



H2020 Work Programme

D1.3 Report on expectations on future BBEC: Understanding the regional conditions as basis for the design of the BBECs

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1. Executive summary

This report is delivered as an output of the BIObec project. We present a compilation of the regional assessments regarding the stakeholders, the needs, expectations, and opportunities of each of the six pilot cases for Bio-based Education Centres (BBECs) that are being conceptualized throughout the BIObec project. These are: The Mediterranean Europe Hub, the North-West Europe Hubs-Finland, the BIObec North-West Europe-Denmark, the BIObec North-West Europe-Ireland, the BIObec Central-East Europe-East, and the BIObec Central-East Europe-Germany. Special attention is given to the comparison of the BBECs which sheds light on the commonalities and differences between the six BBECs in order to provide a useful basis for the further developments of each of the BBECs in the frame of the working packages to come.

For the purpose of this report, we undertook three steps: First, we broke down all data assessed within the working package 1 to carve out the specific conditions for each of the BBECs. Second, regional workshops with the stakeholders identified earlier on in the project were conducted to define the visions for each region, to get an idea regarding potential gaps towards these visions for each of the pilots and to find out about the stakeholders' commitment to contribute to the centres. Finally, each of the BBEC coordinators presented their vision, needs, expectations, and opportunities to the entire project consortium in a pan-European workshop. To better understand the diversity among the BBEC pilots, the respective project partners responsible for each BBEC, subsequently worked on classifying their centre according to the relevance and state of fulfilment of the ten guidelines for successful education hubs identified earlier on in the project.

This report shows quite clearly, that there are great differences in conditions, opportunities, and visions for BBECs depending on their regional contexts. We learn that each centre will need to design its very specific set-up in order to fulfil its very specific objectives. At the same time, we contend that the participatory processes necessary to establish education hubs as integral part of dynamic regional bioeconomy ecosystems, very much resemble each other. In conclusion, the commonalities, and differences between the BBECs suggest that even though each centre requires very specific action, a close exchange of knowledge and experiences between the pilot cases should be facilitated and opportunities for collaborative action and peer learning created to support the instalment of thriving BBECs.

2. Introduction

The transformation towards a sustainable bioeconomy has started already. A multitude of various new technologies, novel processes, and innovative practices are sprouting in a European political context that has put sustainable development and green growth prominently on its agenda. At this point in time, the transformation challenge has shifted from deliberating potential futures towards deploying these futures in industry, professions and every-day life in the various circumstances and environments that constitute the realities of European citizens – from East to West, from rural to urban, from high-tech to low-tech. To make sure the sustainable bioeconomy meets the needs and expectations of the industry and the society in this variety of contexts, information and education strategies are to be set up that build bridges between regional realities and global goals.

This is what the Bio-based Education Centres (BBECs) that are conceptualized in the BIObec project, aim for. Safeguarding that the regional specifics in terms of needs, opportunities, and expectations are really accounted for in the design of the BBECs, was the central focus of the first working package. To achieve this objective, it was necessary to involve appropriate actors in the process of identification of needs and conditions for BBECs; to collect and analyse needs and opportunities at different territorial levels; to collect success cases and best practices; and to identify expectations for future BBECs and conditions to create dynamic ecosystems.

This Working Package was split in four tasks:

1. Identification of stakeholders for a future network creation
2. Analysis of needs, opportunities, and expectations at European and regional level
3. Scope of best practices and success cases to support the development of education models
4. Implementation of regional and pan-European workshops revealing expectations on future BBECs

After the identification of potential stakeholders involved in Bioeconomy education at European and regional levels, a literature review was executed followed by a pan-European internet-based survey, and regional focus-group interviews with regional stakeholders aiming at understanding the needs and expectations for educational programmes, educational centres, certification schemes and services for the future BBECs. The results of this task are in the deliverable 1.1 “Report on European and regional analysis of the needs, opportunities, and expectations to bio-based education/training models”.

In addition, a desk research was completed to identify and select the most relevant best practice cases for existing or evolving bio-based education hubs at different geographical and educational levels in Europe. This allowed to comprehend current models, core principles, impacts, outcomes, potential success and failure factors to build guidelines to be considered

when creating a BBEC. The results are in the deliverable 1.2 “Report on best practices of BBECs”.

Finally, 6 regional workshops were organised simultaneously by CNR (Italy), UEF (Finland), FBCD (Denmark), PRO-CIVIS (Poland), UHOH (Germany) and MTU&IBF (Ireland) in order to capture multiple stakeholder perceptions, differences between the examined levels and the respective educational needs. Regional workshops focused on: Presenting the previous results of the project, jointly envisioning BBECs networks based on the respective expectations and needs and present the best practise examples to envisage potential connections and fostering the dialogue between actors on different levels.

A common methodology and guidelines were elaborated to guide this activity through the cases. The objective of these workshops was to understand the specifications of each regional BBEC in order to meet the needs and expectations on Bioeconomy education and take advantage of the opportunities in the region. There was a discussion between the participants to answer the following questions:

- How do you envision the BBEEC in the future?
- How can the different activities, initiatives, organisations related to bioeconomy education that are already happening in your region be connected through the BBEC?
- How can you imagine your involvement in the future BBEC?

The regional workshops lasted around 3 hours and the participants were representatives from different types of stakeholders: governmental actors, industry, educational organisations e.g. universities and vocational institutes, innovation centres, among others. In the Annex 3, a more detailed description of the participants of the regional workshops is indicated and in Annex 4, the reports of the regional workshops are included.

Then, a pan-European co-creation online workshop was organised with the whole project consortium to communicate the needs, expectations, opportunities, and development level of the regional BBECs and discuss the development of a BBECs network. Representatives of the BIObec partners introduced the main results of each of the regional workshops and then, after a recapitulation of the recommendations, there were breakout rooms per centre to discuss about the relevance and fulfilment level of the recommendations by BBEC. Presenting the results of this discussion created a joint understanding of the development level of each centre. In the end, ideas for the creation and functioning of a collaboration network among the were collected.

In section 3, we introduce the definition of the BBECs and the six pilot BBECs. Then, we present the stakeholder maps displaying the types of stakeholders involved in bioeconomy education in the six regions where the BBECs are foreseen to be developed in section 4. In the stakeholder maps the variety of bioeconomy educational offerings and the connections

between the stakeholders are presented. After having a glance on the stakeholders maps, we collect the main insights regarding needs, opportunities, and expectations for the BBECs in section 5. These insights are extracted from the previous deliverable of the project (D1.1) and the results of the workshops. We then discuss the similarities and differences between the BBECs in section 6.

3. The variety of the six BBECs

Bio-Based Education Centres (BBECs) in the project BIObec are intended as centres providing education and training services for a wide range of users, with a focus on the present and future bioeconomy workforce, aligned at the outset with capabilities and skills demanded by the bio-based industries, deeply rooted in the regional context. Given the complex nature of the bioeconomy, a BBEC can be seen as a knowledge hub bridging between knowledge providers, innovation institutions and users/beneficiaries, as well as policy makers. The concept hence merges the traditional idea of an education centre, with that of a knowledge/innovation hub.

A BBEC is intended to be a bio-based education hub, a regionally delimited construct designed to build and coordinate a community of actors who offer education and training in the bioeconomy and promote knowledge and innovation in the field. Consequently, the bio-based education hubs:

- integrate various stakeholders,
- promote cooperation between those stakeholders,
- include bioeconomy or bio-based economy as an essential part of their mission,
- have a leading role in the bioeconomy at regional, national or international level,
- develop education, training, research and innovation strategies, actions and activities for any educational level, with a focus on business actors and including startups
- are established or emerging hubs with a long-lasting vision and strategy.

The BBEC brings together capacities and know-how from different institutions (e.g. universities, research centres, capacity building, vocational training and life-long learning providers, etc.) to fit the present and future education and training needs of the industry, primary sector, SMEs and entrepreneurs. It also allows for feedback from users to knowledge providers in terms of demand and priorities for the sector. Finally, it promotes networking and dialogue, and elaborates visions and strategic agendas about education needs and approaches. The concept of BBEC is sketched in figure 1.

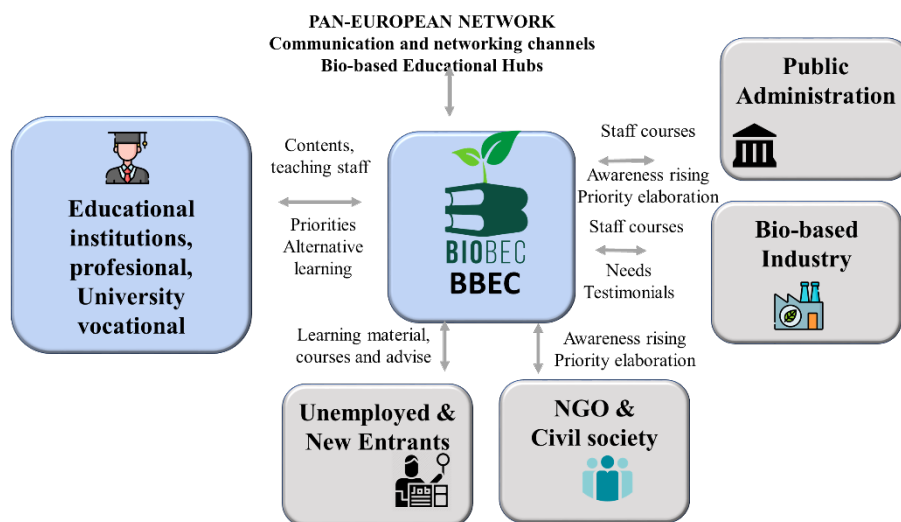


Figure 1. Concept of BIObec BBEC

Six pilot case studies have been identified preliminarily to run activities in the different steps of the BIObec project. They represent the three geographical areas: (i) Northern-Western Europe; (ii) Central and Eastern Europe; and (iii) Mediterranean Europe. Besides geographical coverage, the BBECs have been selected also considering the diversity of the bioeconomy typology and the bioeconomy educational readiness level within the European context. A description of the six BBEC pilot follows:

3.1. Mediterranean Europe Hub

The University of Bologna (UNIBO) will steer this BBEC in collaboration with Italian and Spanish partners. The focus will be on a wide range of education initiatives spanning through all levels from high schools to PhD. UNIBO gives access to a wide range of curricula in sectors related to the Bioeconomy (agriculture, biology, engineering) as well as with social sciences. It is also involved in the inter-university Postgraduate Master BIOCIRCE on Circular Bioeconomy. It is especially strong in connection with primary production. National Research Council (CNR) will provide a link with education research, FVA New Media Research with industry and stakeholders, while Spanish partners (SIE, CTA) will support the BBEC through the link with industry and developing common topics and synergy in the Mediterranean. A wide network of industry is connected to these partners. Country members of IRWG also include training centres and regional administrations. A number of DIHs will link to the BBEC, especially thanks to the strict cooperation of UNIBO with two of them located in Bologna, CINECA and Bi-REX, the latter one coordinating actions on Big Data at national level.

