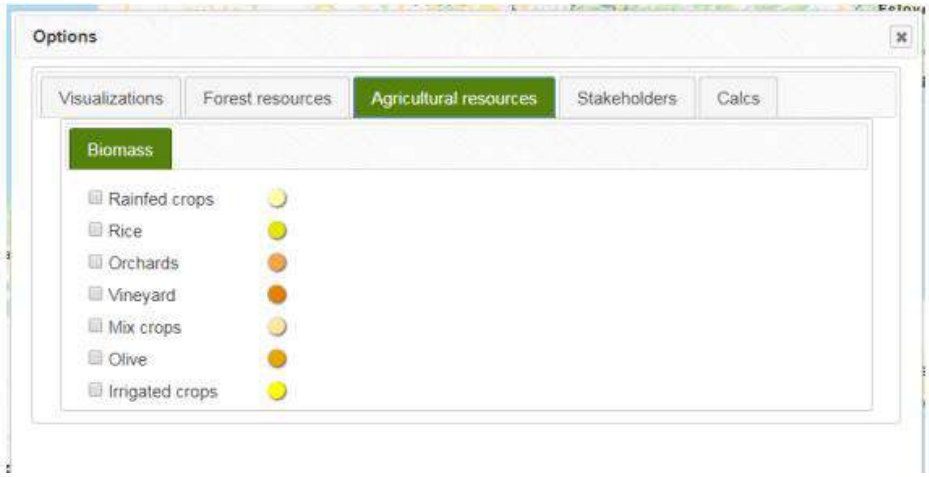
6.1.4 BioRaise

Name of the tool	BIORAISE
Logo	No logo.
Link	http://bioraise.ciemat.es/Bioraise/home/main
Brief Description	The application **BIORAISE** is a tool that offers information regarding agricultural and forest field biomass resources with potential energy use in Croatia, France, Greece, Italy, Portugal, Slovenia, Spain and Turkey, and the existing raw biomass producers from agri-food and wood industries as well as bioenergy market stakeholders. The platform allows the calculation of the mentioned biomass resources and its harvest and transport costs.
Type of tool	Supply chain
Subtype	Map / GIS (Geographic Information System)
Related to	Business model
Most valuable information that can be obtained	BIORAISE platform, integrates the biomass resources layers, environmental risks and stakeholders' data. The service evaluates the biomass field resources available from agriculture and forestry, including shrublands. From user selected locations, the platform provides, on the fly, the following information: biomass resources, harvesting and transport costs and energy content. The application includes diverse stakeholders related to solid bioenergy sector.
How does the tool work / manual of the tool	The terrain page displays several tabs, from which Google base maps, either map or satellite, options and legend can be chosen. The Visualisations tab shows environmental maps of the risk layers related to the soil facets: Soil Erosion Risk, Bedrock immediately underlying the soil layers 0-100% of the R horizon, Absolute Depth to Bedrock, Volumetric Coarse Fragments in % at 0.05 m of topsoil, RUSLE Equation R factor and Soil Organic Carbon at 30 cm depth. In addition, the Net Primary Productivity layer is also shown in an analogous gradient from areas of high productivity (green) to areas of lower productivity (red/purple shades). The layers are displayed in categorised values showing a gradient of risk from green (lower risk) to red/purple (higher risk). 

Name of the tool	BIORAISE
	A sub-tab shows specific maps of selected dominant stands of trees from the JOINT RESEARCH CENTRE in case the user wants a more refined view of specific forest data.

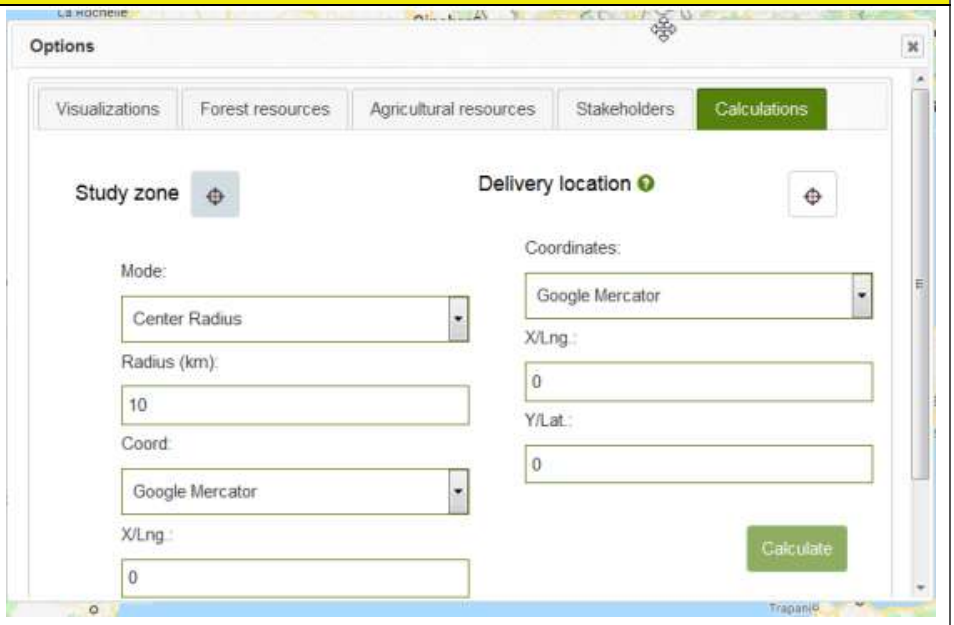


The Forest Resources and Agricultural Resources tabs allow the user to select between agriculture, forestry and scrubland use from CORINE LAND COVER. Agriculture contains field resources of arable crops (rainfed crops, rice and irrigated crops), orchards, vineyards, olive trees and mixed crops (agroforestry arable crops). Forestry categories include coniferous, broadleaved, mixed stands, agroforestry systems (e.g. pasture) and scrub.



The Calculations tab allows the user to choose a location for the area of interest and the collection point. For calculations, a circular radius (from 1 to 100 km) or administrative boundaries (NUT3 regions - e.g. province in the Spanish administrative divisions - or sub-region - e.g. municipality boundary) are required.

Name of the tool	BIORAISE



Once "calculate" has been clicked, a dialogue window displays the results. Potential biomass is given in tonnes of dry matter per year (t DM year-1), areas are given in hectares and average harvesting and transport costs in EUR/tonne. Due to the efficiency actually achievable in the harvesting processes, not all resources from the field reach the biomass production chain: therefore, a more realistic available biomass is also calculated.

Agricultural Biomass	Potential resources (tDM/year)	Available resources (tDM/year)	Average cost of collection (€/tDM)	Resources surface (ha)	Average transport cost (€/tDM)
Rainfed crops	5,550.03	2,775.01	41.67	2,087.54	5.69
Irrigated crops	338.36	169.18	21	30.67	5.59

In the case of agricultural field resources, due to the actually achievable efficiency in harvesting processes, not all field resources reach the biomass production chain: therefore, a more realistic available biomass is also calculated. In the case of forest resources, the risk of soil erosion and organic carbon deeper than 30 cm limit the potential resources. In addition, technical constraints are applied by taking into account a threshold of 20% slope increase in the cost calculations.

Forest Biomass	Potential resources (tDM/year)	Available resources (tDM/year)	Average cost of collection (€/tDM)	Surface of potential resources (ha)	Surface of available resources (ha)	Average transport cost (€/tDM)
Conifers	2,822.58	1,027.19	55.83	3,332.27	3,317.79	5.62
Broadleaved species	3,699.04	1,474.32	45.26	3,977.46	3,972.25	5.58
Mixed	380.15	127.3	49.68	380.52	379.71	5.64
Shrub	2,771.03	1,053.48	40.52	4,281.6	4,257.07	5.58

Regarding transportation costs, the user can select the "Transportation fuel cost", which is highly variable over time and across regions. The default option

Name of the tool	BIORAISE

is 1.2 €/l. Transportation costs do not include VAT considerations (variable between countries).

Energy contents are also calculated: the user can apply different moisture contents by moving the % wet basis bar.

Calculation results

Energetic content

Agricultural Biomass	Available resources (tDM/year)	% wet base	Available resources (tWM/year)	Ash value mean reference (% d.b.)	Energetic content (GJ/year)	Average cost of collection (€/GJ)	Average transport cost (€/GJ)
Rainfed crops	2,775.01	35	4,269.25	6.1	43,744.03	2.64	0.36
Irrigated crops	169.18	35	260.28	7.8	2,630.36	1.35	0.36

Forest Biomass	Available resources (tDM/year)	% wet base	Available resources (tWM/year)	Ash value mean reference (% d.b.)	Energetic content (GJ/year)	Average cost of collection (€/GJ)	Average transport cost (€/GJ)
Conifers	1,027.19	35	1,580.29	2.7	18,124.23	3.16	0.32
Broadleaved species	1,474.32	35	2,268.18	3.7	24,069.05	2.77	0.34
Mixed	127.3	35	195.85	3.2	2,162.19	2.93	0.33
Shrub	1,053.48	35	1,620.74	3.1	16,277.4	2.34	0.32

The STAKEHOLDERS tab collects data locations and details of solid raw biomass producers: wood industry, olive oil industries, nut shelling and wine sector - distilleries, and other actors: industry equipment and machines, services and facilities, biofuel producers, biofuel distributors, research centres, large consumers and BIOMASUD PLUS certified biofuel producers and distributors.

Name of the tool	BIORAISE

At the end of the results window, the user can click on the "Download results" button and a zip file containing a CSV and a shapefile are provided. The corresponding attributes in the shapefile are:

	A	B	C	D	E	F	G	H	I	J	K	L
1	Centro: Lat. 41,9461 Lng. -3,6021	Radio: 5,00 Km	Punto recogida: Lat. 41,7659 Lng. -2,4922	Fuel price: 1.3 €/L								
2												
3	Type of biomass	Surface of potential resources (ha)	Surface of available resources (ha)	Potential resources (tDM/year)	Available resources (tDM/year)	Average cost of collection (€/tDM)	Average transport cost (€/tDM)	% wet base	Ash value mean reference (% d.b.)	Energetic content (GJ/year)	Average cost of collection (€/GJ)	Average transport cost (€/GJ)
4	Secano	813.16	813.16	2,161.89	1,080.95	41.67	20.00	35	6.10	17,039.52	2.64	1.27
5	Frondosas	1,662.50	1,646.28	1,075.64	424.22	45.33	19.88	35	3.70	6,925.67	2.78	1.22
6	Forestal mix	634.69	633.76	440.84	175.97	46.69	20.18	35	3.20	2,988.73	2.75	1.19

- Origin: land use category (i.e., Agriculture or Forestry).
- Biomass: resource type in accordance with the Agriculture or Forestry Corine Land Cover subcategories (e.g., Rainfed Crops, Conifers, etc.)
- SurAgrAvl: surface of available agricultural categories (ha).
- SurAgrPot: surface of potential agricultural categories (ha).
- SurForAvl: surface of available forestry categories (ha).
- SurForPot: surface of potential forestry categories (ha)
- BiomassPot: potential biomass (t DM/year).
- BiomassAvl: available biomass (t DM/year).
- CostCollec: harvesting cost (€/t DM).
- CostTrans: transport cost to from the tile centroid to destination point (€/t DM).
- distX: euclidean distance from the tile centroid to the closest road (m).
- distY: distance by road to destination point. The CSV provides the summarized results for the area of interest.

	A	B	C	D	E	F	G	H	I	J	K	L
1	Centro: Lat. 41,9461 Lng. -3,6021	Radio: 5,00 Km	Punto recogida: Lat. 41,7659 Lng. -2,4922	Fuel price: 1.3 €/L								
2												
3	Type of biomass	Surface of potential resources (ha)	Surface of available resources (ha)	Potential resources (tDM/year)	Available resources (tDM/year)	Average cost of collection (€/tDM)	Average transport cost (€/tDM)	% wet base	Ash value mean reference (% d.b.)	Energetic content (GJ/year)	Average cost of collection (€/GJ)	Average transport cost (€/GJ)
4	Secano	813.16	813.16	2,161.89	1,080.95	41.67	20.00	35	6.10	17,039.52	2.64	1.27
5	Frondosas	1,662.50	1,646.28	1,075.64	424.22	45.33	19.88	35	3.70	6,925.67	2.78	1.22
6	Forestal mix	634.69	633.76	440.84	175.97	46.69	20.18	35	3.20	2,988.73	2.75	1.19

Following the European directive of INSPIRE (INfrastructure for Spatial InfoRmation in Europe), the BIORAISE tool offers WMS services of the bioenergy Stakeholders. The WMS service can be accessed through the following address: http://bioraise.grupotercerafase.com/WMS

Name of the tool	BIORAISE
	The HELP section is to contain a brief method report and main references. Contact with the authors is possible and user feedback encouraged as a way to increase the testing of the tool, understand the limitations of the methods and enhance the functionalities to better meet user requirements unaccounted for in this version that would be addressed in further updates. CIEMAT has been verifying the consistency of results and would like to still improve some of the computations in the geospatial layers of BIORAISE[4]
Who is this tool destined to (potential users)	Local authorities, local economic players, biomass owners, biomass management companies, RESCoops/Energy Communities, Associations, ESCOs, Research centers / Universities.
How can this tool affect/benefit or help a relevant stakeholder?	It can help allocate nearby biomass in order to stablish a technically and economically feasible supply chain, based in regional and sustainable fuels. Additionally, it can help estimate the biomass potential, heating values, harvesting and collection costs, and the distance by road to the destination point. All of this summarised in a simple Excel spreadsheet that agglutinates all these information.
Additional information of the tool	As a calculation tool, the application can query by a circle from 1 to 100 km radius around the selected site, or alternatively, by province or municipality polygons. The requested site can be defined in the application by clicking on it on a displayed map or by introducing its geographical co-ordinates. When a query is launched, the application shows a window with two tabs: one allows to assess the resources and collection costs of agricultural and forest field biomass in the whole five countries, and the other can perform the same function for the agro-industrial biomass by-products in the SUDOE region. BIORAISE allows to calculate the resources in tons of dry matter per year (o.d.t./year) and their average collection costs in Euro per o.d.t.. By entering the most probable moisture values of the different types of biomasses, the energy content in GJ/year (Net Calorific Value) and the average reference value of ash content dry mater are also calculated. BIORAISE allows to calculate the biomass transport cost from the selected circle or polygon to the chosen delivery site. For this purpose, the fuel price (diesel) must be introduced in the cell “Fuel price” and then the “Issue transport cost” button must be clicked. The tool then provides an estimation of the average transport cost by road for each biomass category.
Organisation/project that developed/manages the tool	This tool has been updated and improved within the scope of the project funded by the European Union through the European Framework Program for financing R+D+I Horizon 2020 'Developing the Sustainable Market of Residential Mediterranean Solid Biofuels (Biomasud Plus)' No. 691763. The direction and coordination of the development of the BIORAISE application has been carried out by the Center for Environmental and Technological Energy Research (CIEMAT), through its Biomass Unit of the CEDER-CIEMAT. The property of BIORAISE corresponds to CIEMAT. Entities that together with CIEMAT have collaborated in providing the basic