3.2. North-West Europe Hubs-Finland

UEF runs education programmes involving a Bachelor and a Master of Forestry as well as the following international programmes: MSc Forestry, MSc European Forestry, MSc Wood Materials Science, and DSc Forests and Bioresources. UEG collaborate with a network of companies from Finland and from a wide forestry network throughout Europe and beyond. In BIObec, it collaborates with other forestry related institutions, in particular APT.

3.3. BIObec North-West Europe-Denmark

The Danish BBEC will focus on development of a training centre and facilities for SMEs developing their strategic and operational skills in turning opportunities into business. It will build on: PhD hub Foulum – An initiative to boost the awareness among Ph.D.'s; INBIOM - The Innovation Network for Bio-Resources helping Danish companies working with bio-resources to gain access to new knowledge and to an overview of funding opportunities and find new partners in Denmark and internationally; 4In-house incubator, where there will be a dedicated space and accelerating programme for bioeconomy and food startups; European Food and Bioeconomy Venture Forum, an event attracting promising startups and leading investors from all over Europe.

3.4. BIObec North-West Europe-Ireland

The Irish BBEC is based on MTU and will benefit from the collaboration of the national cluster IBF. MTU brings expertise in bioeconomy education with a range of under-graduate and post-graduate programmes in sustainable agriculture, agri-technology agri-biotech, ecosystem and, natural resource management and valorisation, bio-based products development and commercialisation, e.g. MSc Bioeconomy with Business, Postgraduate Certificate in Circular Economy. MTU is a leader in the development of lifelong learning, and it works closely with industry deploying state of the art pedagogies, skills needs analysis, foresight-horizon and learning journeys. MTU is highly active in bioeconomy with an extensive portfolio of EU BBI JU, H2020 and EIP-Agri projects and an extensive national and EU level network. MTU have recently launched Ireland's Knowledge Centre for Climate, Carbon and Community action (IKC3) a national platform for climate education. The Centre will provide graduates and industry professionals with a variety of curated learning pathways, stackable micro-courses, summer schools and micro credentials that create and maintain the flow of talent and relevant skills required by enterprise and civic society. MTU & IBF cooperate in ICT-BIOCHAIN digital innovation hub (www.ictbiochain.eu) and the RDI Digital innovation hub (<http://www.rdi.com>) to connect with industry, knowledge and technology providers and international networks. IBF brings extensive networks, piloting and scale-up facilities and potential for hands-on training through their network.

3.5. BIObec Central-East Europe-East

The Central-Eastern BBEC will be piloted by PRO CIVIS in collaboration with IBE, TRU and ART, to cover the whole BIOEAST partner countries. In previous experience as facilitator, PRO CIVIS conducted feasibility studies for other similar centres for other sectors of economy. Key network for the deployment of the Polish BBEC in cooperation with key entities as IBE and ART partners of the project, Warsaw University, the Polish Research Network and the Biobord Network and also BIO HUB CZ facilitating the replication across; beside Poland, Czech Republic and Bulgaria, also Estonia, Latvia, and Norway will be linked to the BBEC. This BBEC, with its pivot centre in Poland, will closely collaborate with the network of the BIOEASTsUP project through the ART and BIOHUB CZ. BIO HUB CZ was established in line with the BIOEAST Governance paper and with the support of the Czech Ministry of Agriculture, and it is bringing together SME, RTD, Universities). Several platforms and associations are members of BIO HUB CZ: Czech Academy of Agricultural Sciences, Association of Research Organisations, that is the only organisation in the Czech Republic representing applied research (AVO has more than 75 members, both entrepreneurs and research organisations), among others. Furthermore, the Czech Ministry of Education signed a letter of support and is part of the IRWG to show its commitment in the deployment of the BBEC.

3.6. BIObec Central-East Europe-Germany

This BBEC is centred around the University of Hohenheim (UHOH) and builds upon Hohenheim's ongoing collaborations at regional and European level. UHOH is the bioeconomy education and research hub in the state of Baden-Württemberg, one of the most advanced bioeconomy regions in Europe. As a university with roots in agricultural sciences, Hohenheim is closely connected to the agricultural sector of the state while at the same time conducting and inspiring bioeconomy research and innovation. It offers a dedicated international Bioeconomy Master programme and several bioeconomy related Bachelor and Master programmes. It also hosts the bioeconomy office of the University of Hohenheim, a central entity that promotes bioeconomy inside and outside the university and runs several projects, such as, for instance, BioPartner BW which supports Master students to perform part of their bioeconomy related studies and research in companies. Other projects and R & D facilities extend their knowledge impact beyond higher education by creating and offering information formats to farmers and other practitioners in the bioeconomy. These facilities include the Bioeconomy competence centre around the biorefinery technology centre, an Agricultural experimental station, a Food technology centre, and the State Institute of Agricultural Engineering and Bioenergy.

UHOH has a unique position within the German bioeconomy community and currently chairs the European Bioeconomy University (EBU) <https://european-bioeconomy-university.eu/>

With its membership in several bioeconomy related international academic networks, UHOH holds plenty potential for developing a vibrant and successful BBEC. It works in close cooperation with the State Ministries of Science, Agriculture, Environment and Economy to develop these activities. The integration of the EBU partners AgroParisTech (APT) in Paris and the University of Natural Resources and Life Sciences (BOKU) in Vienna into the BBEC will benefit from a longstanding and trustful relationship to both institutions. Excellent study opportunities at APT will facilitate the extension of the postgraduate education in bioeconomy at supra-national level. BOKU in Vienna is a strong academic partner with experience in innovation transfer and societal impact.

As described before, it is evident that there are differences among the six potential BBECs in terms of the context that includes stakeholders involved in bioeconomy education, current bioeconomy education offerings i.e. master curricula, informal education programmes, vocational education, among others. Thus, the needs, expectations, and opportunities are also expected to be different. In the following chapters, a comparison among the BBECs is done in order to understand the current context, expectations, and visions to further develop unique, suitable and appropriate designs for the BBECs.

4. Stakeholders and bioeconomy educational offerings

A consideration of the stakeholders involved in bioeconomy education and their educational offerings in the six different areas covered by the BBECs has been conducted. This exercise consisted on a reflection of the offerings based on the experience and knowledge of the partners of this project and complemented by the stakeholders invited to the different workshops. Although the following stakeholder maps are not comprehensive, it constitutes an essential step for a dynamic network creation necessary for the design of the Centres. For an understanding and categorisation of the educational offerings, all the partners followed the definitions from the glossary in the Annex 2.

4.1. Mediterranean Europe Hub:

For the Mediterranean region, a focus is made on the Italian and Spanish context as the partners have expertise in these two countries. In the stakeholder map (Figure 2), it is evident the role of the universities in creating and co-creating educational offerings especially with industry partners in the Italian context. Research institutes and accelerators/incubators are also present and contribute by exchanging knowledge but also through staff exchange. Other stakeholders such as public-private partnerships, hubs, and associations appear to have a significant role in the bioeconomy educational offerings mainly for knowledge exchange and joint projects. The offerings in this BBEC are mainly in higher education but also for on-the-job training, vocational, and continuing education. Informal education is currently the least frequent offering for the bioeconomy according to this initial exercise to map the stakeholders in the region.

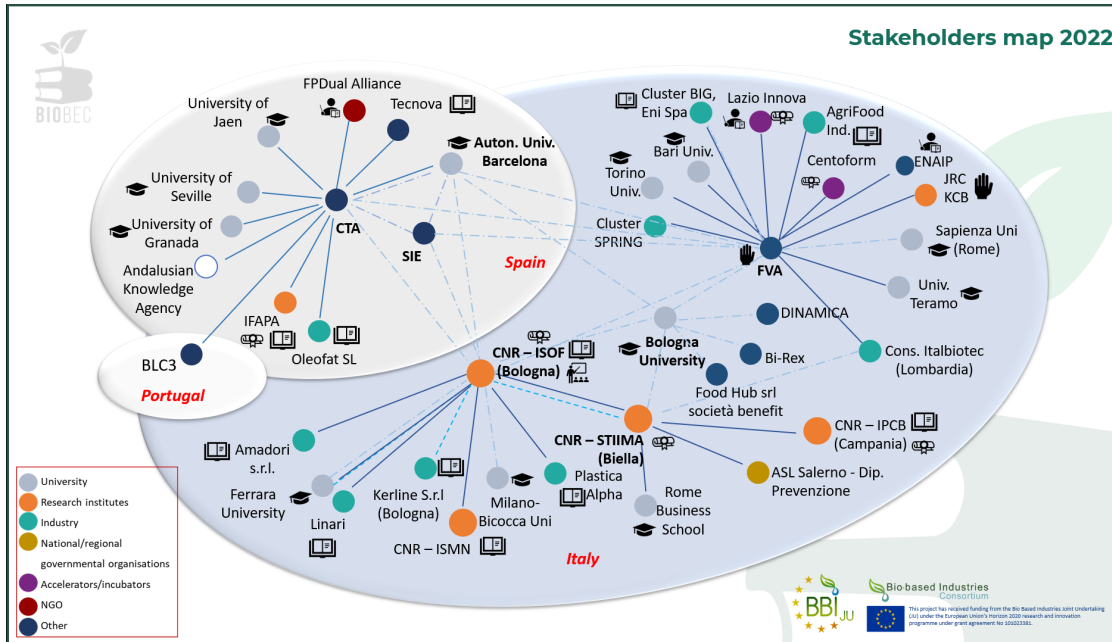


Figure 2. Current stakeholder map for the Mediterranean Hub

4.2. North-West Europe Hubs-Finland:

The main actors identified within the area of this future BBEC are represented in Figure 3. The main actors working on bioeconomy education in the area are the educational institutions: University of Eastern Finland, the vocational school Riveria and the University of applied Sciences Karelia. Between these stakeholders, the main type of collaboration is the knowledge exchange. There are also regional and national organisations that are involved in the bioeconomy education: Ministry of education and culture, Natural resources Institute Finland and Finnish environment Institute that are funding programmes or work in joint projects. In addition, there is the governmental organisation Tapio that offer education material for companies and educational institutes. Besides, Finnish Forest Centre provides data for forest owners while connects with other stakeholders through joint projects. Another important stakeholder is Business Joensuu, an accelerator that provides entrepreneurship and funding information. There are other external stakeholders with a focus on forest industry such as

Metsamiesten, mainly funding educational offerings, and the Finnish Forest Association, a foundation offering informal and continuing education. These last two stakeholders are connected with other stakeholders through the work in join projects. It is noted that company involvement is not so strong in bioeconomy educational offerings, although there is one example of the company Arbonaut that provides educational material, practices staff exchange, and also stimulates student participation.

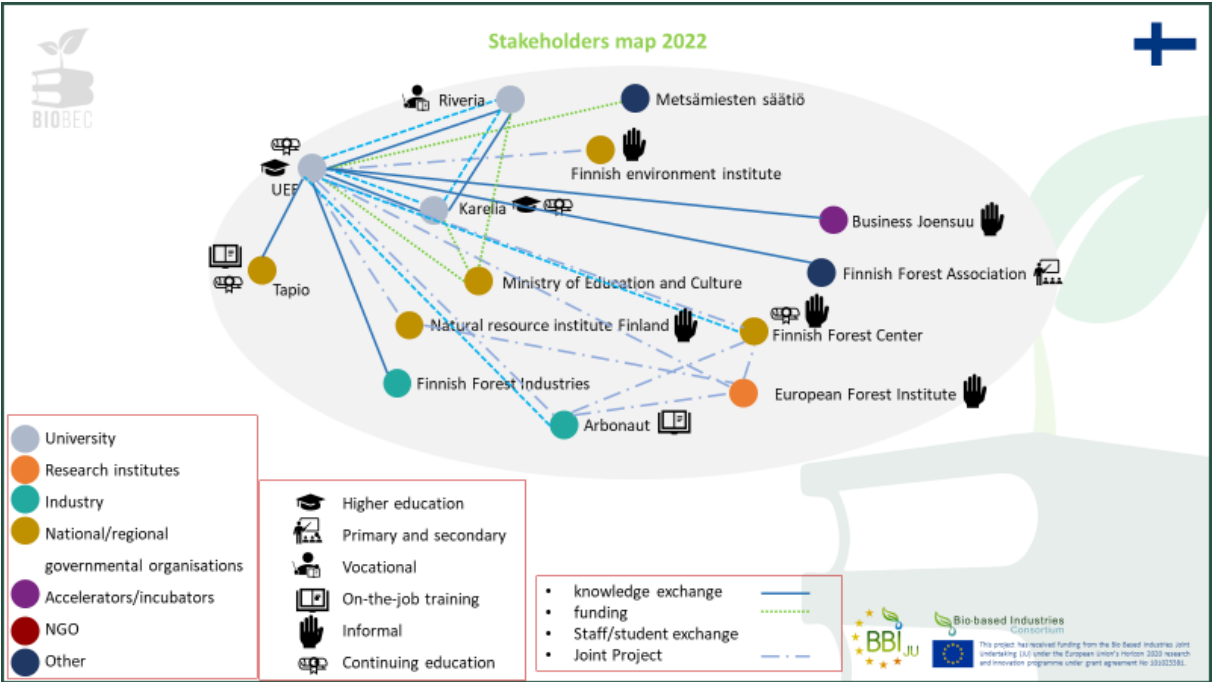


Figure 3. Current stakeholder map for the North-West Europe Hubs-Finland

4.3. BIObec North-West Europe-Denmark:

In this region, the educational institutions have a key role, especially the university of Aarhus with its different bioeconomy-relevant departments but also vocational institutions such as the technical universities. These vocational institutions are principally agricultural schools that have already an important role in bioeconomy education. There are also incubators focused on the bioeconomy educational solutions as Agrobusiness Park in the Food and Bio Cluster Denmark and Klimafunden Skive, focused on climate solutions in the agriculture. Municipalities play an important role in the education, particularly Skive, Viborg and Central Denmark Region that have been active working in joint projects. Outside the region there are institutions such as ministries, advisory services, national think tanks that also have an impact in the bioeconomy education in the region and are connected to the regional ecosystem by

funding bioeconomy projects and through knowledge exchange. A complete representation of the stakeholders can be seen in Figure 4.

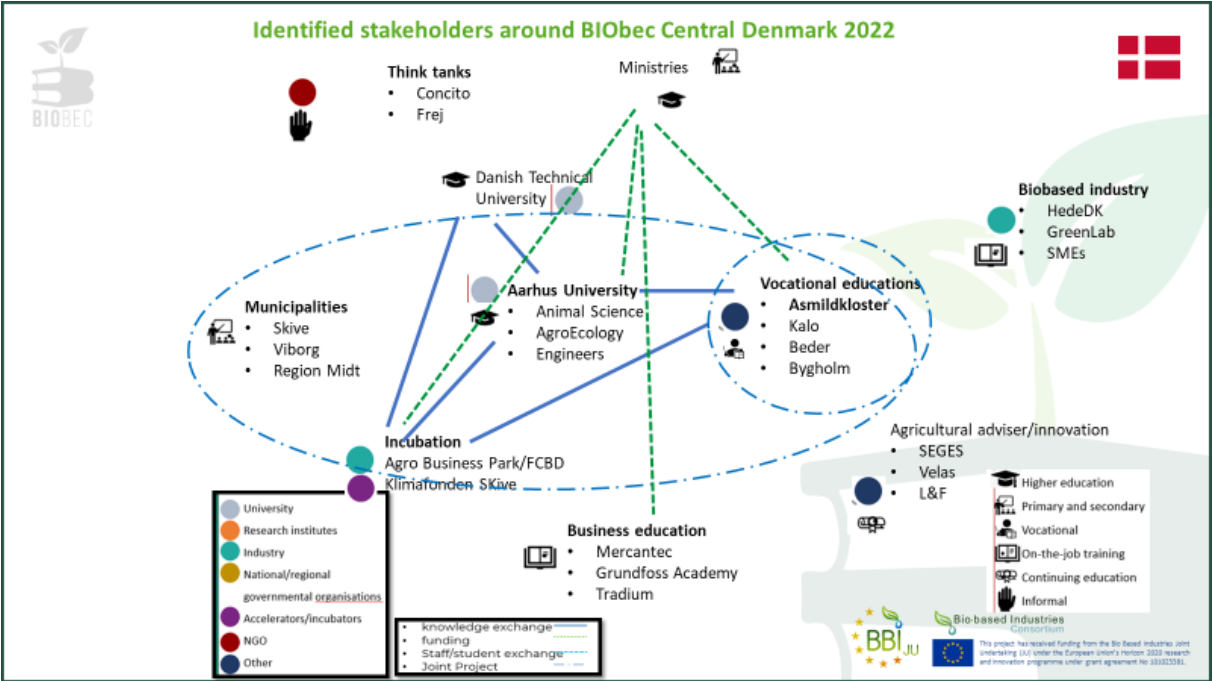


Figure 4. Current stakeholder map for the BIObec North-West Europe-Denmark

4.4. BIObec North-West Europe-Ireland

The bioeconomy education in the Irish ecosystem is integrated by a diverse group of stakeholders (See Figure 5). These stakeholders have been identified and some even engaged in the BIObec project. There is a combination of university partners, regional county council partners, government agencies such as the department of Agriculture Food and Marine, local councils, associations set up by the government such as Coillte for forestry and Teagasc for Agrifood themes. A current collaboration between 14 universities in Ireland takes place for the bioeconomy education. Joint to the Munster technological university there are clusters and networks that are related to bioeconomy such as the CircBio Research Group, CBSCW Cluster and enterprise Ireland. As a connector with industry, innovation centres and hubs are working across the country. There are other organisations in the area of skills development institutions such as Solas network and Skillnet, regional skill programme and the national programme for lifelong learning Springboard that are playing a relevant role for the bioeconomy education ecosystem in the region.

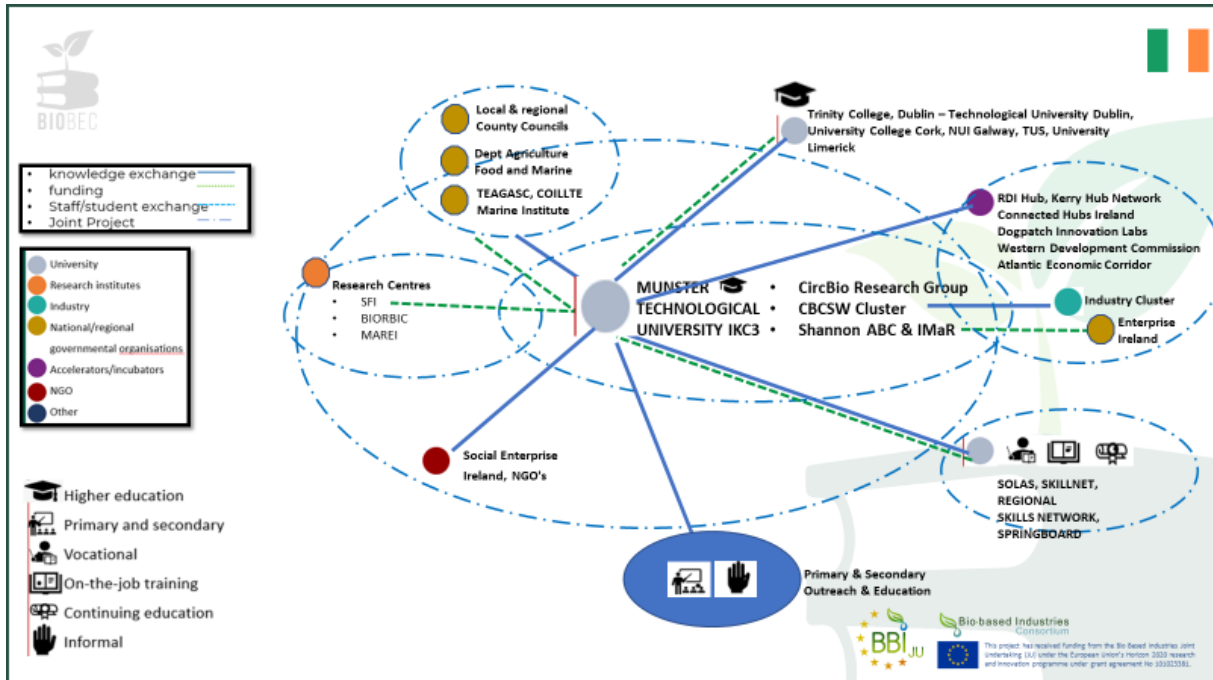


Figure 5. Current stakeholder map for the BIObec North-West Europe-Ireland

4.5. BIObec Central-Eastern Europe-East

The main actors identified for this BBEC in Czech Republic, Poland and Bulgaria are represented in Figure 6. The knowledge exchange is focused on the industry while public sector is mainly responsible of distribution of EU funding. There is staff and student exchange between the universities and with the private sector. There is also a wide cooperation between industry and science for Research and development projects. In the future, there is a need to include other actors such as society for training, education and dissemination. The industry is expected to communicate their needs and expectations to allow science to be more flexible. The public sector is expected to be open to the knowledge of other actors and integrate this to their activities.