[4] D2.4 BIORAISE GIS platform with actualized information of sustainable biomass resources available and costs and stakeholders relevant data for residential heating solid biofuels production, logistics and use in each participating country - Developing the sustainable market of residential Mediterranean solid biofuels – BIOMADUS PLUS

Name of the tool	BIORAISE
	data for this application: • Italian Agroforenergy Association (AIEL - Italy) • Tübitak Marmara Research Center (TÜBITAK MAN - Turkey) • Biomass Centre for Energy (CBE - Portugal) • Centre for Research and Technology Hellas (CERTH - Greece) • Slovenian Forestry Institute (SFI - Slovenia) • Green Energy Cooperative (ZEZ - Croatia) • The Spanish Bioenergy Association (AVEBIOM- Spain)
Responsible for the study of the tool and organisation	Fundación CIRCE

6.1.5 BioEnergy Association best practice guideline

Name of the tool	BioEnergy Association: Best practice guideline for life cycle analysis of heat supply projects
Logo	
Link	https://www.bioenergy.org.nz/resource/tg14-evaluation-of-heat-plant-opportunities
Brief Description	Best practice guideline, along with the associated Excel Levelised Cost Of Energy (LCOE) model, is intended to provide a standardized methodology for assessing options for commercial and industrial-scale heat supply, especially for the group of advisers or decision-makers considering the options for the supply of heat to commercial and industrial users. This tool contains the methodology for: • evaluation of the costs and benefits of the available options for heat supply over the life of a facility, and for the selection of the best option; • assessment of the comparative lifetime costs of heat from plants fuelled by electricity, gas, oil, coal, and biomass over the project lifetime; • the basis for the preparation of the financial business case for the heat project and obtaining project approvals. This tool captures the collective technical knowledge of a range of leading bioenergy industry personnel. In addition, it benefits from the collective experience of the Members of the Bioenergy Association Wood Energy Interest Group.
Type of tool	Economic tool
Subtype	Tool
Related to	Business model
Most valuable information that can be obtained	The process detailed in this Guide involves assessment and clarification of project objectives, analysis of potential heat supply options, and then in detail of the financial parameters of the selected solution, followed by the preparation of the business case for the project. It is structured under (indicatively) the following eight steps: **Step 1.** Identify and quantify the site heat requirements, assessment criteria, analysis assumptions, financial parameters, and economic life for analysis **Step 2**. Assess fuel options: availability, cost, and reliability of supply over the economic life of the facility **Step 3.** Assess comparative costs of heat from fuel options based on capital, risk, operational and fuel costs and any quantifiable project benefits **Step 4.** Assess non-monetary and less tangible benefits and quantify where possible in business terms **Step 5.** Select a preferred option on the basis of Steps 4 and 5 and refine costs and benefits to complete the financial assessment

Name of the tool	BioEnergy Association: Best practice guideline for life cycle analysis of heat supply projects
	Step 6. Consider risks, potential upsides, and sensitivities **Step 7.** Confirm project timescale and critical milestones and monitoring mechanisms **Step 8.** Prepare the business case, submit and gain project approvals Detailed LCOE model overview: **Sheet 0: Introduction to model.** **Sheet 1: Capital costs.** This sheet comprises a checklist of capital cost components for installing a heating plant and associated systems and services, against which estimated or quoted costs can be entered, with the sum being the capital cost transferred to the DCF calculation of heat costs. It is noted that all cost items will not be required for each heat supply option. **Sheet 2: Operating and maintenance costs.** This provides a checklist of cost categories against which estimated or quoted costs can be entered, with their sum being the operation and maintenance cost transferred to the DCF calculation of heat costs. **Sheet 3: Fuel cost calculation sheet.** This sheet calculates the fuel cost, by fuel type, for inclusion in the financial model and the associated carbon cost. It is noted that the preferred basis for the calculation of fuel use is the specific fuel consumption for the boiler being considered, this figure being obtained from the heat plant supplier. **Sheet 4: Modelling inputs**. This is a master input sheet into which the project and business-specific economic parameters are entered. The inputs to Sheet 4 are as follows: • Fuel inflation rate Fuels will escalate in cost at different rates. The model assumes that the fuel costs will increase annually at the same rate as all other costs. The inserted figure is the estimated fuel cost inflation figure for that fuel in excess of the figure for general inflation. • Residual value. This is a nominated figure intended as a proxy for the value of the cash flows from the energy plant after the modelling term, based on the fact that such facilities generally have a much longer life if well maintained and if demand for their heat remains. For a well-maintained heat plant with an ongoing application at the site, a residual value in the range of 25 to 40% of the initial cost is seen as appropriate. • Additional benefits or costs. Such benefits might include: - Savings on wood residue disposal - Heat sales to third parties - In the case of a decision on heat plant replacement, the avoided costs of running the heat plant/system that is being replaced - Other quantifiable financial benefits associated with the project • WACC (Weighted Average Cost of Capital). This is the discount rate that applies to the lifecycle analysis. It is usually the rate that a company is expected to pay on average to all its security holders to finance its assets (a weighted average of the cost of debt and equity)

Name of the tool	BioEnergy Association: Best practice guideline for life cycle analysis of heat supply projects
	• Project life: The term over which the project is to be financially assessed. It is noted that: the shorter the modeling period, the higher the heating cost will be as the capital costs will be amortized over a shorter period, and that a shorter period tends to "favor" project options with a lower capital cost (i.e., gas rather than wood fuel). Heat plants have long lives, certainly in excess of 20-years, if well maintained, but business requirements may change over time, leading to changing demand for heat. It is suggested that a term of 20-years be used as a default ; in cases of heightened project uncertainty, a term of 15-years is used. **Sheet 5: Modelling outputs:** This summary/report sheet is fed by the DCF models in sheets 6 to 12 to provide numerical and graphical figures covering heat supply costs. The following are reported on this sheet for up to seven fuel or equipment scenarios: • The annual costs of heat in year 1, excluding any consideration of capital costs • The pre-tax NPV of the project costs and benefits if applicable, including the capital, over the modelled period • The levelised costs of heat supply from the scenarios considered, in USD/GJ and $/kWh, in both table and graphical form • The sensitivity, considered in USD/GWh, of the options to changes in input parameters **Sheet 6 - 12: A scenario analysis.** These sheets contain seven DCF models, covering different fuel or technology options, each input with data from Sheet 4. They calculate the annual heat cost of each option and the financial sensitivity to parameter changes. Proposed conditions for sensitivity analysis of heat plant project: The following sensitivities are assessed for each of the heat plant options modelled: • Capital cost: plus 20%, minus 10% against modelled base-case costs • Fuel: costs: +20%, -10% • O&M costs: +20%, -10% • Heat demand: +/-20% Social Analysis based on Cost Benefit Analysis (CBA) tool that advises on estimating the dollar value impacts of policy changes, drawing from a common database of impact values - these intended for social investment) Moreover, require consideration of: • all impacts (including financial, social, and environmental) that can be identified, whether they can be quantified, being specific about which individuals or groups will be affected, how and when

Name of the tool	BioEnergy Association: Best practice guideline for life cycle analysis of heat supply projects
	• secondary impacts such as opportunities to train individuals for employment that may increase their income, quantifying these impacts if and monetizing them by converting them into a dollar value, i.e., 'money saved from reduced social costs. Ranges may also be used, with more comprehensive ranges indicating more uncertainty. Benefits are to include Government benefits (costs) and broader societal benefits (costs). • the proposal's other positive and negative impacts compared to what would happen if the proposal does not go ahead (the counterfactual).
How does the tool work / manual of the tool	Technical Guide and associated financial model have been published on the Association administered website www.usewoodfuel.org.nz, and these are freely available, so the user can download, read and test it.
Who is this tool destined to (potential users)	Various stakeholders (e.g. advisers, decision makers)
How can this tool affect/benefit or help a relevant stakeholder?	The methodology includes recommendations on how to deal with assumptions of life cycle analysis of heat plants, and how to undertake a financial risk and sensitivity analysis and present the findings to decision makers.
Additional information of the tool	This Guide is intended to provide the basis for the analysis of options for the production of the low, medium, and high temperature and pressure process heat, or heat production for commercial scale-space heating, but not for use at the residential scale. No analysis of other biomass fuels apart from wood chips (e.g. agricultural biomass fuels)
Organisation/project that developed/manages the tool	BioEnergy Association: Australian New Zealand Biochar, Australian Pulp and Paper Industry Technical Association, Bioenergy Australia, Forest Industry Contractors Association, Heavy Engineering Research Association, NZBIO, New Zealand Forest Owners Association, New Zealand Home Heating Association, Sustainable Business Network, WasteMINZ, Women & Leadership New Zealand, World Bioenergy Association
Responsible for the study of the tool and organisation	Wroclaw University of Environmental and Life Sciences (WUELS)

6.1.6 RESCoop handbook

Name of the tool	Handbook on Investment schemes for REScoop projects
Logo	

Name of the tool	Handbook on Investment schemes for REScoop projects
Link	https://www.rescoop.eu/uploads/rescoop/downloads/Financial-Handbook-for-REScoops-English_2020-10-19-171323.pdf
Brief Description	The first part of the handbook focuses on the description of the types of investment schemes. The second section of the handbook is dedicated to the description of practical cases of REScoop investment schemes. It focuses on four key examples from the REScoop movement in Europe, which have been identified as best practices based on different criteria, among which the technical and economic sustainability of the project and the financing schemes and participation of citizens as shareholders. The final section of the handbook depicts new investment schemes that are either very punctually used or not yet set up to finance REScoops.
Type of tool	Bioenergy relevant tool, business model
Subtype	Tool
Related to	Business model
Most valuable information that can be obtained	Ways of REScoop financing, Methodology of choosing the suitable investment scheme, Best practices' investment schemes as practical examples, innovative and new financial schemes for the early start-up phase of a REScoop
How does the tool work / manual of the tool	Getting acquainted with the content of the handbook and using the obtained information in practice
Who is this tool destined to (potential users)	Citizens, local authorities, local economic players
How can this tool affect/benefit or help a relevant stakeholder?	The first section - methodology set up by the partners of the REScoop 20-20-20 project to help in pinpointing an investment scheme that corresponds to the main characteristics of the given REScoop project. The second section - replicable examples are detailed to give a more precise idea of setting up an investment scheme for a specific electricity production project. The final section - this part of the handbook is to overview the potential of several tools, methods, and ideas that could be supported and exploited by the citizen-based projects in the renewable energy sector in the future.
Additional information of the tool	The handbook presents many ways of financing energy communities. The methodology of choosing the right form is presented in an accessible way. Based on the use of the matrix, we can choose the appropriate form of financing. This handbook is a bit outdated (year of publication: 2014). Perhaps new ways of financing investments worth mentioning have already been developed. In the handbook, there are no examples of REScoops producing heat. Only those that generate electricity are presented.
Organisation/project that developed/manages the tool	REScoop 20-20-20

Name of the tool	Handbook on Investment schemes for REScoop projects
Responsible for the study of the tool and organisation	Wroclaw University of Environmental and Life Sciences (WUELS)