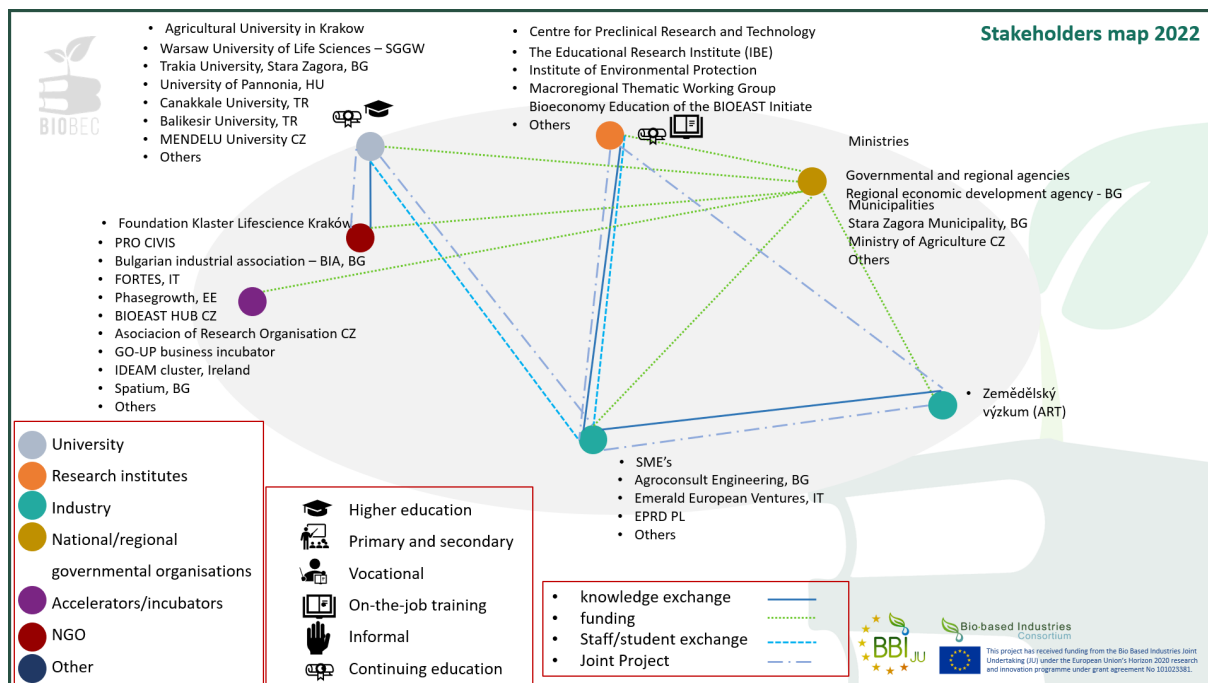


Figure 6. Current stakeholder map for the BIObec Central-Eastern Europe-East

4.6. BIObec Central-East Europe-Germany

The stakeholders map for the German BBEC focuses on the region of Baden Württemberg (See Figure 7), where there are 8 universities offering master and bachelor programmes on bioeconomy-related topics. The University of Hohenheim as co-founder of the European University plays an important role in the region and connects with external universities such as the University of Natural Resources and Life Sciences (BOKU) in Vienna, Austria and AgroParisTech (APT) in France. These European partners can be conceived as satellite hubs that contribute with additional stakeholders. While BOKU brings in its experience with elementary and secondary education as well as with the support of startups, APT is envisioning the development of cooperative postgraduate study programmes within the BBEC.

With regards to VET, UHOH has established contact with agricultural training institutions and the public agricultural VET administration. The ministerial stakeholders from the state government are mainly funding research and education and offering information to the general public regarding bioeconomy topics. On a more strategic level, these connections to government organisations have a special relevance with view on their potential to inform the BBEC about political decisions and upcoming topics. It is important to note that in addition to these close contacts, there is a variety of stakeholders that maintain weaker connections, either by rather informal ties between individuals of the listed organisations or by merely occasional contacts. This holds for some accelerators and incubators, municipalities, museums, and industry partners.

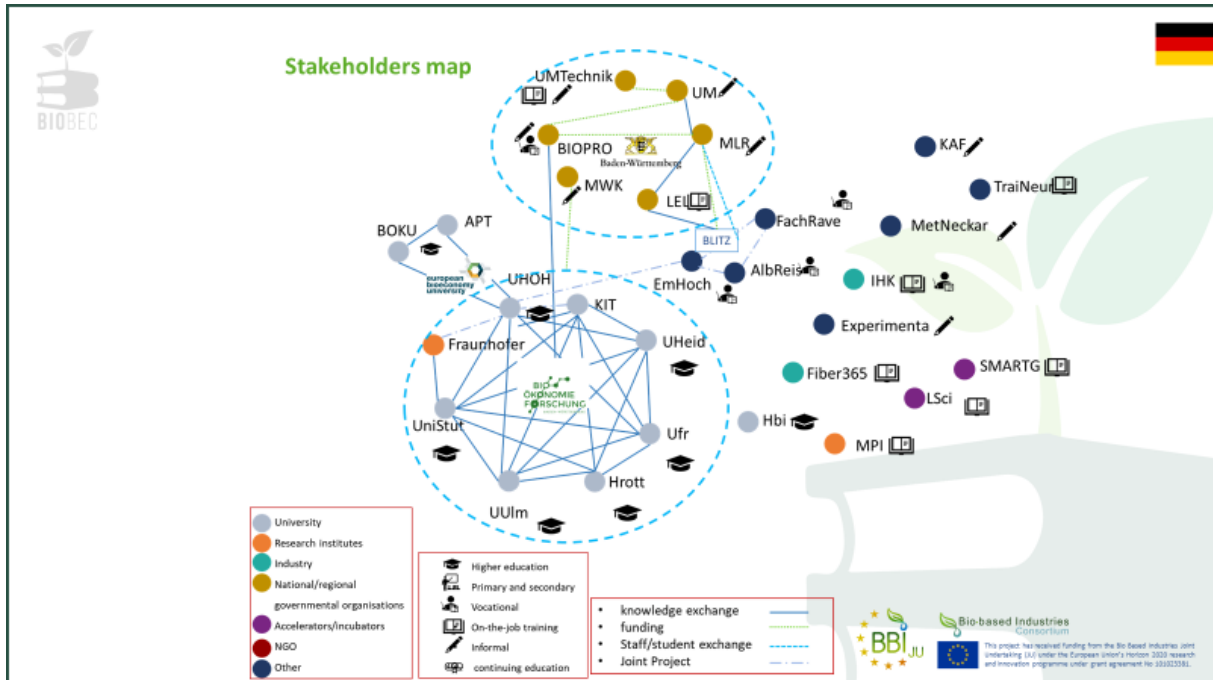


Figure 7. Current stakeholder map for the BIObec Central-Eastern Europe-Germany

5. Needs, opportunities, and expectations for BBECs

Each region has its own needs, opportunities and therefore the expectations for the BBEC are also different. In the following, the needs, opportunities, and expectations of each of the pilot BBECs will be presented. These are the results of the interviews and regional workshops.

5.1. Mediterranean Europe Hub

Needs

There is a need of building connections among different actors and bridges between education and bio-industries, for example with the alignment of training offer with bio-industries expectations; for example, in this area need of professionals with skills in bio-based pilot plants and biomasses managements is relevant and currently, there is no connection with bioeconomy in conventional technical courses.

Special attention is given to the small and medium-sized enterprises (SMEs) that could take advantage of the potential educational offerings of the BBEC as usually the on-the-job training tends to be costly and time consuming. The training of professionals in SMEs would have two

advantages: besides the benefit of skilled staff, the company will also profit from learning how to implement a training course in bioeconomy by itself. However, there is still limitation in regulation that needs to be tackled through fostering dialogue and coordination among different administrative levels (e.g., regional and state level).

Opportunities

There is a strong connection between different types of stakeholders willing to collaborate to create those bridges between industry and education. Some examples are already taking place in post-graduate courses, summer schools, dual VET programmes, or industrial Ph.D.

The medium-large companies are quite proactive in terms of education. Many of them have already created specific in-house training that could serve as a basis for the development of new educational offers in the future BBEC. They are also open for suggestions from the BBEC.

The startups in the region working on Bioeconomy are growing in number. This indicates a young Bioeconomy with new actors that are going to be included in the BBEC network. Apart from this important and emergent type of actor, the intermediate bodies, e.g. industrial clusters, have shown great interest in updating their knowledge and training programmes.

Expectations

Following the needs and opportunities in the region, the main insights from the stakeholders that have been involved in the project have shown a great expectation for the creation of a certification scheme and an entity capable of attesting the specific skills and competencies relevant for the bioeconomy. The future BBEC is also expected to be a Bioeconomy disseminator and promoter in terms of formal and informal education and to play an important role at the interface between policy, research and education to modernise the current regulatory framework. Finally, the promotion and implementation of dynamic and flexible training, especially for professionals of medium profiles (i.e., technicians) is also expected to be fulfilled by the BBEC.

The stakeholders that are expected to be involved in the Mediterranean BBEC are universities, educational organisations, research organisations located in different cities both in Italy and Spain, educational organisations, accelerators or incubators, industry, public institutions (among them also secondary schools), and NGOs. These stakeholders are expected to collaborate for knowledge exchange, offer consulting services or funding, exchange staff, create new educational formats together, and coordinate all related activities. Research Centres and Universities are expected to collaborate constantly and to involve in the knowledge exchange also the other actors. In particular, the involvement of Industry Association/ Companies and of Educational Organisation will be strongly encouraged. Also,

NGOs are expected to be involved in the exchange of knowledge with companies, Research centres and Universities, i.e. by organising workshops together. Some ways for this Knowledge Exchange can be: (a) the setting up of Consortia for specific projects, (b) organisation of workshops, (c) building up a stakeholder's community and keep it informed, and (d) to promote a communication campaign focused on the innovative research results and aimed to reach general public. Public organisations are expected to have an important role for funding, while NGOs are expected to have an exclusive role for exchange knowledge. The BBEC is envisioned to foster the creation of a community to disseminate and communicate for instance research results and to motivate the joint use of infrastructure and exchange staff.