6.1.7 Phyllis2

Name of the tool	Phyllis 2
Logo	Phyllis2
Link	https://phyllis.nl/
Brief Description	It is a database containing information on the composition of biomass, macro-and micro-algae, feedstocks for biogas production, biochar, and torrefied biomass; it provides data for individual materials or average values for a group of materials. The database consists of 3 classifications. The first one is ECN Phyllis classification based on a mixture of plant physiology and practical considerations. The materials have also been classified according to the NTA 8003 classification (version December 2008), resulting from the "Classification of Biomass" project initiated by Novem. The BIODAT subset of data is also classified according to CEN/TS 14961. The Phylis 2 database can help find the optimal biomass raw material for use in RESCoop in terms of physicochemical properties (optimal in terms of calorific value and the potential air emissions resulting from its processing).
Type of tool	Bioenergy relevant tool
Subtype	Tool
Related to	Technical information
Most valuable information that can be obtained	Valuable information obtained from the use of the "Phylis 2" database: ● biomass material classification codes ; ● results of the material ultimate analysis: carbon, hydrogen, oxygen, nitrogen, sulphur, chlorine, fluorine, and bromine content; ● results of the material proximate analysis: ash content, water content, volatile matter content, fixed carbon content ; ● material biochemical composition (cellulose, hemicellulose, lignin, fats, protein, pectin, starch, extractives, C5 and C6 sugars, total non-structural carbohydrates content) ; ● biomass calorific value ; ● material (alkali)-metal content ; ● composition of the biomass ash (including heavy metals content i.e., lead (Pb),

	cadmium (Cd), copper (Cu), mercury (Hg), manganese (Mn), chromium (Cr)).
How does the tool work / manual of the tool	The Phyllis 2 website has a helpdesk tab that provides a procedure for using the tool. It describes step by step how to proceed. After selecting a classification scheme, an interactive tree containing the samples in the database, classified into groups according to the chosen scheme is opened. After clicking the name of a group, the subgroup's name or the samples that the group contains are displayed. A search field is available above the classification tree (search for names of samples, classification groups, and sample IDs). The tree will highlight the results when the search is complete. By clicking on a sample, its details and the measured values that have been recorded in the database are shown on the right. The values are organised into groups, each of which can be hidden or shown by clicking the header. When possible, dry values are automatically converted to daf (dry & ash free) and ar (as received) values for specific properties, in which case all three values are shown side-by-side.
Who is this tool destined to (potential users)	Various stakeholders (e.g. end-users, traders)
How can this tool affect/benefit or help a relevant stakeholder?	The database includes some relevant information related to biomass fuel properties. For instance, it could recommend to end-users which fuel is worth using and will not cause major problems during energy processing (e.g., it will not cause corrosion of boiler fittings), thus not exposing stakeholder to unplanned expenses. For the trader, this also has an advantage as it will increase his awareness of the properties of a given fuel, which may increase the quality of the imported fuel, and thus the satisfaction of potential customers.
Additional information of the tool	**Pros (+)** • a wide range of biofuel categories to choose from, • simple operation of the tool - materials are assigned to the appropriate category, • the tool allows calculating average values of arbitrary sets of samples, • possibility to upload own data to the database – if we would like to share our data with others, we should use the link

	shared on the website. Then, we can download an Excel file, add data, and send the file to TNO. After a check, they will make an update, • graphical representation of the results, • the ability to download the results of own analyses (after prior registration on the website). **Cons (-)** • the NTA 8003 classification is available in Dutch only - it would be good to add other languages, • the database does contain materials for which there is no valid code within a classification scheme. These materials are given non-standard codes "other" or are hidden - a request to systematically update the database, • some data are outdated e.g., cattle manure - submitted in 2001, • it would be nice to create one universal classification instead of three different ones.
Organisation/project that developed/manages the tool	TNO Biobased and Circular Technologies
Responsible for the study of the tool and organisation	Wroclaw University of Environmental and Life Sciences (WUELS)

6.1.8 Agrobiomass observatory

Name of the tool	Your Priorities
Logo	AgroBioHeat
Link	AgroBioHeat Observatory
Brief Description	AgroBioHeat H2020 project has developed an observatory for the European success cases of biomass. It shows and allows to filter according to a series of parameters decided by the user.
Type of tool	Technical tool
Subtype	Geographic information system
Related to	Energy communities' success cases
Most valuable outcome that can be obtained	Gain insights about the usefulness of agricultural biomass (or agrobiomass) through success cases and experiences of other stakeholders in the area.
How does the tool work / manual of the tool	The tool can be accessed through the AgroBioHeat project webpage (www.agrobioheat.eu). Once there, in the main tab, the user should click on the "Observatory" button:  Once there, a map of Europe will be displayed, including all the identified cases during the project.
Who is this tool destined to (potential users)	Useful for renewable energy communities interested in biomass use, for bioenergy production. But not only this, biomass owners, biomass management companies can get inspired by other success cases. ESCOs can see alternative fuel utilisation systems, Research centres or universities can widen their sights when referring to bioenergy, NGOs or public authorities can see alternatives uses of disposals not so long ago considered residues and see the potential of converting them into bioenergy.
How can this tool affect/benefit or help a relevant stakeholder?	It can help visualise or show relevant stakeholders other success cases that have been developed and deployed in their surroundings or throughout Europe, concerning a wide range of non-so-usual biomass, as, per example, wine-tree prunings or straw. It can give a best practice starting point, or a contact to whom to go to in the case any doubt is present in the creation of a new community or the deployment of new services in an already existing one.
Additional information of the tool	More information can be found in the following web page: https://www.agrobiomass-observatory.eu/Instructions
Organisation/project that developed/manages the tool	The AgroBioHeat project aims to produce a mass deployment of improved, market-ready agrobiomass heating solutions in Europe. Agrobiomass is a large, underexploited and indigenous resource, which can support the achievement of European Energy and Climate targets, while promoting rural development and the circular economy.

	Actions will be mainly located in 6 European countries (EL, ES, FR, RO, HR and UA; 5 EU-28 + Ukraine) where the aim is to create a broad national movement through engagement, alignment of interests and policy making. Economic and social conditions favouring the expansion of agrobiomass heating. At EU level, specific policy recommendations on the efficiency and emissions of agri-biomass heating solutions will be forwarded to relevant bodies for the development of new regulations.
Responsible for the study of the tool and organisation	Jaime Guerrero (CIRCE)

6.1.9 BioGrace I

Name of the tool	LOOMIO
Logo	BIOGRACE Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe
Link	https://www.biograce.net/home
Brief Description	BioGrace enables this tool to harmonize European calculations of biofuel GHG emissions that have to be made to comply with the Renewable Energy Directive (RED, 2009/28/EC) and the Fuel Quality Directive (FQD, 2009/30/EC). For these, an excel-based spreadsheet was elaborated to stablish GHG emissions calculations of the 22 different biofuel production pathways listed. A list of standard values, additional values, a set of calculation rules and user manual were made along with the excel-based spreadsheet to allow economic operators to generate actual calculations. This tool has been recognized by the European Comissions as a voluntary scheme.
Type of tool	Bioenergy Relevant Tool
Subtype	Environmental Impact Calculator
Related to	Technical
Most valuable information that can be obtained	A very detailed tool that enables to calculate the GHG emissions of different processes, such as obtaining ethanol from wheat with CHP, NG steam boiler, NG CHP, biodiesel (FAMEs) or biogas productions; or the calculation of other features as direct land use change, improved agricultural management, N2O field emissions according to IPCC and CO2 capture, replacement and/or storage. A list of standard values is given containing conversion factors that enable to calculate default values from RED Annex V Three main functions have been identified: 1. **Give details on RED default value calculations**: the calculation sheets have been developed to detail the exact and comprehensive methodology applied to established default values of the Renewable Energy Directive. 2. **Adapt existing pathways for actual value calculations**: adapting some of the input numbers of the calculation sheet allows easy and RED compatible own actual value calculations. It is also possible to add your own standard values (or conversion factors, see the final glossary in chapter 8) in the calculations (for example, adding a specific chemical input). The tool can also be used to estimate the contribution to total GHG emissions of any process or any improvement actions. 3. **Create a new pathway**; next to the two main functions, it is also possible to create a whole new pathway within the tool. Some advice on how to do this is given at the end of this tutorial. However, the tool does not offer user-friendly functionalities for this function; the user shall first have obtained a thorough understanding of the tool before being able to create a new pathway.

How does the tool work / manual of the tool	User-friendly tool. *How does the tool work?* The BioGrace Excel tool is available through the website www.BioGrace.net. In fact, 2 versions are available (Testing and Compliance) the only difference is the "Track Changes" option on/off. The tool is organised in several excel sheets (as introductory explanation sheet, Directory (Figure 1) of links to spreadsheets and calculations sheets.

Figure 1: Directory Sheet

Several calculation sheets are dedicated to one precise aspect of calculation as LUC (GHG impacts of possible Land Use Changes), Esca (carbon stock changes due to improved agricultural practices), N_2O (estimation of N_2O emissions).

Regarding biofuel production pathway calculation sheets, they contain all necessary input numbers and results in the most transparent way possible (example in Figure 2).

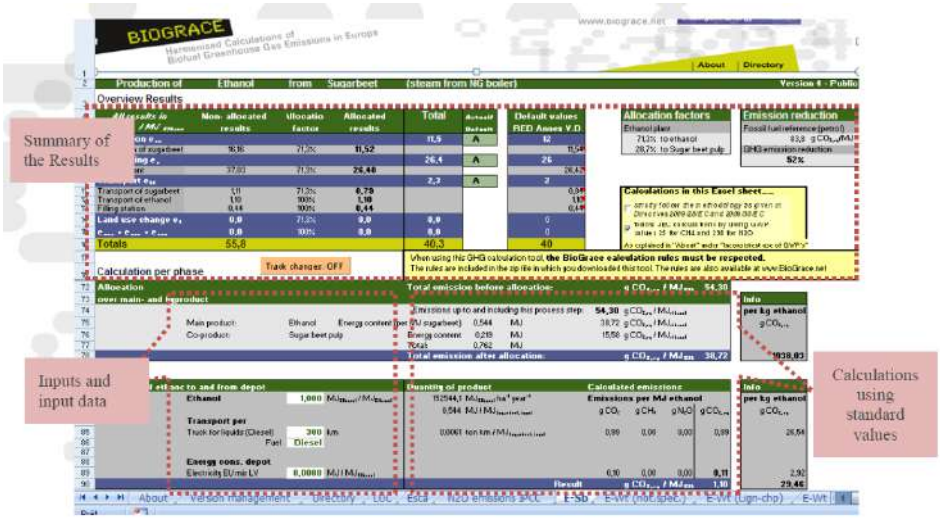


Figure 2: Example of pathway spreadsheet

Calculations are presented always through the same scheme (Figure 3):

Input Data > Intermediate Calculation or Information > GHG calculations and results > Results in other units and other input data.

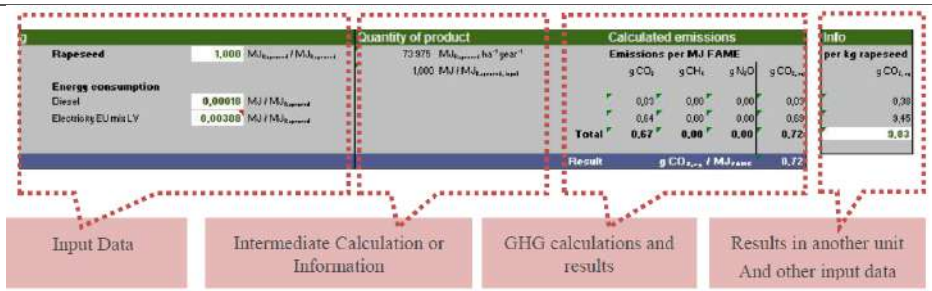


Figure 3: Calculation Input/Output data Scheme

At the end of Directory, it is possible to find two different sheets with "user defined standard values" and "standard values" presenting generic data necessary for the calculations.

- Standard values: conversion factors used for the calculation of RED default values. They are mainly defined by GHG emissions coefficients. It also contains other necessary data for further calculations and/or conversions.
- User defined standard values: In case the user may wish to use conversion values that are not listed within the standard values list, this sheet is provided. However, BioGrace has established several rules for utilizing its own standard values that must be followed. These rules are available in *BioGrace- I calculation rules* document.

How GHG calculations are made?

RED Directive and current BioGrace Excel calculation tool follow a LCA perspective to evaluate GHG emissions of one MJ of selected biofuel.

Hence, several statements must be considered:

- The functional unit is defined as 1 MJ of fuel
- From biomass production to fuel use steps are taken into account within life cycle analysis and are presented in the calculation sheet through different modules.
- Biofuel use phase bears no emissions as is considered to be biogenic CO_2 (other emissions CH_4 are considered to be insignificant).
- Each module gathers the inputs and calculate emissions of the three main GHG (CO_2, CH_4 and N_2O) whereas the details of their individual contributions are presented in the last step in order to have a high traceability, required by ISO norms.
- Finally, GHG emissions are summarized to obtain the GHG emissions of the whole pathway.

Inputs:

Names and quantity of inputs, yields, etc., are given here. There exist four main types of inputs:

- Yield of step
- Energy (electricity or steam consumption)
- Results from previous and partial GHG calculations
- Other inputs such as chemicals, transports…

Some modules dealing with specific issues can be found at the bottom of each calculation sheet. Indeed, some agricultural practices or local conditions also need to be considered within the RED methodology, for instance no tillage, or carbon storage due to straw incorporation into soils. Issues like "Land-Use-Changes", "CO2 storage", "Improved agricultural management", have been

added to specifically address and consider these subjects in each calculation sheet.

Results and general information

The first rows of each Excel sheet present the summary of results for the pathway calculated (Figure 4).

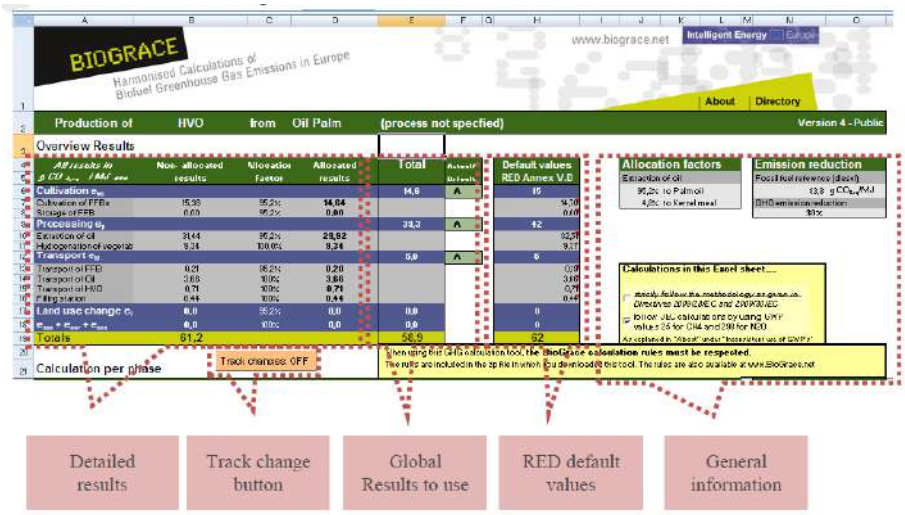


Figure 4: Results spreadsheet sections

- Detailed results: It gives the results step by step before and after allocation. The result given by the white zone corresponds to the one given in Annex V of RED. It sums up the different contributions to impact category (LCA methodology)

C. *Methodology*

1. Greenhouse gas emissions from the production and use of transport fuels, biofuels and bioliquids shall be cal lated as:

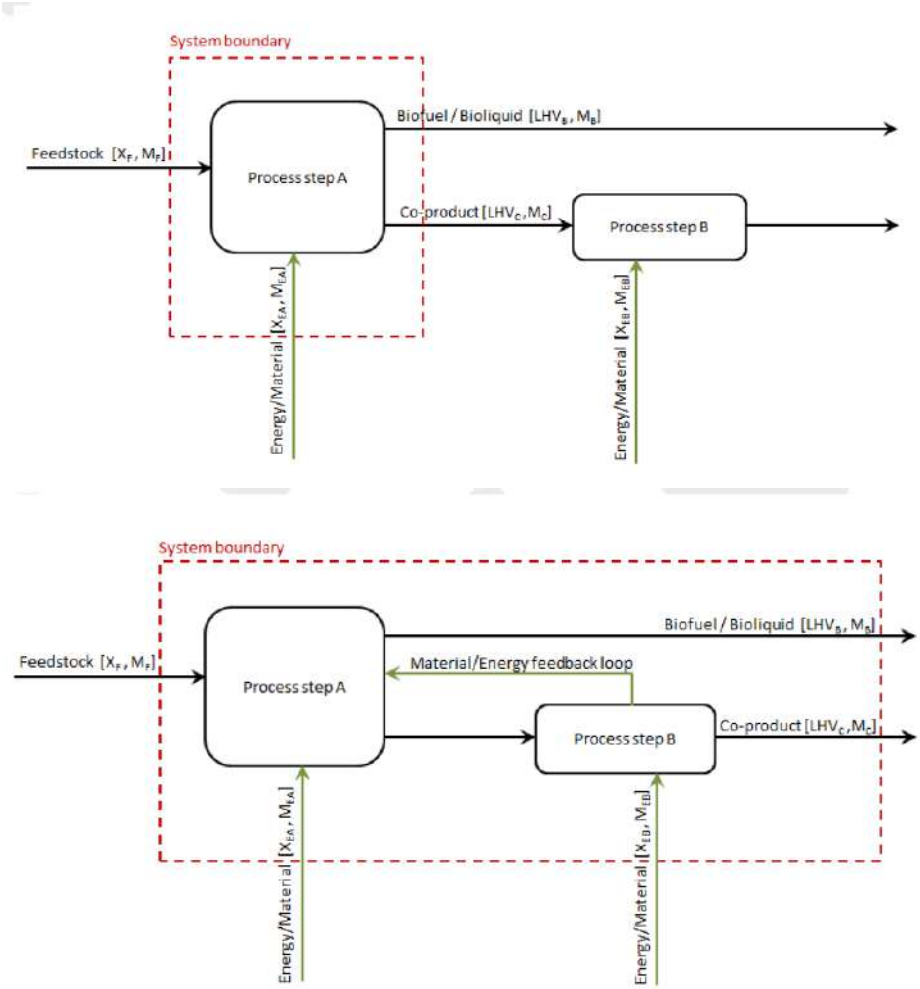
$$E = e_{ec} + e_l + e_p + e_{td} + e_u - e_{sca} - e_{ccs} - e_{ccr} - e_{ee}$$

- Global results: First column gives step by step actual calculated results whilst the second column calculates final total GHG emissions for this pathway.
- RED default values: It gives a clear and direct comparison between calculated result and default value from RED for the same biofuel pathway
- General information: The main most important information given here is the GHG emissions reduction achieved with this biofuel as compared to fossil fuel. Allocation applied for the calculation is also highlighted as an important parameter in the result.

Allocation

RED, Annex V, point 17 defines the concept of allocation. The fuel for which emissions is calculated may be produced along with one or more other byproducts. GHG emissions shall be divided between the fuel (or its intermediates) and the co-products in proportion to their energy content (determined by their LHV).

When allocating emissions between co-products and the fuel, the emissions to be allocated are the emissions that arise up and until the process step where a

	co-product is formed. The allocation takes place after the process step directly after the forming of a co-product (Figure 5).  *Figure 5: Allocation scheme, taking place after the process step where the fuel and co-products are separated (with or without feedback loops)* Allocated emissions coefficient calculations are described on RED, Annex V, point 17. Further inputs as electricity use, emissions from process heat, waste streams handling or production unit GHG emissions or land usage are contemplated within BioGrace spreadsheet
Who is this tool destined to (potential users)	Policy makers from all EU member states and economic actors seeking to calculate GHG emissions impacts or savings may make reference to this list of standard values in their national legislation implementing the Renewable Energy Directive and the Fuel Quality Directive.
How can this tool affect/benefit or help a relevant stakeholder?	RED Annex V defines default values for GHG emissions savings of 22 biofuel production pathways. Calculation methodologies are also prescribed in Annex V: total greenhouse emissions are the sum of emissions from cultivation, processing, and transportation of those biofuel. Nevertheless, RED I or RED II do not specify “standard values” (conversion factors) or “input numbers” used

	to obtain those default values. For those reasons, as standard values were not fixed, and various values could be found from literature, economic operators are "free" to choose the most beneficial values for them, enhancing their GHG and biofuels performances. BioGrace calculation tool enable to understand how those default values have been established and tries to harmonize those calculation methodologies among countries producing a complete set of standard value. The calculation tool enables economic operators and other users to calculate actual values of biofuel greenhouse gas emissions following the same methodology.
Additional information of the tool	For additional supports on BioGrace calculation Tool, please refer to project website, Instructions Video and material: ● https://www.biograce.net/content/ghgcalculationtools/recognisedtool ● https://www.biograce.net/content/ghgcalculationtools/instructionvideos ● https://www.biograce.net/img/files/2015-05-12-161933BioGrace-I_GHG_calculation_tool_-_version_4d.zip
Organisation/project that developed/manages the tool	BioGrace: Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe project was financed by Intelligent Energy Europe programme from 2010 to 2012 and coordinated by Netherlands Enterprise Agency. Different project partners cooperated to develop this tool: ADEME (France), BE2020 (Austria), BIO IS (France), CIEMAT (Spain), EXERGIA (Greece), EFEU (Germany), STEM (Sweden). 
Responsible for the study of the tool and organisation	CIRCE

6.1.10 BioGrace II

Name of the tool	LOOMIO
Logo	
Link	https://www.biograce.net/biograce2/
Brief Description	BioGrace enables this tool to harmonise European calculations of GHG emissions from electricity, heating and cooling activities produced through bioenergy and biomass. It does so in the European context, using values and methodologies from the recast of the Renewable Energy Directive (RED-II). For this, an excel-based spreadsheet was elaborated to stablish GHG emissions calculations, including a list of standard values, a set of calculation rules and user manual were made along with the excel-based spreadsheet to allow economic operators to understand and use the tool and to generate actual calculations. This tool has been recognized by the European Comissions as a voluntary scheme.
Type of tool	Bioenergy Relevant Tool
Subtype	Environmental Impact Calculator
Related to	Technical
Most valuable information that can be obtained	The BioGrace GHG calculation tool allows users to make GHG calculations in line with Directive (EU) 2018/2001 (the "RED-II") for electricity, heating and cooling from biomass activities. Three main functionalities are expected from BioGrace-II: 1) BioGrace-II tool **makes transparent how the RED-II default values were calculated**. For each pathway of production, a dedicated Excel sheet presents the details of the default value calculations. The list of the pathways can be found in the “Directory” sheet with links to the pathway sheets. All calculations are presented step by step, following the well-to-wheel approach. Looking in detail at a calculation sheet provides information on how the calculations were made and on how the methodology from RED-II Annex VI.B was applied. For instance, and without being exhaustive, you can find detailed information on the following issues: • Which steps and inputs have been taken into account in the RED-II default value calculations: The different steps encompassed and the way they are modelled (e.g. has the transport of bagasse pellets been taken into account in the RED-II default value?); All the different inputs taken into account for the calculation (and conversely, one can deduct the inputs not taken into account).

	• Input quantities considered, for instance yields (for cultivation and processing steps), energy consumption, chemical consumption, distance, etc. It is possible to click on each cell **to** see if the number is a raw data figure or if it is a calculated value (the formula is then visible)**.** • Standard calculation values used for calculating default values, like LHV, the GHG emission for producing and using one MJ of natural gas, etc**.** • How energetic allocations are made (see the allocation module for this as well as the calculation rules)**.** • How surplus electricity and/or heat is taken into account (see the exergy calculations for detail examples)**.** • Intermediate calculations, in column E, where all the yields are expressed**.** • GHG emissions **as calculated from the input numbers, in** columns I, J and K, respectively for CO_2, CH_4 and N_2O**.** • The difference between typical and default values: default values correspond to conservative estimations of GHG emissions which are calculated by multiplying typical values by a factor (1.2 or 1.4 depending on the pathway considered). For more **details,** please consult the "About" sheet in the Excel tool**.** • Specific emissions calculated in modules at the end of each Excel sheet: **annualized** emissions from carbon stock changes caused by land use change, CO2 storage, etc. For most of the default values listed in the RED-II, the corresponding calculation in the BioGrace-II tool gives a result that comes very close (deviation less than 0.05 g $CO_{2\text{-eq}}$/MJ). For further understanding, a methodological background documented is extended to determinate calculation methodologies and emissions allocation methods. 2) The BioGrace-II tool allows economic operators to adapt the default value calculations for available pathways. **It could thus be used for setting up calculations of own actual values.** The following chapters give a step-by-step tutorial on how to adapt an existing pathway for several situations: • Changing input data • Using the result from previous and partial GHG calculations • Adding specific standard calculation values for existing inputs • Adding new input in the process 3) BioGrace-II tool can also be used to set up new bioenergy production chains. This requires some knowledge of Excel and a detailed observation of how calculations are made. A short tutorial is provided within the user manual to highlight major steps in case you would like to make the modifications yourself.
How does the tool work / manual of the tool	User-friendly tool. *How does the tool work?*

The tool is organized in several excel sheets, containing general introduction and explanations and a directory with links to all excel spreadsheets with specific pathways names.

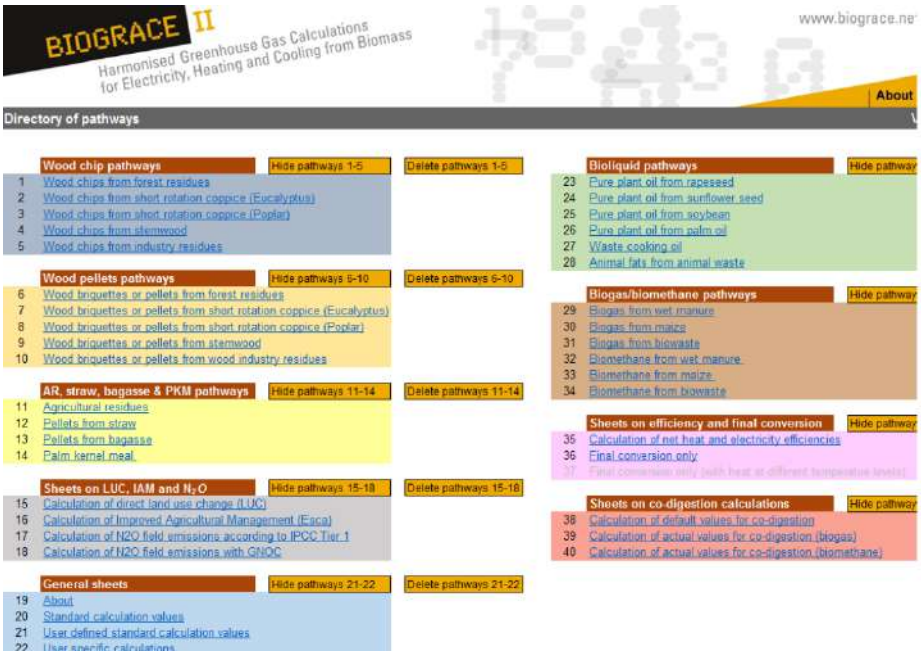


Figure 1: Excel sheets link directory

It is possible to find further sheets dedicated to various precise aspects of calculations as land use changes, N2O emissions according to Global Nitrous Oxide Calculator (GNOC) or IPCC TIER 1 methodologies, and electricity, heat and/or cooling from biogas/biomethane from biowastes digestions.

The sheets contain all input numbers and results for the pathways scoped in the most transparent way possible. Each specific excel sheet calculator will contain significant sections:

- Summary of Results
- General settings of the pathway
- Overall yield of the pathway
- Inputs data
- Standard values used for the calculation

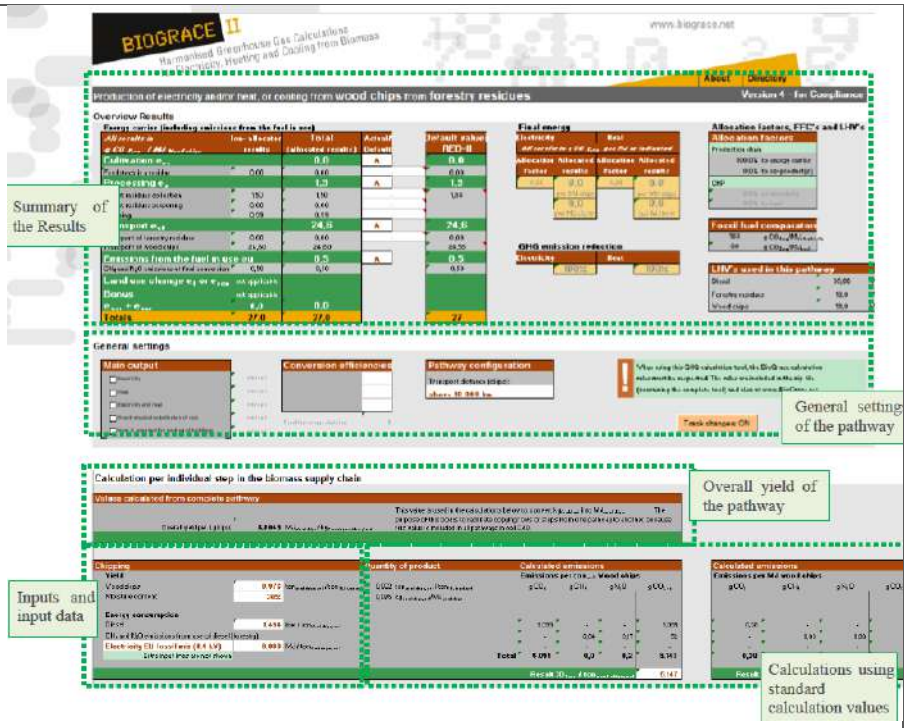


Figure 2: Excel sheet calculator view

The sheets named "User defined Standard Calculations Values" and "Standard Calculations Values" present the generic data necessary for calculations.