5.2. North-west Europe Hubs- Finland

Needs

From the labour market perspective, there is a need to have a new, skilful and motivated labour force, e.g. professionals capable of planning and implementing the sustainable use of natural resources. The goal is to bring added value to the wood and non-wood forest products (NWFP) sectors, for example through innovation in nature-based solutions and through the facilitation of the adoption of new technologies.

From the industry perspective, there is a need to provide related, flexible, and updated on-the-job training including the acquisition of soft-skills. There is also a need to have more providers for VET education and have a focus on continuous and non-formal education. For the latter one, is important to have a certification scheme to support career development.

Opportunities

There is a willingness to increase the cooperation between education organisations, R&D institutions, and companies and also among the educational organisations (Schools, Applied Universities, Universities, VET, continuous learning).

Another opportunity is seen in that companies are already involved in the education process by providing practical tasks to students. This could be generalised by developing an innovation platform where academia, the education sector, R&D units, and companies can work together and contribute to gathering and transferring newest R&D, best education methods, and contents.

Expectations

The future BBEC is foreseen to serve as a mean to foster actively collaborations and synergies between different educational organisations. This should include spaces where teachers and

students from equal and different education levels meet to exchange ideas and knowledge. The BBEC should also ensure that the educators within the region share the same understanding of bioeconomy and that they are aware of each other's offers and capabilities in bioeconomy education.

Educational organisations are expected to provide informative knowledge and visions of job opportunities for students within the bioeconomy, but also high-quality online and onsite education and education export services that give the students (especially university students) practical skills for the bioeconomy.

It is expected that educational organisations join forces to share educational technology, develop and market education export services, and create tailored and unique education exchange services and expert trips.

It is important to note that there is an expectation that the local economy benefits from education collaboration. Therefore, more organisations are expected to be involved in the bioeconomy education, especially companies but also actors outside the industry including NGOs, other universities, and international actors.

5.3. BIObec North-West Europe-Denmark

Needs

The needs reported in Denmark are related to two types of offerings in education: in one hand, micro-learnings to teach and learn specific topics such as technologies for the Bioeconomy, regenerative farming, green proteins, agroforestry, insect, sea and vertical farming, livestock integration and new ownership models. On the other hand, holistic and systemic topics such as green and brown biorefinery, quadruple helix, LCA or sustainable industrial symbiosis business models. Besides, there is a need for demand-driven, flexible, personalized, and cross-silo offerings with a focus on specific abilities/competences and potentials rather than formal education and life-long learning, especially for Bioeconomy-related professionals or trainees.

Opportunities

The main opportunities for the successful establishment of this BBEC is given by the existing bioeconomy network in the region. The role of Aarhus University with its strong structure and framework for the bioeconomy including for instance the Centre for Circular Bioeconomy (CBIO) and the Bioeconomy-related departments in agroecology and agrobiological, animal science, veterinarian science and education, and biological and chemical engineering; the Food and Biobased Cluster Denmark with its current cooperation among the cluster members and with external institutions such as Aarhus University; Vocational education institutes such

as Asmildkloster, Kalo Organic Agricultural College, Bygholm Agricultural College and Beder; municipalities in Viborg and Skive but in general the Central Denmark Region; the Agro Business Park and the quadruple helix cooperation between universities, vocational institutions, business/incubation organisations and public sector. The existence of this network is considered a great opportunity as the stakeholders have already a strong connection. When extending to the different stakeholders of the quadruple helix, it might be possible to extend the impact of the future BBEC and foster the bio-based education in the area.

Expectations

It is expected to increase the cooperation and interactions between actors in the helix and innovate in the cooperation strategies for example through matchmaking events at individual and institutional level or joint projects. It is also expected to achieve a more qualified workforce within the bio-based economy with systemic and transdisciplinarity skills that are able to perform cascade analysis or LCA. This will expectantly accelerate the transfer of results from research to the economy where FBCD and GreenLab could play an important role.

The stakeholders expect also to see an integration of practitioners into the education and vice versa, for example through a municipal job training facility. Finally, the BBEC is expected to foster networking among bioeconomy education stakeholders.

This BBEC is envisioning to be a hub with courses that match the needs of business and other skilled professional needs. The courses are both very specific (e.g. in insect cultivation), and others also rather broad (e.g. on circularity, on green business models, or LCA). This BBEC is expected to be an agile hub with some research-/demo-facilities and close cooperation on internships with bio-based industry without a new building with incubation environment on several localities.

With the support of the BBEC, professionals can use a living lab to take ideas to practical scale to integrate these with other technologies into relevant solutions to societal challenges and there is training for skilled workers with system competences but also detailed new technical knowledge.

5.4. BIObec North-West Europe-Ireland

Needs

In an Irish context, there is a need to identifying and bringing together partners for future projects at national and European level. Therefore, there is a necessity to create a library of past EU funded projects and outcomes for access to resources and documents because the results of past projects are not always easily accessible. This could be done through an advisory group for EU and regional bioeconomy projects.

From the industry perspective, there is a need to identify the skills that companies need and create a rapid programme to develop these skills. Another industry key need is to have facilities for scale-up trials and have access to technology. Companies are keen to get expertise to spin in for a short period of time to improve research and development processes. For this, there is a need to have structured graduate programmes and industry placements that are mutually beneficial for both graduate and industry.

In terms of education, there is a need for a new educational framework that offers accredited certification for industry, modular learning packages, that are stackable, e.g. as micro-courses and also micro-credentials. In addition, there is a need to have shared training facilities for students and graduates around technologies and to identify upskilling needs for practice- and job-oriented learning programmes in which the students are supported to understand the bioeconomy, discover the roles, jobs, and skills needed.

Opportunities

Irish stakeholders have a representation at European level, e.g. in policy steering groups and joint projects. There is also a great mobilisation of promotion activities and knowledge exchange in the bioeconomy field through projects, funding opportunities, and collaborations.

At industry level, the BBEC has the opportunity to support the identification of skills gaps and the implementation of projects or programmes to address that. Also, the network of the future BBEC can provide access to experts from across Europe to Ireland on a regional scale and enable value chain collaboration for innovation and commercialisation activities. There is also the opportunity to offer accelerator programmes including access to funding and investment.

The BBEC could offer opportunities to students for work placement and internships and to create pathways at different stages of education through the connection among universities and education providers to complement modules into specific circular bioeconomy courses.

Expectations

The expectations of the BBEC is to be a well-established centre of excellence for circular economy and bioeconomy sectors that coordinates, consolidates, and creates best practice education for industry, academia, and civic society, responsive to the real-time needs of stakeholders. It will focus on the access to knowledge and technology through the dissemination of results among the other BBECs and Irish stakeholders, access to sites and facilities for tours and seeing best practices, and access to technologies. There is also an expectation to influence policy decisions within public administration and governmental departments, for example through the participation in steering committees. For the industry,

the main expectations include to have access to state-of-the-art expert knowledge and training programmes, develop skilled graduates through educational pathways that meet the needs of the industry. For graduates, the most relevant expectation is to understand clearly the job opportunities in the bioeconomy, the associated skills, the bioeconomy-related offerings in Ireland and across Europe. For this, it is expected that the skills and education offering improves and also to avoid duplication and overlapping of the offerings focusing on the gaps and strengthening the linking of local authority work with resources and education sector.

5.5. BIObec Central-Eastern Europe-East

Needs

The most important need of the Eastern European BBEC is to raise awareness and basic knowledge on bioeconomy in the industry, in the society, and in the non-bio sectors that can be related to bioeconomy. This is connected to the need of enhancing the cooperation between stakeholders, especially between academia and industry through the exchange of good practices without creating a new institution. Another need is to anticipate the trends within the industry to create flexible education offers that improve the current curricula. This also requires more experienced trainers, especially for teaching practical skills, and a certification scheme that supports it.

Opportunities

There are already educational institutions, universities, science institutes, and networks and these stakeholders represent an opportunity for fulfilling the expectations for bioeconomy education in the region. Some of the platforms and cooperation schemes already established during projects are BIOEAST UP and BIO EAST HUB and its thematic working group on education in 11 countries, BLOOM, BIOBORD, BioEcon, GO-UP business incubator and AgriEco. The experienced staff willing to take part in training courses is also considered an opportunity together with the existing R&D infrastructure.

Expectations

The Central East BBEC is expected to strongly collaborate with industry and academia. It is also expected to raise awareness and promote international cooperation among stakeholders within and outside the region to learn from other countries where the bioeconomy awareness is higher. For this, the BBEC is projected to support the mobility of students and scientific staff, to provide certification for practical skills and also to offer consulting services especially to the public sector to serve as a connector with other stakeholders.

The most important expectation in terms of bioeconomy education is that the BBEC ensures that society and industry have a clear understanding of the bioeconomy and its potential and that bioeconomy is part of the curricula at all levels of education in the region. Universities and companies should design and implement joint training programmes and regularly exchange knowledge via established formats and channels, e.g. supporting mobility. This is expected to be supported by the BBEC through complementation of theory-based education with internships, innovation sprints, deep dive sessions, and site visits, activities in pilot plants, and entrepreneurial training.

The BBEC is envisaged to provide tools, didactical resources, contents, and expertise to educational institutions and also information such as a list of education providers in the bioeconomy to better orient students, scientists, and qualified workforce. The BBEC is expected to build upon the existing solutions, initiatives, resources and practices of the bioeconomy.

In general, the BBEC is foreseen as a platform to connect between different types of stakeholders, including public administration with science and industry but also knowledge areas, e.g. law regulations with technology advancements. Some ideas include support schemes in finding partners for projects, especially SMEs, and the provision of consulting in preparing applications for funding in the area of bioeconomy and business models, support in certification for training institutions and qualified workforce.

5.6. BIObec Central-East Europe-Germany

Needs

The stakeholders of this hub see a need for a transformation of the industry towards sustainability. To achieve this, a better communication and marketing for the bio-based industry is key. That way, the different stakeholders can be involved in the transformation on the basis of higher levels of information. Within the bio-based industry, there is a need for entirely new job profiles, such as, for example, a 'translator' who is capable of connecting the different stages of the bio-based value chains and webs. For a complete transformation, there should be strong connections and exchange between stakeholders and a bi-directional knowledge transfer between sciences and the practical implementation of the bioeconomy.

Opportunities

The main opportunities in the region are rooted in the state, national and European context of sustainability transformation. This political background fosters a multitude of ongoing activities, facilitating co-operations, encouraging startups and initiatives to strengthen the

bioeconomy at educational, industry, and societal level. A few examples: Two state ministries of Baden-Württemberg (for agriculture and for the environment) are pushing R&D initiatives and scientific projects for the implementation of the State strategy for a sustainable bioeconomy (launched in 2019), the federal ministry of science and education has only recently brought the science year for the bioeconomy 2020/2021 to a close and on the European level, the adoption of the New Green Deal has once again emphasized the importance of bio-based solutions for sustainable development.

The increasing willingness to invest in sustainability is a clear opportunity for the deployment of bio-based solutions. However, for some stakeholders the advantages of shifting towards a bioeconomy are not fully evident since potential industrial contexts are complex. This complexity highlights the important role of universities, students and scientists in improving bioeconomy awareness by ongoing research and education in different areas of the bioeconomy.

Some on-the-job-training programmes in Baden-Württemberg as well as the political interest in introducing bioeconomy in vocational training by closer collaboration with existing higher education offers constitute a solid base for further development.

Expectations

There is a general expectation of a de-fossilisation and de-carbonisation of the economy through incremental changes instead of radical changes that is supported by rapid technology development for new products. The BBEC in this region is expected to train staff and professors to acquire the right skills to teach in bioeconomy and to improve the transfer of results from research to the economy. The BBEC is also expected to bring the practitioners' perspective into educational approaches and educate professionals that are competent in intervening along the entire bioeconomic value webs and understand the complexity of the bioeconomy systems.

In general, the BBEC is expected to represent a hub or contact point for bioeconomy education in the region and beyond. In addition, it is supposed to design and offer its own interdisciplinary formats with a practical focus, adapt existing courses and define different professional profiles. Furthermore, the BBEC shall support and foster the connection among bioeconomy and education stakeholders and increase the awareness of bioeconomy in society. On top of that, the BBEC should also take advantage of its supra-regional network and facilitate exchange by developing joint training offers for students and professionals to add value to regional focal points.

6. Comparison of the six BBECs

6.1. Stakeholders

From the scanning exercise, we conclude that the six BBECs share three types of stakeholders offering bioeconomy education activities: industry, universities, and governmental organisations (Fig. 8, left side). The NGOs and accelerators/incubators offer bioeconomy education in five out of the six BBECs (Mediterranean Europe Hub, North-West Europe Hubs-Finland, BIObec North-West Europe-Denmark, BIObec North-West Europe-Ireland, BIObec Central-East Europe-Germany) and research institutes in five different BBECs (Mediterranean Europe Hub, North-West Europe Hubs-Finland, BIObec North-West Europe-Ireland, BIObec Central-East Europe-East, BIObec Central-East Europe-Germany). There are other types of stakeholders present in the regions such as associations, hubs, public-private partnerships, advisors, and vocational institutions.

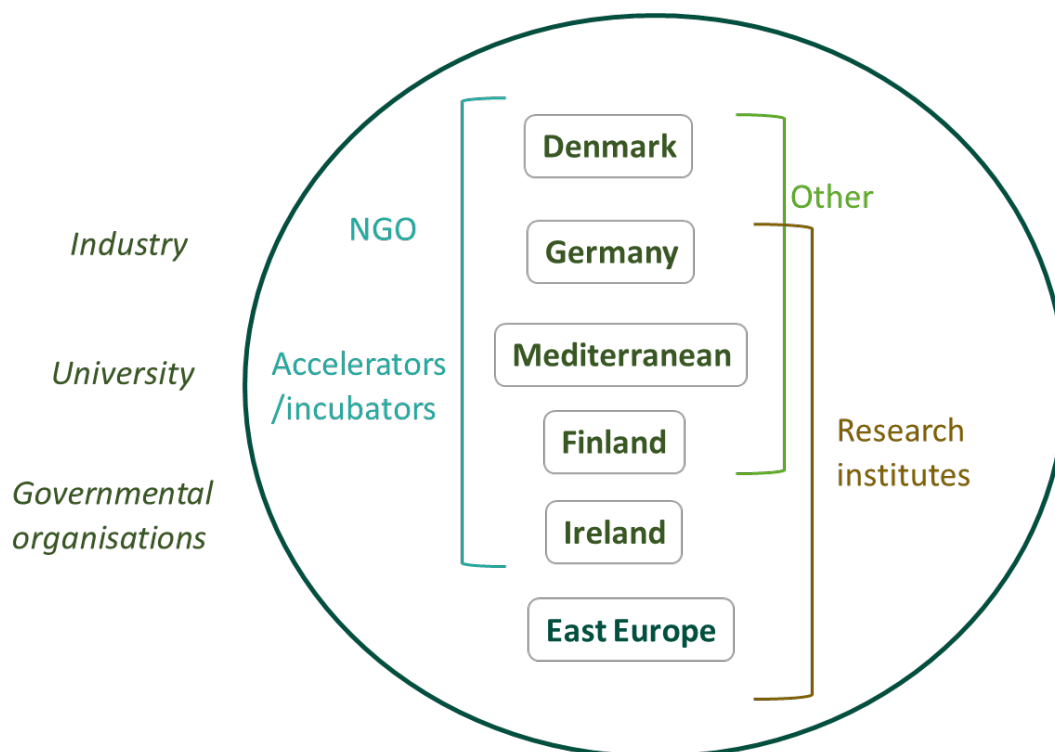


Figure 8. Shared and specific stakeholders present in the pilot BBECs

6.2. Levels of education offerings

In all regions, we already find higher education, informal learning, and vocational training offers in relation to bioeconomy. Continuing education has not yet been evidenced in the regions of the BIObec North-West Europe-Denmark and BIObec Central-East Europe-East according to our initial bioeconomy education scanning. In the BIObec Central-East Europe-Germany no continuous offer is yet observed for primary and secondary school in relation to bioeconomy while on-the-job training is missing in the BIObec Central-East Europe-East. Regarding the quantity of offerings, it seems that the primary and secondary educational offerings are the least common and also informal learning except for the Mediterranean Europe Hub and the BIObec Central-East Europe-Germany.

6.3. Geographical range, knowledge area, and BBEC type

A first description of the BBECs show that there are two regional BBECs (focus on a specific region within the country), two national BBECs and two transnational BBECs that will initially focus on two and three countries. This extension might change with the following activities of the project.

Although in the regions where the BBECs will be designed there are different value chains, the main value chains are shown in figure 9, where food is key for two of the BBECs (Mediterranean and Denmark) while the others have a focus on forestry in the case of the Finnish BBEC, agriculture in the German one, Agri-food and marine in Ireland and fresh water and bioeconomy in the BIObec Central-East Europe-East. A more comprehensive list of value chains in the regions will be shown in the second Working Package of this project.

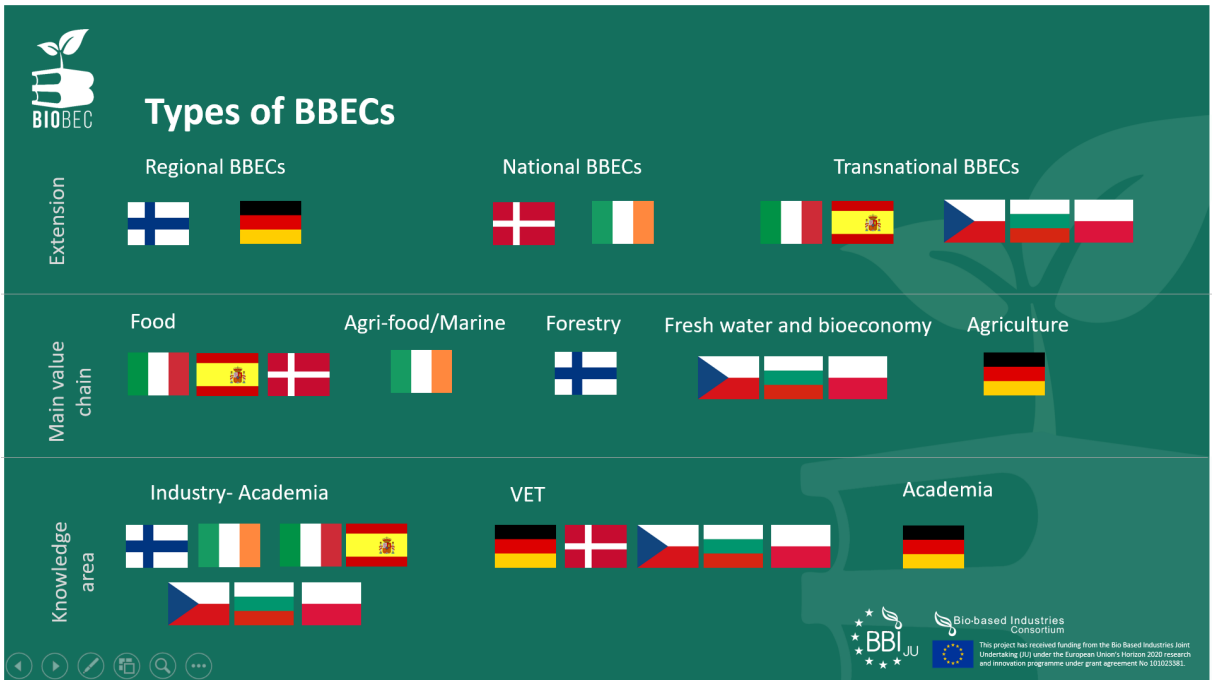


Figure 9. Geographical range/extension of the different BBECs

Regarding the current knowledge area, four BBECs have a focus on industry and academia, while the other two in vocational training (See Figure). The BIObec Central-East Europe-East has a focus on both of them and BIObec Central-East Europe-Germany has a focus on Academia additionally to the VET. This also might change with the design development of the BBECs depending on the alliances and stakeholders that are involved in the development of the BBECs.

6.4. Needs, opportunities, and expectations

A complete report on the needs, opportunities, and expectations is provided in the Deliverable 1.1. Here, we want to highlight the main needs, opportunities, and the expectations as well as the similarities and differences between the regions of the BBECs. Regarding the needs, it is evident that stakeholder connection is important in four out of the six BBECs with the exception of BIObec North-West Europe-Denmark and North-West Europe Hubs-Finland. This does not mean necessarily that these two do not need to connect the different bioeconomy education stakeholders but rather that it is not seen as a priority in comparison to other needs.