The "Standard Calculation Values" sheet includes the conversion factors used by JRC to calculate the RED-II default values. These are (a) GHG emission coefficients, (b) Lower Heating Values (LHV), (c) fuel use when transporting 1 ton of goods per truck, ship or train, and (d) CH4 and N2O emissions from fuel combustion in trucks, ships, boilers, etcetera. **The GHG emission coefficients are the emissions of the main GHG gases associated with 1 kilogram or 1 MJ of input.** Moreover, those emissions include both combustion emissions as well as up-stream emissions for producing and transporting these inputs.

The "User defined standard calculation values" sheet can be used in case the user wants to use conversion values that are not included in the list of standard calculation values.

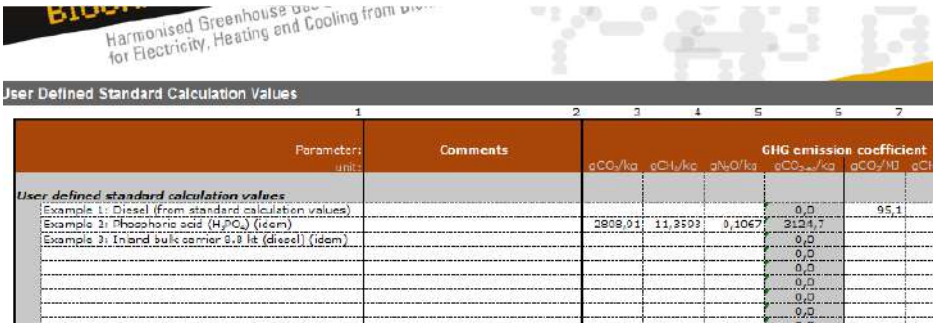


Figure 3: User defined Standard Calculation Values

Finally, the "User specific calculations" sheet is provided to keep track of all intermediate calculations made by the user of the tool and ease the work of the verifiers in case of certification supervision. Any kind of calculation can be put in that sheet, such as conversion unit calculations.

Starting the tool

When you open the BioGrace tool, a popup box called “Help for the cell that is selected” appears. This box gives you all needed information to understand and manage the comments included in the cells of the tool.

As explained in the help box, comments appear with the usual format of Excel comments, as a small red triangle in the right corner of the commented cells. These comments give:

- Explanations on how calculations were made, or
- Instructions on how specific cells or selection boxes can be used; and/or
- References to specific parts of this user manual or to the BioGrace-II calculation rules

Current BioGrace-II Excel version 4 calculations are first made on the basis of tons of biomass, allowing to give inputs in units familiar to biomass producers and owners of conversion installations such as pellet mills. In a second step the tool converts calculated emissions per ton of biomass to the unit grams of $CO_{2equivalent}$ per MJ of biomass, and in the top section the emission per MJ of heat and/or electricity is calculated.

The first rows of each Excel sheet present the summary of results for the pathway calculated (Figure 4):

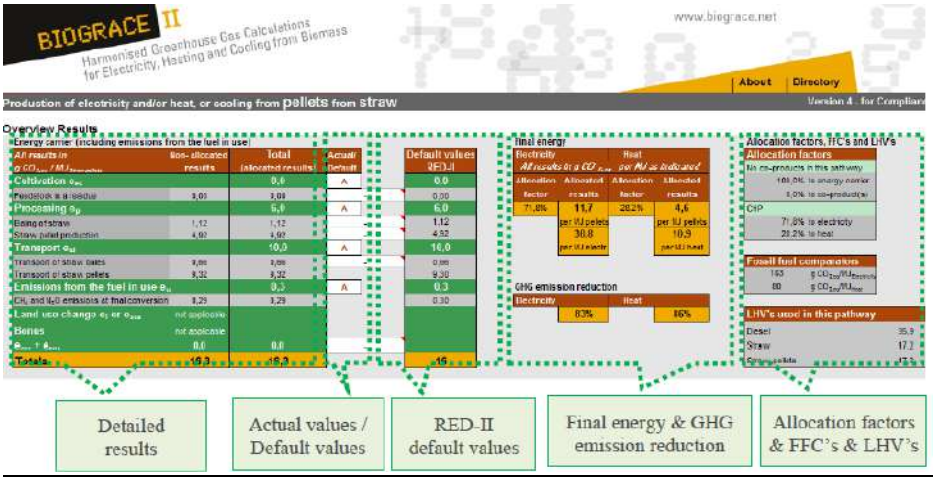


Figure 4: Results spreadsheet sections

- Detail results: It gives the results step by step before and after allocation. The resultant given by the white zone correspond to the one given in Annex V of RED. It sums up the different contributions to impact category (LCA methodology)

C. *Methodology*

1. Greenhouse gas emissions from the production and use of transport fuels, biofuels and bioliquids shall be cal lated as:

$$E = e_{ec} + e_l + e_p + e_{td} + e_u - e_{sca} - e_{ccs} - e_{ccr} - e_{ee}$$

- Actual values / Default values: The column allows to use a mix of disaggregated default values and actual values for the remaining parts of the pathway.
- RED-II Default Values: The default vaues from Annex VI – RED II are given as for the calculation result for each individual step from JRC Excel Databases

- Final energy & GHG emissions reduction: the GHG emissions reduction achieved with this bioenergy pathway in comparison to fossil fuel reference is presented here. This allows demonstrating that the sustainability criteria on GHG savings are met. Final results shall be presented in gram $CO2_{,eq}$ per MJ of electricity and(or in gram $CO_{2,eq}$ per MJ of heat according to final energy selected in settings box.
- Allocation factors & FFC's and LHV's: key data is shown here, displaying allocation factors for the whole production chain and/or for the CHP, if it exists. In fact, this factor shall only be relevant for stakeholders that involve co-products within the generation or production chain. This means that the emission of processing steps up to this point are split between the main product and byproducts based on yield and energy content. However, allocation emissions rules are listed from Renewable Energy Directive II.

Further information in this section are the fossil fuel references used to calculate GHG emissions factors. Finally, LHV used for calculations are also displayed.

How GHG calculations are made?

In each pathway, calculations start with a box called "Value calculated from complete pathway". This box contains a number that corresponds to the overall yield for the total pathway. This number is used in the calculations to convert "MJ feedstock" into "MJ final energy carrier".

Calculations are presented always through the same scheme (Figure 3):

Input Data > Intermediate Calculation or Info > GHG calculation results > Results in other units and other input data.

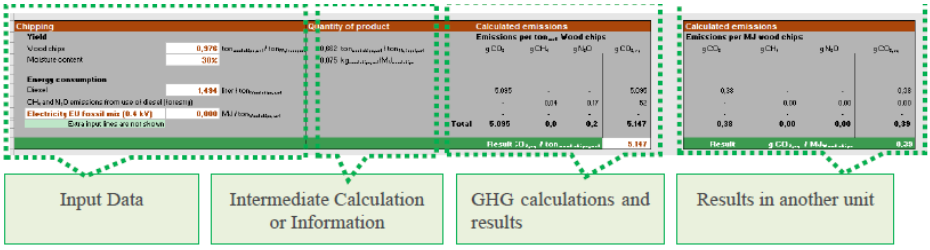


Figure 5: Calculation Input/Output data Scheme

Inputs:

Names and quantity of inputs, yields, etc., are given here. There exist four main types of inputs:

- Yield of step: it is given for the main product and for existing co-products.
- Energy consumptions: Heat or electricity can either be provided from external sources or come from a boiler or a CHP to be included in the calculation. If any energy surplus is produced, emissions shall be allocated
- Other inputs such as chemical, transports…

Intermediate calculation information

Relevant information is given in the central part of the module that may help to acquire easier understanding of some calculation stages or for further parts of the tool.

	GHG Calculations and Results The global warming potentials for the three main gases are taken from the "Standard calculation values" sheet. In this part the results are expressed in the unit g $CO_{2,eq}$ per ton of intermediary product (including moisture). If solid or bioliquid biomass pathways is selected, there will exist a last module presenting the final conversion of final energy carrier combustion calculated to N_2O and CH_4 emissions.  *Figure 6: Final conversion module* When making actual calculations, the "Factor from typical to default values" should be "1". The CH4 and N_2O emissions are already provided for some combinations of "type of fuel in end conversion" and "type of end conversion". If a combination is not provided, then the calculation will result in an error ("#N/B", this can be different in different language versions of Excel). If so, the user must define the CH_4 and N_2O emissions related to his process using the "User defined standard calculation values" sheet. *Units* It is important to use default specific units to avoid calculation errors. Therefore, user may need to change collected data into the units thar are used in the tool. This is the quantity of input needed per MJ of final energy carrier, which then is multiplied by the global warming potential coefficient for CO_2, CH_4 and N_2O to establish final $CO_{2\text{-eq}}$ input per MJ of final energy carrier. *Specific Issues* BioGrace-II contains specific excel calculations for N_2O emissions due to crop cultivation which contains the Global Nitrous Oxide Calculator model (GNOC). Furthermore, GHG emissions from boilers and CHP are also displayed with several different configurations regarding the source of heat. For example, wood chip boiler GHG emissions could be configured for wet or dry chips. Moreover, other configurations may be selected for pellet/briquettes production pathways. Selected pathways and configuration may impact on thermal efficiencies or involve moisture into calculations. Finally, BioGrace calculation tools contain specific issues as for Land Use Changes (LUC) GHG emissions taken into account for your product calculations. A dedicated module is available in the BioGrace-II tool near the bottom of each pathway. It will collect the emissions caused by carbon stock changes from the LUC sheet. Thus, you will need to fill in this LUC sheet to calculate your actual changes in carbon stock. A declared LUC for a pathway will apply to the whole result of the pathway.
Who is this tool destined to (potential users)	Policy makers from all EU member states and economic actors seeking to calculate GHG emissions impacts or savings may make reference to this list of standard values in their national legislation implementing the Renewable Energy Directive and the Fuel Quality Directive.

How can this tool affect/benefit or help a relevant stakeholder?	RED Annex V defines default values for GHG emissions savings of 22 biofuel production pathways. Calculation methodologies are also prescribed in Annex V: total greenhouse emissions are the sum of emissions from cultivation, processing, and transportation of those biofuel. Nevertheless, RED I or RED II do not specify "standard values" (conversion factors) or "input numbers" used to obtain those default values. For those reasons, as standard values were not fixed, and various values could be found from literature, economic operators are "free" to choose the most beneficial values for them, enhancing their GHG and biofuels performances. BioGrace calculation tool enable to understand how those default values have been established and tries to harmonise those calculation methodologies among countries producing a complete set of standard values. The calculation tool enables economic operators and other users to calculate actual values of biofuel greenhouse gas emissions following the same methodology.
Additional information of the tool	For additional supports on BioGrace II calculation Tool, please refer to project website, Instructions Video, previous versions and materials: ● https://www.biograce.net/biograce2/content/ghgcalculationtool_electricityheatingcooling/instructionvideos ● https://www.biograce.net/biograce2/content/ghgcalculationtool_electricityheatingcooling/previousversions ● https://www.biograce.net/biograce2/img/files/BioGrace-II_GHG_calculation_tool_Version_4_Draft.zip
Organisation/project that developed/manages the tool	BioGrace GHG calculation tools have been developed by two project consortia which included 10 organisations from 8 European countries. This development took place from 2010 to 2015. BioGrace: Harmonised Calculations of Biofuel Greenhouse Gas Emissions in Europe project was financed by Intelligent Energy Europe programme from 2010 to 2012 and coordinated by Netherlands Enterprise Agency. Different project partners cooperated to develop this tool: ADEME (France), BE2020 (Austria), BIO IS (France), CIEMAT (Spain), EXERGIA (Greece), EFEU (Germany), STEM (Sweeden). 

Responsible for the study of the tool and organisation	CIRCE

6.1.11 Thermos

Name of the tool	Handbook on Investment schemes for REScoop projects
Logo	THERMOS
Link	THERMOS: Home (thermos-project.eu)
Brief Description	**THERMOS** is a user-friendly, free and open-source software to make heat network planning faster, more efficient, and more cost effective. The software was developed by a team of planning experts & practitioners from universities, local and city-wide authorities, energy and environmental agencies, and specialist consultancies based in the UK, Spain, Poland, Latvia, Denmark, Germany, Portugal, and Romania as part of the THERMOS (Thermal Energy Resource Modelling and Optimisation System) EU Horizon 2020 funded research project.
Type of tool	Technical tool
Subtype	Bioenergy Relevant Tool
Related to	Local district energy network
Most valuable information that can be obtained	THERMOS is a free, web-based energy planning software that provides accurate heat and cold network options analysis instantly within one web-based, user-friendly tool. Developed by the THERMOS EU-funded project, the software is designed to optimize local district energy network planning processes and sustainable energy master planning to facilitate the deployment of new low-carbon heating and cooling systems and a fast upgrade, refurbishment, and expansion of existing systems. Whereas traditional heat and cold network planning is lengthy, tedious, complex, resource and time intensive and often suboptimal in both process and result, THERMOS is identifying place-based, user specific optimal network solutions for any given area within minutes.
How does the tool work / manual of the tool	The THERMOS tool makes District Heating and Cooling (DHC) planning processes easier, faster, and more cost-effective, supporting energy planners in the evaluation of the expansion of an existing system, the planning of an entirely new system, or in comparing the performance of a potential energy network with the deployment of individual solutions on buildings. To access to the tool, registration is needed (THERMOS: Login (thermos-project.eu)),.the basic account is limited to 8000 buildings, 10 optimisations across all projects per 7 days. Once a new project has been started, the first step is to obtain a map of the district heating/cooling area (Figure 1). There are several alternatives to obtain tis map: ○ From OpenStreetMap, which is the most direct option. ○ GIS files: accurate demand and cost information on the case study area. You can upload 3 types of files : shapefiles, GeoPackage, GeoJson

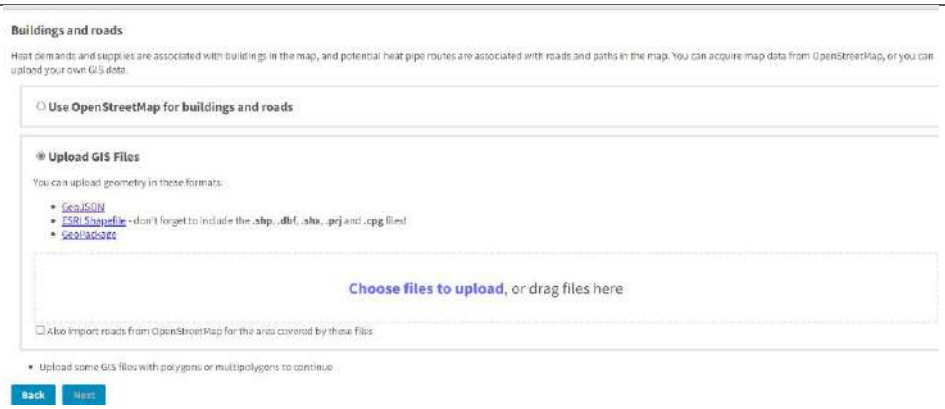
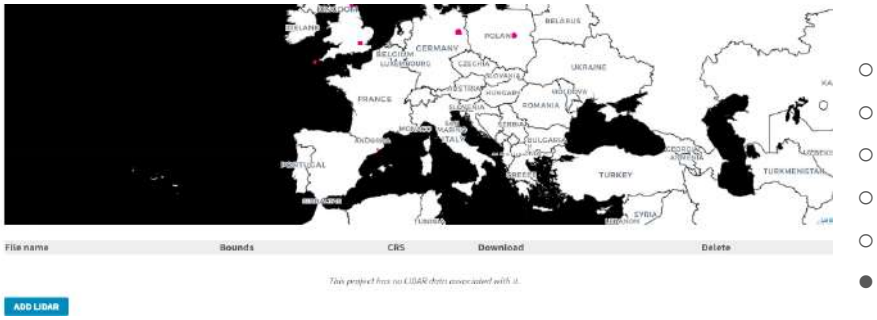


Figure 1. Creation of a map in automatic mode (OSM) or upload your geometries (GIS)



In both cases, THERMOS allows checking for LIDAR coverage (Figure 2) for the study cases as well as uploading a pre-made layer. LIDAR coverage is not mandatory but building height data will improve the quality of demand estimates produced from the built-in 3D regression model. For already existing maps the parameters (Figure 3) can be modified by downloading a MS excel spreadsheet and then uploading it again.

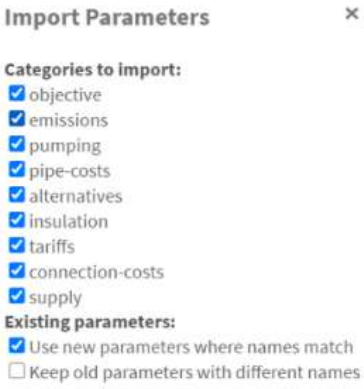


Figure 3. Editable parameters

Currently, THERMOS offers two complementary functionalities to analyse a thermal energy problem: network optimisation and supply optimisation.

- Network optimisation: allows to determine an optimal network solution to satisfy the thermal energy problem described in the current project.
- Adding new sites and connections (Figure 4): An existing network can be selected. Once this has been done, the user needs to categorise it as 'required' because the tool is now forced to include the existing network in the solution. The potential candidates for expansion should be included as optional. Then, the user has to choose from:

- Maximise network: the profitability is analysed based on market tariffs, capital expenditures…
- Maximise whole system: in this case revenues and tariffs have no effect

After pressing 'Optimise Network', if a solution is found, the tool will provide a description of the optimal solution

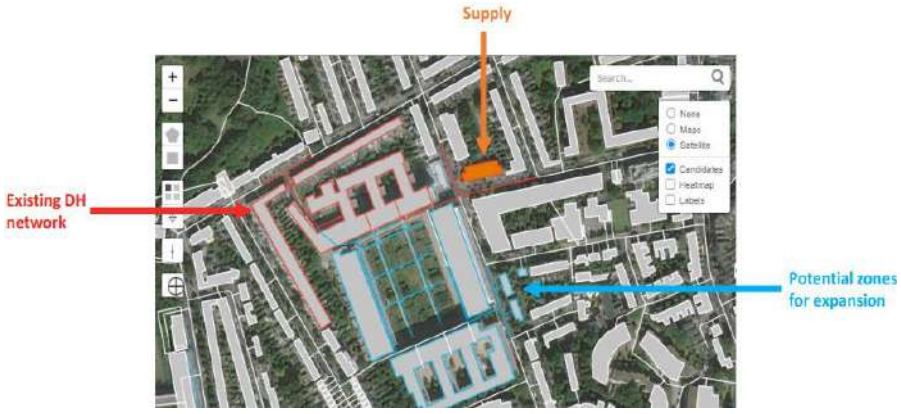


Figure 4. Adding new sites and connections to an existing network

- ***Planning a new network (Figure 5): define the heat supply source categorised as a heat plant building. The user can select the candidate building and categorise it as optional. In order to exclude other connections from the analysis, they can be categorised as forbidden. If a solution is possible the tool will provide a description.***

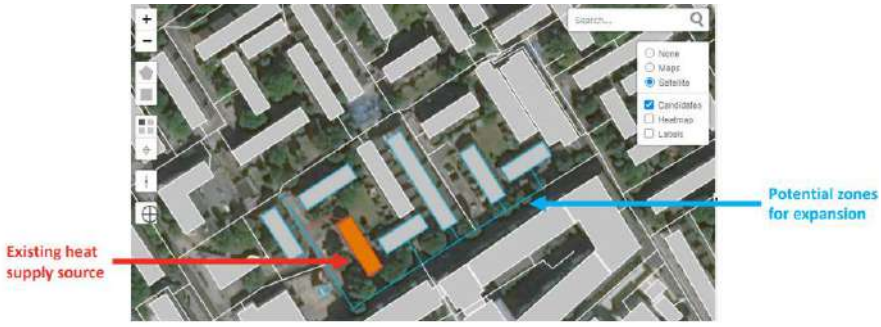


Figure 5. Creating a new network

- Designing a new network to supply a given set of buildings: the way is the same that in the previous case, but in this scenario the user can add multiple heat supplies.
- Assessing and comparing the performance of specific networks and individual non-network solutions (Figure 6): The aim of this use case is to provide an easy way for energy planners to compare the viability of implementing a district heating network against individual solutions used as an alternative.
- The user can set individual solutions from the tool menu and select buildings independently creating a network as in the other cases. Finally, "maximise whole system" tab has to be chosen. The tool will then compare, for each building, the individual systems with the possibility of connecting it to the network and, if it is possible, choose the solution which allows to supply heat at the minimum overall cost. In the "results summary" tab, the tool will provide the most relevant data regarding the individual systems installed.

Figure 6. Example of result of mixed network and non-network solution

- ***Supply optimization: it identifies which technologies should be included in the network over the whole year. The parameters are:***
  - ***Profile: The first step is setting the different standard days that will be considered, pressing "+" the user can change the frequency. For setting the time precision there could be: heat profiles, price fuel profile and substation load.***
  - ***Technologies (Figure 7): it defines equipment involved in covering the system's demand. Some parameters are: lifetime, fuel, capital cost, operating cost…***
  - Objective: This section provides the opportunity to define the different criteria that impact the supply optimization result financials. These sections are: accounting period, emissions costs, computing resources and model option.

THERMOS SOLUTIONS:

The solutions for each optimization are.

- Network optimization: Map view (Figure 8): This map depicts the thermal network developed by the tool as result of the optimisation process.

Supply technologies

	Technology	Lifetime yr	Fuel	CHP	Capacity MW	Power/fuel %	Heat/fuel %	Substation	Capital cost k¤	Capital cost ¤/kWp	Capital cost ¤/kWh	Operating cost k¤	Operating cost ¤/kWp	Operating cost ¤/kWh
✖	Geothermal	40	Electricity	☐	0,1	n/a	420,0	None	0	500	0	0	58	0
✖	Wood boiler	20	Wood	☐	0,6	n/a	85,0	None	0	500	0	0	14	0
✖	Gas boiler new	20	Natural gas	☐	2,0	n/a	90,0	None	0	60	0	0	1	0

Add plant

Figure 7. Supply technologies

Figure 8. Map solution

Solution summary: in this part economic, energy and technical figures can be found.

- Supply optimization:
    - Total cost: the tool returns a summary of the costs for all technologies involved in the optimisation, as well as their specific power generation throughout the whole project. Firstly, the tool provides a breakdown of all costs into capital costs, operating costs, fuel costs and results of electricity export, if considered.
    - Plant and storage: The results summary continues describing the characteristics of the supply plant and the thermal storage.
    - Heat production (Figure 9): This section provides a detailed description of the system's heat production. To do so, the tool presents the results in two different formats, graphs, and tables.

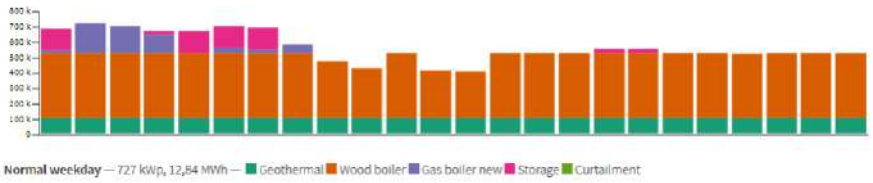


Figure 9. Heat production graphic results

    - Fuel (Figure 10): fuel consumption and grid export solutions are also presented as both tables and graphics. The fuel consumption depends on the source used.

Figure 10. Fuel consumption and grid export graphics for a normal week

    - Emissions: short summary about the emissions generated in terms of production and associated costs

Who is this tool destined to (potential users)	THERMOS users and beneficiaries are: ESCOs, Public authorities and policy makers, Cooperatives / RESCoops, Research centers / universities.
How can this tool affect/benefit or help a relevant stakeholder?	This users that use this solution can obtain different assets, such as: a network optimization model to optimise supply for identifying a cost-optimal; heat and cold map creation tool; demand estimation method operating with limited data inputs in any location; representation of variable pipe and dig costs (by pipe diameter), and network heat losses to the ground;
Additional information of the tool	Explore training materials to adopting THEMOS professionally using this link: THERMOS: Training Materials (thermos-project.eu) The open-source code is available for users in the following link GitHub - cse-bristol/110-thermos-ui Users can post their questions directly to other THERMOS users and developers here: THERMOS Forum (thermos-project.eu)
Organisation/project that developed/manages the tool	THERMOS H2020 project (Thermal Energy Resource Modelling and Optimisation System) was developed by a range of experts from universities, local and city-wide authorities, energy and environmental agencies, and specialist consultancies based in the UK, Spain, Poland, Latvia, Denmark, Germany, Portugal, and Romania partners to the THERMOS project. The project was coordinated by the Centre for Sustainable Energy and supported by an Advisory Board composed of a variety of stakeholders from the energy sector, as well as the heating and cooling sector who provided technical and dissemination advice.
Responsible for the study of the tool and organisation	● ***Jaime Guerrero (CIRCE)***

6.1.12 Your Priorities

Name of the tool	Your Priorities
Logo	
Link	YourPriorities
Brief Description	Your Priorities is an online idea generation and deliberation platform that connects governments & nonprofits with citizens. Your Priorities has been used to improve decision-making in thousands of projects in 45 countries by over 2 million people since 2008. It can also be used to provide a contacting/decision making platform in the scope of an energy community, cooperative, RESCoop or other non-profit organizations.
Type of tool	Community model tool
Subtype	Communication software
Related to	Energy communities' communication
Most valuable outcome that can be obtained	YourPriorities can be used to connect decision makers, governors or managers of different types of institutions or organisations (including energy or renewable energy cooperatives) with the regular members. This way, it can facilitate a continuous flow of information between them, thus helping with the governance of the institutions. This fact can correlate with some of the principles that also rule the renewable energy cooperatives or RESCoop model, which are the following: ● Voluntary and open membership ● Democratic member control ● Economic participation through direct ownership ● Autonomy and independence ● Education, training and information ● Cooperation among cooperatives ● Concern for community YourPriorities can have a direct influence in open membership, contribute to democratic member control by helping the establishment of contacts between members and managers, also creating a community sense of belonging. It can also help to cooperate among different cooperatives or informing the members. The tool allows to create a participation community for idea generation and policy deliberation, but also to create a participatory budget voting or a deep policymaking gamification. It helps to create improved communities through better decisions, by merging collective intelligence for a more complex world and creating useful collections of pros and cons for each idea.