There is a need for a suitable certification scheme for the bioeconomy in the regions of the Mediterranean Europe Hub, North-West Europe Hubs-Finland, BIObec North-West Europe-Ireland and the BIObec Central-East Europe-East. This point was also mentioned in the BIObec Central-East Europe-Germany but as an expectation for the BBEC. In the regions of the Mediterranean Europe Hub and North-West Europe Hubs-Finland there is a need to improve the access to on-the-job training for bioeconomy-related industries specially for the SME that encounter more difficulties to have a tailored training for employees due to high costs.

According to the collected info in the surveys and interviews (Deliverable 1.1), there is a need to have flexible and demand-driven educational offers. This is often referred to as micro-learnings or modular learnings. This need was particularly highlighted in the regions of BIObec North-West Europe-Denmark, BIObec North-West Europe-Ireland and BIObec Central-East Europe-East. The bioeconomy awareness is still perceived as a need, especially in the regions of the BIObec Central-East Europe Germany and also East while the need of skilled labour for bioeconomy-related sectors was mentioned for the regions of North-West Europe Hubs-Finland and BIObec Central-East Europe-Germany.

In general, the opportunities that are shared among all regions of the BBECs are the existing networks on bioeconomy education including the projects in which the stakeholders have been and still are involved. The willingness to further collaborate and create new educational offers together represents an opportunity for the future design and development of the BBECs. Also, new trends in the bioeconomy that usually translate into new, evolving and

dynamic network where startups are founded and usually in need of educational offerings constitute a clear opportunity for the BBECs.

Interestingly, the expectations connected with the BBECs vary across the different pilot regions. This is mainly due to the needs that are quite specific for each region. However, there are some similarities that require further attention on a European level while demanding modification in the regional contexts. One of these expectations is the certification of skills that the industry needs for implementing bioeconomy solutions. This was predominantly mentioned in the regions of the Mediterranean Europe Hub and the BIObec Central-East Europe-East.

Involved stakeholders in most of the regions furthermore expect their BBEC to play an important role in raising bioeconomy awareness, either in cooperation with the stakeholders that are already working on it or as an additional and independent activity of the BBEC. Together with the awareness, it was also mentioned that the BBECs should connect particularly the academia and industry to support the dissemination and transfer of research results into the industry. The connection role of the BBEC is not only foreseen to play a role between academia and industry but also between academia and policy makers or connecting job opportunities with companies or organisations looking for specific professional profiles.

Other aspects indicated as expectations in different regions are the offering of flexible, tailored, and personalized training programmes (micro-learnings and modular learning) that are practical and linked to industry needs and also for train-the-trainer programmes, support for technology sharing, and consulting services.

6.5. Guidelines fulfilled and to be tackled

From the studies carried out for deliverable 1.2, ten guidelines were derived to be attended for the successful design of BBECs (see Annex 1). However, some of the guidelines might be more relevant than others depending on the context of the region. When the BIObec partners were asked about the relevance and fulfilment of these guidelines (see Annex 5), it became evident that the advice to involve a university is already fulfilled in most of the regions as university partners are either part of this project or closed to the project partners. On the other hand, regarding the guidelines that are relevant but not yet fulfilled, meaning the guidelines to be tackled soon in the regions, we found that the co-creation of suitable education formats, the long-term perspective, and the effective cooperation models and governance structures are the three guidelines that are considered crucial to be followed by most of the BBECs. The two latter ones are indeed in line with some of the following activities of the project that aim at defining the business model for the BBECs and create the governance structures.

6.6. BBECs' cross-case overview

The table 1 presents the summary and contrasts the status-quo of the six BBECs, their specific needs, opportunities, and expectations as well as the status of the guidelines' fulfilment and relevance.

BBEC	Stakeholders	Levels of education	Description	Needs & Expectations	Guidelines (partially) Fulfilled	Guidelines to tackle soon
Mediterranean Europe Hub	<ul style="list-style-type: none"> University Research Institute Industry Accelerators/incubators National/regional governmental organisations NGO Other 	HE IL PSS VT OJT CE	<p>Extension: Local to pan European</p> <p>Knowledge area: Academic-industry/ Food and food waste</p> <p>BBEC Type: Public/private</p>	<p>Needs: On-the-job training; Stakeholder connection (Industry-education); Certification scheme</p> <p>Opportunities: willingness to collaborate, startups, clusters</p> <p>Expectations: certification framework, skills certification, dissemination and promotion of Bioeconomy, connect policy and research, flexible training</p>	<ul style="list-style-type: none"> Involvement of university 	<ul style="list-style-type: none"> Co-creation of suitable education formats Long term perspective Political support Effective cooperation models and governance structures Keep stakeholders interested Support networking Involve stakeholders early
North-West Europe Hubs-Finland	<ul style="list-style-type: none"> University Industry Research institutes National/regional governmental organisations Accelerators/incubators Other 	HE IL PSS VT OJT CE	<p>Extension: Regional/sector-oriented</p> <p>Knowledge area: Academic-industry/ Forestry</p> <p>BBEC Type: Public</p>	<p>Needs: skilful labour force, on-the-job training, soft-skills training, focus on continuous and non-formal education, certification scheme</p> <p>Opportunities: Bioeconomy-related organisations</p> <p>Expectations: foster stakeholders' collaboration, exchange of ideas, information, connect to job opportunities, technology sharing, tailored education services</p>	<ul style="list-style-type: none"> Involvement of university Diverse network Political support 	<ul style="list-style-type: none"> Long term perspective Effective cooperation models and governance structures
BIObec North-West Europe-Denmark	<ul style="list-style-type: none"> University Industry National/regional governmental organisations Accelerators/incubators NGO Other 	HE IL PSS VT OJT	<p>Extension: Within the same country, region in Europe, pan-EU</p> <p>Knowledge area: VET and workforce/ Food</p> <p>BBEC Type: Facilitator</p>	<p>Needs: micro-learnings for specific topics, training on holistic and systemic topics, flexible and demand-driven educational offerings</p> <p>Opportunities: Bioeconomy-related existing network</p> <p>Expectations: cooperation and interaction of stakeholders, qualified</p>	<ul style="list-style-type: none"> Involvement of university Diverse network 	<ul style="list-style-type: none"> Co-creation of suitable education formats Effective cooperation models and governance structures Cooperative research

				workforce for bioeconomy. Transfer of results from research to economy		
BIObec North-West Europe-Ireland	<ul style="list-style-type: none"> University Research institutes Industry National/regional governmental organisations Accelerators/incubators NGO 	HE IL PSS VT OJT CE	<p>Extension: National (Ireland)plus international students (e.g. UK)</p> <p>Knowledge area: Academic level, Industry/ Agri-food, Marine</p> <p>BBEC Type: Public</p>	<p>Needs: identification and connection of partners for projects, identification of skills needed in the industry, industry-academia cooperation, new educational framework with modular learning packages, certification, Bioeconomy students and graduate support</p> <p>Opportunities: representation at European level, current Bioeconomy network.</p> <p>Expectations: knowledge and technology access, dissemination, policy influence, new educational pathways linked to industry needs, stakeholder connection, link to job opportunities</p>	<ul style="list-style-type: none"> Involvement of university Diverse network Cooperative research 	<ul style="list-style-type: none"> Long term perspective Keep stakeholders interested Effective cooperation models and governance structures Cooperative research Co-creation of suitable education formats
BIObec Central-East Europe-East	<ul style="list-style-type: none"> University Research institutes Industry National/regional governmental organisations 	HE IL PSS VT	<p>Extension: Regional oriented to the BIOEAST region</p> <p>Knowledge area: Academic – Industry, VET and workforce/ Fresh Water, Bioeconomy</p> <p>BBEC Type: private</p>	<p>Needs: raise awareness, stakeholder cooperation (industry-academia), flexible educational offering, train the trainers, certification</p> <p>Opportunities: bioeconomy network</p> <p>Expectations: industry-academy cooperation, raise awareness, connection with European stakeholders, mobility, skills certification, consulting services</p>	<ul style="list-style-type: none"> Involvement of university 	<ul style="list-style-type: none"> Cooperative research cooperation models and governance structures Long term perspective Co-creation of suitable education formats
BIObec Central-East Europe-Germany	<ul style="list-style-type: none"> University Research institutes Industry National/regional governmental organisations Accelerators/incubators Other 	HE IL VT OJT CE	<p>Extension: Regional (State Baden-Württ.), pan-EU (EBU), international</p> <p>Knowledge area: academic level, VET or workforce/ Biorefinery, Agriculture</p>	<p>Needs: communication and marketing of Bioeconomy, new job positions, stakeholders connection, practical implementation</p> <p>Opportunities: favourable political context, current cooperations and initiatives, strength of university's role</p>	<ul style="list-style-type: none"> Involvement of university Diverse network Cooperative research 	<ul style="list-style-type: none"> Early involvement of stakeholders Political support Co-creation of suitable education formats Effective cooperation models

			BBEC Type: Public	Expectations: train the trainer, practical educational offerings, support connection, Bioeconomy awareness		<ul style="list-style-type: none"> Is and governance structures
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Table 1. BBECs' cross-case overview

HE- Higher education

IL- Informal learning

PSS- Primary and Secondary School

VT- Vocational Training

OJT- On-the-job training

CE- Continuing education

6.7. Reflection on the results

The results of this report are foreseen to be used for the further development of the BBECs' design. The discussion on similarities and differences between the BBEC pilot cases provides valuable input for the successful implementation of the BIObec project. From these insights, several questions arise that need to be solved on the operational level. The following set of questions does not aim to be comprehensive but may serve as a starting point for the partners responsible for the realisation of the BBECs' design:

- How will the stakeholders be connected through the BBECs?
- What value can each BBEC create for the stakeholders?
- What levels of education will the BBECs focus on?
- Will the extension, value chains and knowledge areas of the BBECs change over the development time?
- How will the differences among the BBECs will be translated into the operational pathways of the BBECs?
- Will the similarities between the needs and expectations of the BBECs be an initial aspect for delivering common or shared services?
- How will the elucidated opportunities regions be seized to design the BBECs?
- Which expectations could be fulfilled and when? What is the pathway for the creation of the BBECs?
- Will all the guidelines be fulfilled? How will these guidelines be tackled?

Annexes

Annex 1. Guidelines derived from best practice analysis

For anyone assigned with the task of designing and running a new bio-based education hub, such as one of the regional BBECs in the frame of the BIObec project, it is essential to learn from previous experiences. The following guidelines have been derived from the analysis of the cases presented above and shall provide support and practical advice for such task.

1. Apply a long-term perspective

Several bio-based education hubs are supported by project money. This can be helpful especially for the design of new or adapted educational formats and also for starting an educational programme that is based on the cooperation of several universities and between academia and industry. However, for developing the bio-based education hubs or centres with a long-term perspective, models for saving the supply of required resources to run the future BBEC need to be considered from the beginning of the design process.