	It also increases civic knowledge of participants and higher public acceptance and satisfaction levels with use of citizens ideas and work
How does the tool work / manual of the tool	Users add ideas, view other people's ideas, and take part in a deliberation about each idea. YourPriorities can both be used in public projects in the context of including large numbers of citizens in decision-making, and also in private projects where smaller groups of people can work together remotely on ideas, deliberation and decisions. Examples of Your Priorities project types ● Government policy crowdsourcing and decision-making ● Schools engaging with students and academics co-creating a masters program ● Nonprofits engaging with their stakeholders working remotely on ideas, deliberation, and decision making ● Political parties engaging citizens and doing internal private work <u>Step 1: Define Your Project</u> The first step is to decide what sort of feedback you want from participants and what the audience for your project is. <u>Step 2: Choose A Hosting Server & Create Your Engagement Community</u> The server can be created in Europe, America, or Iceland. If the created organization is not located in America or Europe then, a server cluster that is closest to it should be chosen. The project can be set up on one of the domains but the organization that created the software can also be contacted to setup a YourPriorities server on a custom domain. If in Europe, it is important to create a Your Priorities help page with the GDPR terms. This page should be shown at new user registration. Once your community has been created, different subtopics can be created, where votes for and against can be posted, as well as opinions or arguments for debate. News, location, photos… all of them can be included in each one of the subtopics. <u>Step 3: Promote Your Project</u> Especially relevant in the first steps of the creation of an energy community. If the community has already been created and the members are already engaged, this step might not be necessary; but it can also help convince those undecided or who remain reluctant to join in. Another case would be if citizens do not know about the project, in this case they will not participate. It is a fundamental right for citizens to know about opportunities to participate in democratic processes. It does not need to be hard or expensive to make the best effort to let as many citizens know as possible. More citizens participating will increase the legitimacy of the project, or the success possibilities. For some projects it can be important to use many marketing channels but as the citizen engagement happens online then those channels are the most important. And usually, the best performing online marketing channels are other social media platforms like Facebook, Instagram, and Twitter – this is due to the fact that people on social media are already in an engagement

	mode and therefore more likely to participate. YourPriorities can also be seen as an extension of social media. Possible channels ● Facebook/Instagram ● Twitter ● Google ads ● TV ads ● Radio ads ● Direct mail ● Face to face meetings Geographical advertisement targeting is a powerful tool to ensure that all areas are represented in a consultation. Even more when a RESCoop is to be deployed, where local stakeholders are key to a successful deployment of the project. Also, to focus the message on the adequate potential members of the community. Step 4: Monitor Your Project with Google Analytics Google analytics allow to see how many people visit the project and a wealth of demographic information and statistics. This way, it can prove democratic selection in the different questions uploaded to the platform. Step 5: Export, Use the Results and Notify Citizens It is easy to export data in Excel format directly from YourPriorities. Updates can also be sent to users on the status of projects from the edit menu on each post, but Bulk Status Updates can also be done for updating the status of thousands of ideas using templates. YourPriorities has a series of features that are overviewed hereafter: ● Effective online idea generation To solve complex problems on all levels facing societies, Your Priorities enables groups of any size, public or private, to come together to find great potential solutions. These solutions are then subjected to a balanced process of deliberation, allowing users to increase trust and harvest the power of the crowd. ● Constructive deliberation solution Citizens add points for or points against each idea. They can then vote the debate points up or down, but they can't comment directly on them – they will have to write standalone counterpoints. This design makes trolling almost impossible, defangs and downplays any personal arguments between participants. ● Automated content management While our deliberation solution minimises toxicity to a low level, we also have AI that scans all incoming content for toxicity sentiment. Content management is automated as much as possible. If something toxic makes it onto the platform, community administrators get a notification right away. ● Flexible user inputs Do you need one paragraph or advanced surveys? You can configure Your Priorities for the simplest or the most complex inputs from citizens. You can use simple surveys as a part of idea generation or complete surveys with features like skip questions & rich text. Organise inputs through communities, groups, and categories.

	● Flexible authentication To support different engagement models Your Priorities supports government-issued electronic IDs, email & password, Facebook Login, one-time login & anonymous login. Custom registration surveys can be created per community/project. Users have full control over their own data, can delete or anonymize data at any point. ● Flexible rating systems The platform routinely uses hearts, arrows, hats & thumbs for vote up and/or down functionality. Or you can use custom Emoji ratings, wherein each post can have up to 4 different types of symbols corresponding to different criteria for ratings/evaluations. ● Images, videos, audios & locations Users can submit text, video, and audio content and then upload images with their ideas as evidence, expression, or explanation. Users can provide a location on a map, and audio and video content run through Google Speech-To-Text AI algorithms, providing text transcripts. Upload videos to headers of communities and groups. ● Rich Artificial Intelligence features We design AI to empower citizens democratically. Tightly integrated Google machine translation enables citizens that speak different languages to come together. AI recommendation engine shows users ideas that most interest them first while they swipe through hundreds or thousands of ideas. ● Data export & API Your Priorities features easy export of ideas, points/comments & users to XLS (Excel) and DOCX (Word). Administrators also have access to all data through an API, using API Keys, to connect Your Priorities directly and automatically into various government information systems ● Usage & Promotion Analytics Your Priorities has Plausible based usage analytics and promotion tools built into the platform. Optionally, Google Analytics is also supported. Your Priorities features its own extendable data analytics API backend, written in Python. Features include an AI similarities engine to cluster content, WordClouds, process maps, and AI recommendations. ● Social media integration Your Priorities can sometimes be thought of as an extension of mass-market social media, the platforms where governments let citizens know about the opportunities to participate in policy deliberation. Users easily share content on other platforms, with details like uploaded image sizes designed to work well when shared on other social media platforms. ● Smart notification system For regular users and administrators, a range of different types of notifications can be configured to be turned off, be delivered to the browser only, or both browser and emails. Notification types include, for example: All ideas, all comments, comments on my content & all activity, which notifies on every like & dislike. ● Bulk Status Updating system Admins may easily update the status of thousands of ideas with the bulk update system with templates and automated email notifications. This feature enables complex formal participation processes, whereby a large

	number of users may be updated on what is happening with their ideas at each stage of the process. ● Newsfeeds for ideas & communities These feeds act as activity updates for all levels of deliberation and function as social media feeds where users can post links with comments. This feature enables users to collect outside references to ideas and communities and works similar to a Facebook "wall". ● Progressive Web App Your Priorities is a mobile-first progressive web app; it works great on big screens but is designed first for mobiles. Each community can be installed as an app on phones' home screens, and just like native apps, they work when the phone is offline, including for submission of new ideas and debate points. ● Highly configurable Communities & Groups in Your Priorities have hundreds of options for supporting an extensive range of different engagement models. Projects often consist of groups with different configurations for each stage in a formal process. With organizations in 45 countries, since 2008, needing different sets of features for their projects, we've added features as configuration options. ● Custom help pages You can set up HTML-based custom help pages for your project that appear under the question mark at the top of the screen at all times. You can configure a help page to show up when a new user registers for your project, useful for GDPR compliance, for example. You can also configure a help page to appear as a popup when a user visits your community for the first time. ● Your colour themes Make your community your own by creating your colour themes with colours that fit your organisation and your main website. Several fonts are available, and we can add custom fonts on request; get in touch with us. The next version of Your Priorities will feature even more theming support, including light and dark mode versions of your theme colours. ● Fraud management system Enable fraud detection, get an email if fraud is detected, and delete all fraudulent content, with just a few clicks. This Fraud Management system detects scripted and other attacks regarding ideas, debate, and endorsements/likes. The feature was developed in collaboration with one of our government partners, in real-time response to an actual sophisticated scripted attack. ● Participatory Budgeting Your Priorities is often used to collect ideas for participatory budgeting projects and has been used in hundreds of PB projects. Your Priorities integrates tightly with Open Active Voting, our secure and gamified budget voting solution. Your Priorities has many configuration options that help create many different types of PB processes. ● Your Priorities Realtime Our Priorities real-time meeting platform allows selected groups of service providers and service users to come together regularly to help improve public services. The platform is integrated with the main Your Priorities platform,

	where ideas can be collected initially for further processing using the Your Priorities Realtime platform.
Who is this tool destined to (potential users)	Especially useful for Community or Cooperative managers to communicate with the members of the cooperative.
How can this tool affect/benefit or help a relevant stakeholder?	Its main point is to establish contact among a big number of people, in order to help with voting and decision-making, but also approval of budgets or relevant policy questions. Community Idea Generation: To solve complex problems facing society, we enable communities to come together to find solutions. Efficient & Proven Deliberation Solution: Evolving since 2008 through thousands of projects, our communities produce constructive deliberation. Content And Toxicity Management: Simple content management. AI scans all incoming content for toxicity. And much more including participatory budgeting, video & audio, surveys, and AI-driven analytics. Click below for an overview.
Additional information of the tool	More information can be found in the following web page: https://citizens.is/
Organisation/project that developed/manages the tool	Citizens foundation: The Citizens Foundation is a global non-profit offering creative and secure open source digital democracy solutions used in over 25 countries.
Responsible for the study of the tool and organisation	Jaime Guerrero (CIRCE)

6.1.13 BioPlat Eu

Name of the tool	Handbook on Investment schemes for REScoop projects
Logo	
Link	BIOPLAT-EU webGIS Tool
Brief Description	MUC lands are considered lands that cannot be used for agricultural and recreational purposes but can still be productive to grow biomass for bioenergy purposes. The challenge to issue biomass production on underutilised land in Europe raises agronomic, technological and environmental consideration on top of economic considerations. Land with potential use for production of additional bioenergy must be statistically and technically assessed taking into account sustainability considerations. Furthermore, since biomass supply chains and bioenergy pathways vary depending on the type of feedstock, the establishment of bioenergy value chains and the evaluation of their sustainability is a complex task. The STEN tool enables users to conduct sustainability assessments on defined value chains on MUC lands destined for bioenergy production.
Type of tool	Technical
Subtype	Geographic information system
Related to	Useful lands
Most valuable information that can be obtained	The BIOPLAT-EU WebGIS Tool provides a comprehensive online platform for supporting the decision-making process for new bioenergy investment and activities that rely on biomass from MUC lands, promoting sustainable use of underutilized lands for bioenergy production through a web-based Platform for Europe. WebGIS Tool provides a constant assessment of the sustainability of the bioenergy production, integrating economic, social, environmental and institutional considerations. Tailored set of sustainability indicators can be applied by countries when planning investments in the bioenergy sector.
How does the tool work / manual of the tool	The STEN tool is part of the BIOPLAT-EU Web Platform. The tool, in parallel with the Geographic Information System (GIS) maps, completes the WebGIS tool to assess the sustainability of selected bioenergy investments on marginal and underutilized lands in Europe and Ukraine. Its indicators have been created starting from the methodologies of the Global Bioenergy

Partnership (GBEP) Sustainability Indicators (GSI). The STEN provides for two levels of analysis.

Standard User: The standard user is the basic form of user who is granted access to the system. This user type can search for marginal, underutilized and contaminated (MUC) land plots, view layers and MUC areas with the webGIS tool, add plots to their list of favourites to perform biomass sustainability simulations with STEN, display the available layers of the viewer and generate reports on screen with the results of the sustainability simulation.

Advanced (AD) user: The Advanced users are registered users who, in addition to the functionalities of the standard users, have the ability to edit values listed by default in the value chain DATABOX, where Standard users can only use default values for their simulations. Moreover, advanced users have the possibility to unlock the measurement of additional indicators for which Europe-wide representative data was not found in the context of BIOPLAT-EU and include those indicators provided that they can retrieve the necessary data.

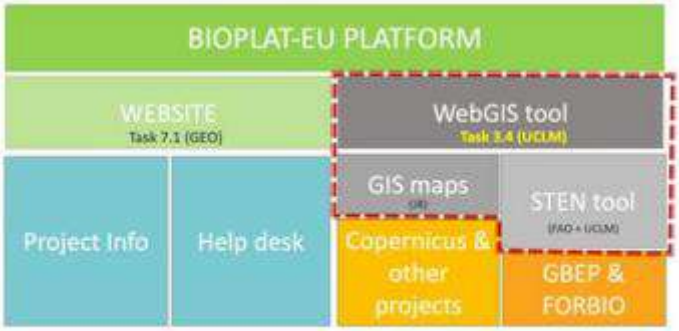
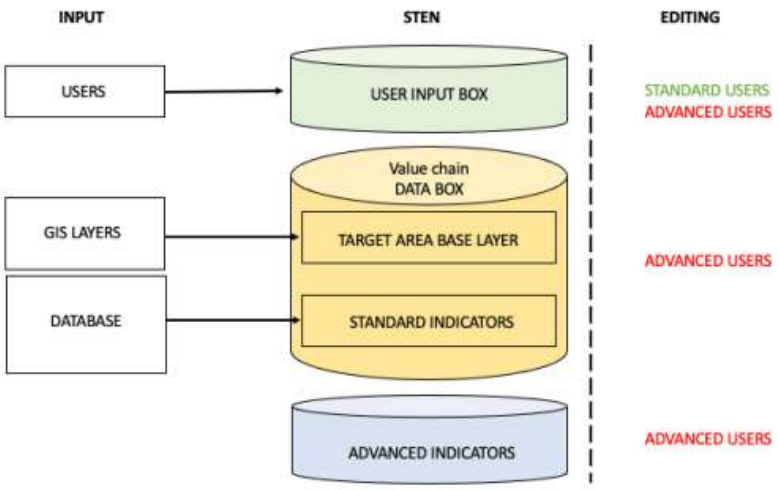
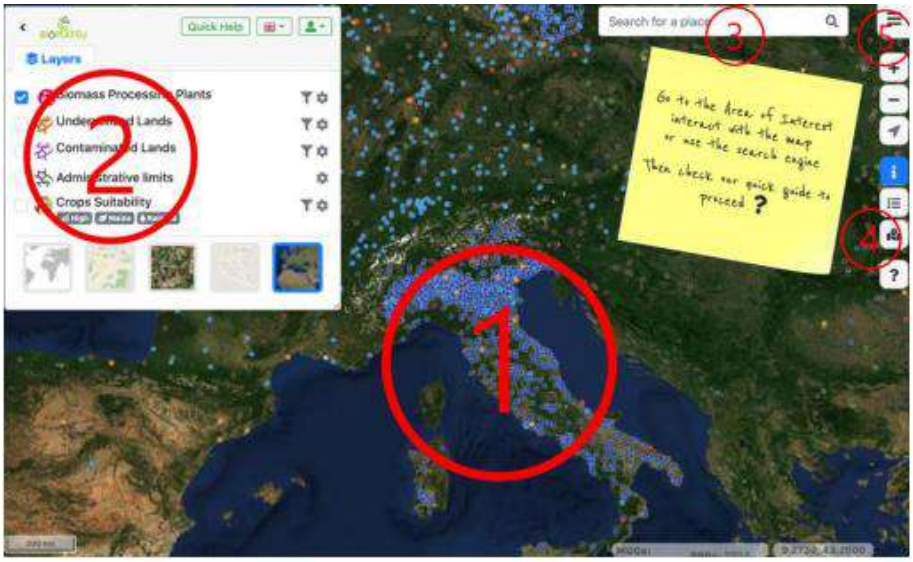


Figure 1. Structure of the BIOPLAT-EU Platform

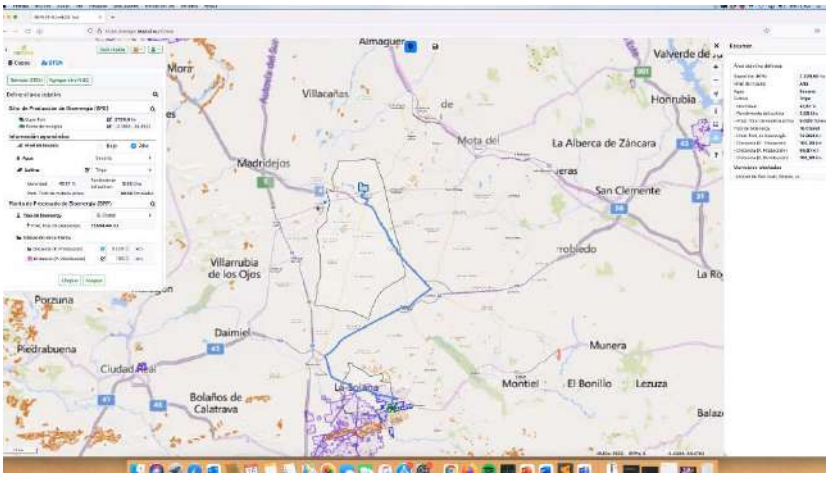
In order to ensure comprehensiveness and reliability of the operations, the starting point for the production of the BIOPLAT-EU set of indicators was the most broadly accepted tool for bioenergy sustainability analyses: the GBEP sustainability indicators for bioenergy. Specifically, the set of indicators developed in the context of BIOPLAT-EU is thought to support the assessment of bioenergy value chains' sustainability. It was clear from the inception of BIOPLAT-EU then, that a solid starting point was represented by the GBEP Indicators that needed a specific adaptation to produce valuable results.



Main interface:

	The system revolves a map viewer where the user can perform the main functionalities of the system. The user would have a geographic representation base map of the reference countries and layers with the information which is related to the BIOPLAT project where the user can view and search for interesting areas for performing simulations. Once the user opens the WebGIS link, he will be directed to the main interface where one can navigate the map, visualise a number of different layers and decide to start a new project simulation. The main interface includes 5 sections: 1) the 2D viewer; 2) the action panel; 3) the search for a place bar; 4) convenient buttons; 5) information panel  1) In STEN, Users can see Europe and its terrain in the 2D viewer. Furthermore, users can navigate through this 2D view of the EU by moving the mouse 2) The action panel is composed of a series of items which characterise the visualisation of the 2D viewer. The following picture lists them in numerical order: A) Hide-show button – Users can use this button to hide and show the action panel. B) Layers tab – Users can use this window to interact with the STEN's layers. C) Quick help – Users can use this window to visualise and interact with the quick help. D) Language – User can use this button to select one of the languages provided for the interface E) Login – By accessing the BIOPLAT-EU webGIS platform, the anonymous users can get access to the login page by pressing the login button in the top-right part of the webpage F) Map visualisation: • Empty Map • Layers /no background – This setting only shows the layers selected in the layers window • Layers/OpenStreetMap – Using OSM, the user can visualise roads and directions, official names and labels of places, etc for better orientation in the viewer • Layers/Bing aerial– Using this option, the user can visualise the selected layers on a satellite image

- Layers/Bing roads – Using this option, the user can visualise the selected layers on a detailed maps which contains administrative and natural borders, roads, names, terrains



3) Users can search for specific locations using the search for a place bar. To do this, enter the location in the input box and click on the Search button.

4) Convenient buttons: easy plugins for manipulating the map

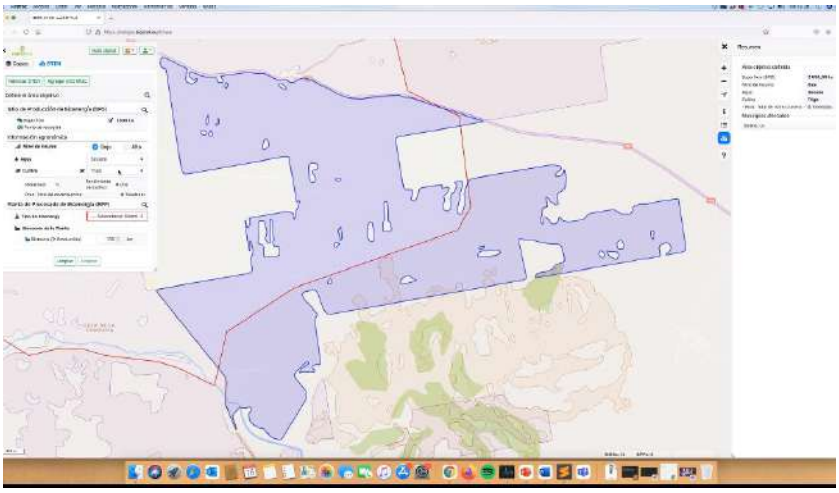
5) Information Panel: This button allows to hide and show the information panel connected with the convenient buttons.

Layers:

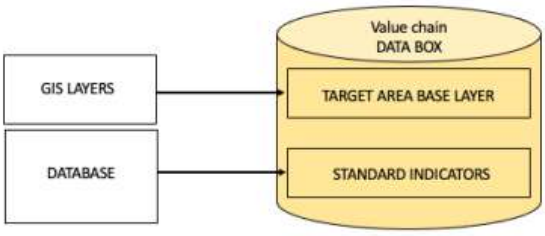
As described above, the viewer is composed of a set of layers with which the user can interact. Some of the actions the user can perform include: enable or disable the visualisation of a specific layer, visualise the map key and consult the layer information available in the system. These functionalities are described in the following paragraph.

List of available layers:

- Bioenergy plants layer
- Underutilised lands layer
- Contaminated lands layer
- Administrative limits layer
- Crop suitability layer

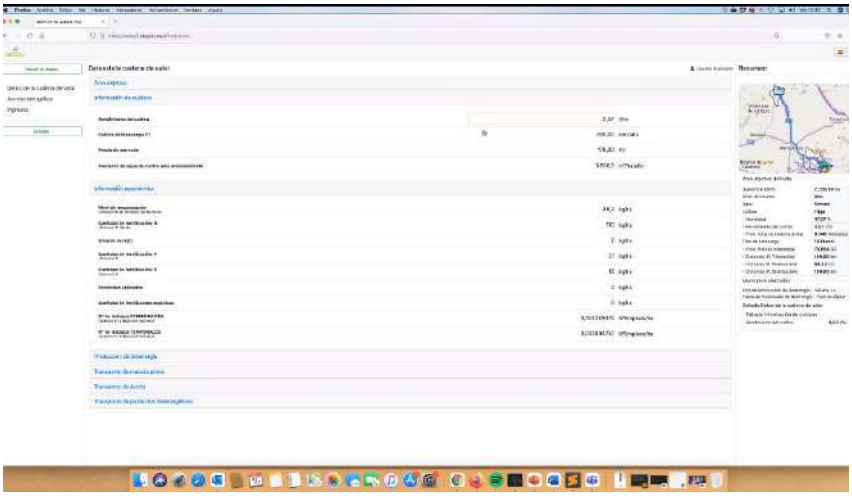


All information needed to measure the standard indicators is directed to the value chain DATABOX.



However, advanced users may fill out specific sections with indicator modules of the STEN. The data used by these modules does not flow in from the pre-existing databases or other repository (GIS maps, etc.) internal to the STEN, but is entirely provided by the users. The STEN, however, provides the algorithms that link the data provided with the indicator's value. The list of additional indicators includes:

- Change in Income
- Change in Energy Access



Results:

After all these, simulation may be generated, with two different outputs for the sustainability assessment:

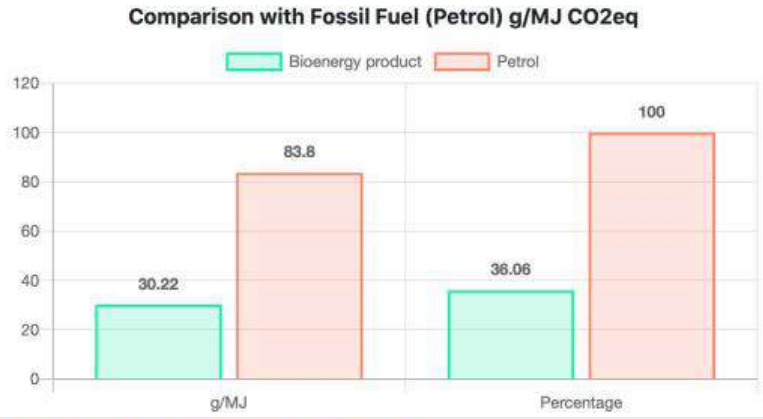
1) A summary of the values considered into the Value Chain Data Box for the measurement of the indicators

Ex:

AIR QUALITY INDICATOR

The GHG emission intensity is expressed in grams of carbon dioxide equivalent per megajoule of bioenergy produced (gCO2eq/MJ)

Emission Factor	Total (tonnes of CO2eq)	Allocated (tonnes of CO2eq)	g/MJ of bioenergy prod.
CO2-eq	33.87	16.83	30.2217
CO	0.05	0.01	0.0188
NOx	0.15	0.03	0.0614
SOx	0.02	0.00	0.0088
PMx	0.01	0.00	0.0029



WATER USER AND EFFICIENCY INDICATOR

Water withdrawn from watersheds within the target area for the production and processing of bioenergy feedstoc

Unit	Wbioenergy/Etotal	Production
m3/MJ	0.29	
l/MJ	291.07	
m3/tfeedstock		972.5

INCOME

Yearly Gross and Net margin at farm gate for the production of bioenergy feedstock

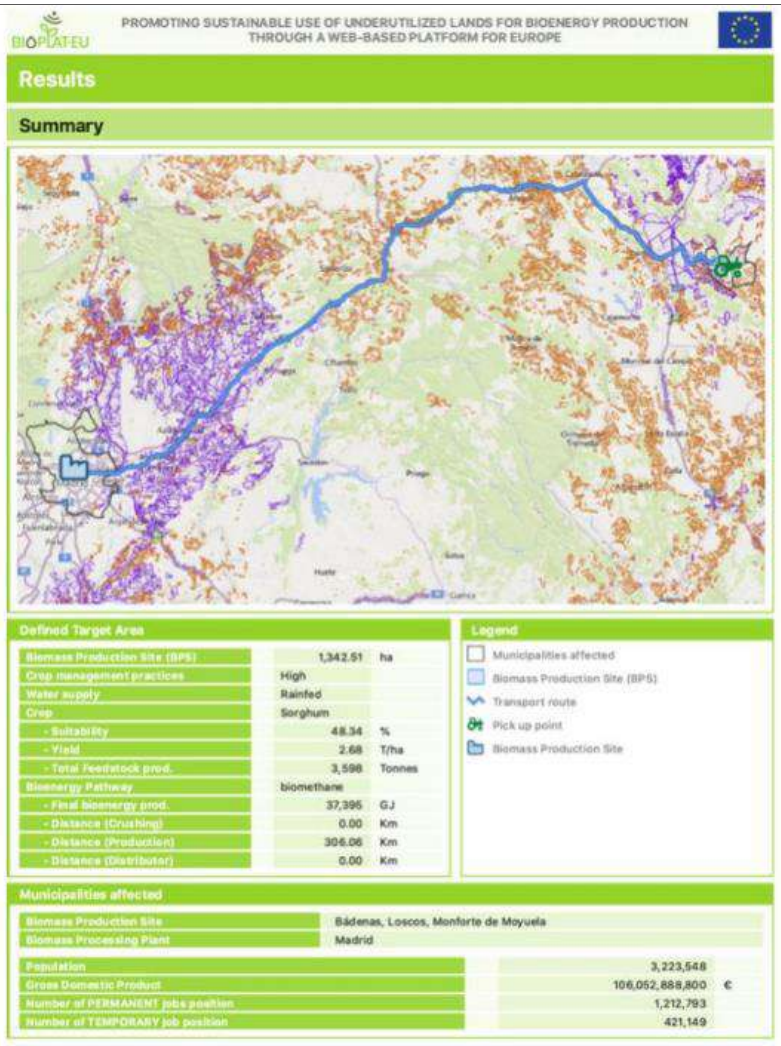
Unit	Annual Gross Profit	Annual Net Profit
€	41,477.97	37,997.55
€ ha-1 yr	1,717.36	1,693.36

ENERGY ACCESS

Change in energy access

Parameter	Unit	Value
Electricity for lighting, communication, healthcare, education and other uses	GWh/yr	0.00
Liquid biofuels for transport	GJ/yr	0.00
Gaseous biofuels for transport	GJ/yr	0.00
Thermal Energy (district heating and cooling)	BTU/yr	513.94
Target area		

2) A final report which presents, for each sustainability indicator, a series of tables and charts containing the final results. These reports are downloadable in PDF format

	
Who is this tool destined to (potential users)	Investors at local or European level, policy makers, to every economic actor participating at any bioeconomy activity (producers, corporations…) willing to be first assessed towards their value chain.
How can this tool affect/benefit or help a relevant stakeholder?	Improve economic profits of MUC lands (abandoned or contaminated marginal lands) which do not compete with food crops at European level. It can facilitate preliminary and cheaper viability studies, funding. Prefeasibility assessment for policy makers to guide sensible objectives.
Additional information of the tool	BIOPLAT-EU provides further guidance to users of the platform through the dedicated Helpdesk. https://webgis.bioplat.eu/assets/docs/quickGuide.pdf You can reach out to our experts and send them your questions regarding any project's topic of your interest. Here below a link to the website Helpdesk | BIOPLAT-EU
Organisation/project that developed/manages the tool	BioPlat European project
Responsible for the study of the tool and organisation	CIRCE