2. Involve a university

Most bio-based education hubs are evolving from or are at least involving the support of Universities, who are not only the experts in developing and performing education programmes, but are also equipped with the governance and administrative structure to manage education programmes on the long-term. Therefore, it is recommended to involve regional Universities into the design of BBEC.

3. Involve stakeholders early

The involvement of industry partner into study programme or BBECs will only be successful if the industry partner sees enough benefit for them to take the effort. Therefore, the design of BBEC should involve all partners from the beginning, ideally already at the stage of developing a joint vision for the development of a BBEC.

4. Develop effective cooperation models and governance structures

The motivation of companies to get involve get into and support BBEC includes access to young experts, specifically educated for their skills demand, but also the access to R&D facilities and results that enables the development of new products and business areas. For a harmonious and successful cooperation, from the beginning a governance structure should be

developed and formalised in a way that the interests of all involved stakeholders are adequately considered (e.g. through MoU or cooperation agreements).

5. Create models and facilities for cooperative research

The availability of demonstration or pilot plants and/or maker spaces, that allow for cooperative research of industry and academia partner is a strong incentive for the development of a bio-based education hub. Also, models and support provided for cooperative research, especially the opportunity for performing student's thesis research in cooperative supervision of University and industry partner, enhances the cooperation of different stakeholder in education. Therefore, it is recommended to involve such facilities and (student) research cooperation models into the design of BBEC.

6. Co-creation of suitable education programmes and formats

Bio-based education hubs apply different educational formats that go beyond the classical lecture format, including practical elements that are often performed in cooperation with industry, and also horizontal skills training. It is recommended that study programmes and educational formats offered by BBEC are co-created by involving stakeholder representing employer and to also involve them into education, for example through guest lectures, in supervision of project work or co-supervision of student thesis.

7. Seek political support

All existing bio-based education hubs are directly or at least indirectly supported and funded by public money. Strong models are especially those, that receive political support and regional/state funding. Therefore, it is recommended to include regional politicians into the design of BBEC from the beginning.

8. Support networking with dedication

The provision of a platform for networking and connecting with other stakeholder or bio-based hubs has proven to be a crucial element of a bio-based education hub. However, most of the existing bio-based hubs are only informally organized on this matter. It is recommended that the design of BBEC develops a manageable model for a networking and exchange platform. This can be virtually supported, but requires a personal manager and person dedicated to networking activities.

9. Keep stakeholders interested

The management of networks or clusters works well applying a rather flat governance, employing an executive committee or general assembly and a management board. More

important than the governance structure is the successful relationships management as the networks and clusters depend on the member's commitment. It is recommended to take this into consideration when designing BBEC. Communication and dissemination activities should be a key strategical activity for the hub. This allows to attract more stakeholders and also have a higher impact and visibility. The communication and dissemination should be clearly directed to the intended group of stakeholders and therefore this intentional activity should be well planned and be an essential part of the organisational model of the hub. Offers that can ensure the members' commitment include for example the provision of updated, specific selected and even personalised information to maintain the interest from the members, especially for the clusters.

10. Welcome diversity

It is recommended to involve a diverse group of stakeholders into the development of BBEC as this strengthens the hub from different perspectives: results are meaningful for practice and are mainly usable or transferable outcomes; increases the capacity of the hub as each stakeholder could potentially offer different "assets" to the hub in terms of skills, legitimization, individual network, infrastructure and capacity for example for joint projects.

Annex 2. Levels of education glossary

There are different levels of education in which potentially there could be bioeconomy education. Some of these levels already involve bioeconomy in Europe as is the case of master programmes. There exists x bioeconomy- dedicated master programmes and around x of bioeconomy-related.

The following levels of education were considered when analysing the offer of bioeconomy education in the BBECs. These definitions are extracted from Terminology of vocational training policy. A multilingual glossary for an enlarged Europe (Tissot, 2004) <https://termcoord.eu/wp-content/uploads/2016/07/vocational-training.pdf> and Lifelong learning: What does it mean? (Laal, 2011)

Lifelong Learning refers to the activities people perform throughout their life to improve their knowledge, skills and competence in a particular field, given some personal, societal or employment related motives. It includes the formal, non-formal and informal learning.

Formal learning consists of learning that occurs within an organized and structured context (formal education, in-company training), and that is designed as learning. It may lead to formal recognition (diploma, certificate)

- **Higher education** refers to any of various types of education given in postsecondary institutions of learning and usually affording, at the end of a course of study, a named degree, diploma, or certificate of higher studies.
- **Primary and secondary education** refers to the educational levels of formal learning before tertiary education
- **Vocational training**, is the training in skills and teaching of knowledge related to a specific trade, occupation or vocation in which the student or employee wishes to participate. It may be undertaken at an educational institution, as part of secondary or tertiary education, or may be part of initial training during employment.

Non-formal learning consists of learning embedded in planned activities that are not explicitly designated as learning, but which contain an important learning element such as vocational skills acquired at the workplace

- **On-the-job training** is a practical approach to acquiring new competencies and skills needed for a job in a real, or close to real, working environment. It is often used to learn how to use particular tools or equipment in a live-work practice, simulated, or training environment.
- **Continuing education:** Education or training after initial education or entry into working life, aimed at helping individuals to improve or update their knowledge and/or skills; acquire new skills for a career move or retraining; and continue their personal or professional development.

Informal learning: Learning resulting from daily activities related to work, family or leisure. It is not organized or structured (in terms of objectives, time or learning support). Informal learning is in most cases unintentional from the learner's perspective. It typically does not lead to certification

Annex 3. Participants regional workshops

<i>BBEC</i>	<i>Participants</i>
Mediterranean Europe Hub	42 participants Universities; Vocational education institutes; innovation organisations; industry; research f institute; cluster from Italy, Spain and Portugal

North-West Europe Hubs-Finland	5 participants Universities, applied science university, vocational education institute Ville
North-West Europe-Denmark	11 participants Municipalities, University, Vocational education institutes, innovation centre, FBCD/Bio-Cluster
North-West Europe-Ireland	12 participants Industry, universities, vocational education institute, cluster, local government, research centres
Central-East Europe-East	42 participants Czech Republic: 8 participants SMEs, private research organisations (that have also a status of SMEs) Bulgaria: 20 participants University; training institutes; Poland: 14 participants University, City Hall, Entrepreneurship Office; governmental institute; on-the-job training education; research centre; consultancy agency; Industry
BIObec Central-East Europe-Germany	19 participants Universities, Science centre, Students, State agency; vocational education institute; industry, ministries

Annex 4. Reports of regional workshops

Mediterranean Europe Hub

1. Our vision of what our BBEC will have achieved by 2035

1. **List the most important achievements expected by the workshop participants from your BBEC.**
2. **Please formulate full sentences, such as „Active professionals in the region have access to formal courses“.**
3. **Please use present tense.**

4. Please separate different goals originally formulated in one sentence/ on one card.

[This outlook on “Our vision by 2035” was obtained by integrating the answers from an Italian workshop with a Spanish consultation of stakeholders]

The participants were asked to pick 3-5 of the goals extracted from the focus group interviews across all BIObec regions *. To collect answers mentimeter.com was used (see figure above) [Total participants (Italian + Spanish) = 42]

The top 4 most important are:

- 1) G4. Universities and companies have designed and implemented joint training programmes – 22 votes
- 2) G12. Alignment of training to the bioeconomy developments - The BBEC gives direction to education content, based on constant observation of the dynamics of bioeconomy development - 16 votes
- 3) G1. Active professionals have access to formal courses in the goals – 13 votes.
- 4) G8. Theory-based education is complemented with internships, innovation sprints, deep dive sessions and site visits, activities in pilot plants, and entrepreneurial training – 12 votes.

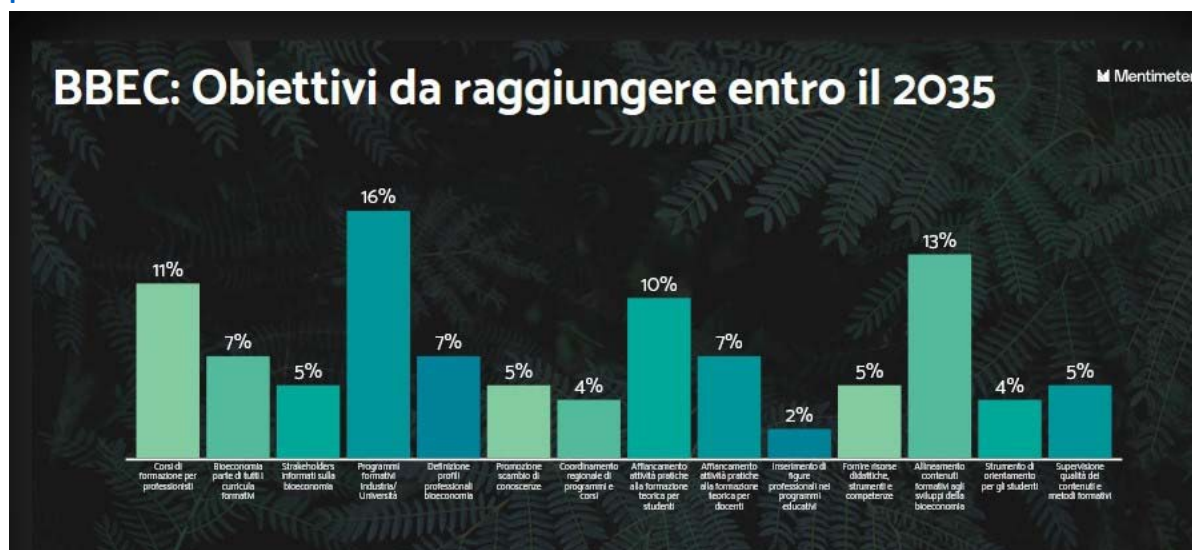
Some participants selected also the following three potential goals:

- G2. Bioeconomy is part of curricula at all levels of education in the region – 9 votes
G3. Citizens, businesses, and policy makers across the region are aware of the bioeconomy – 9 votes.
G9. Teachers’ training involves on-site learning from industries’ activities – 9 votes.

Other goals received from 3 to 7 votes.

Full answers for the Italian workshop are available at

https://www.mentimeter.com/app/presentation/866cfa7d76fdcf1e43cd20f90bfb704d/d6dc17be678c?utm_campaign=voter_viewed_result&utm_medium=email&utm_source=rv_transactional

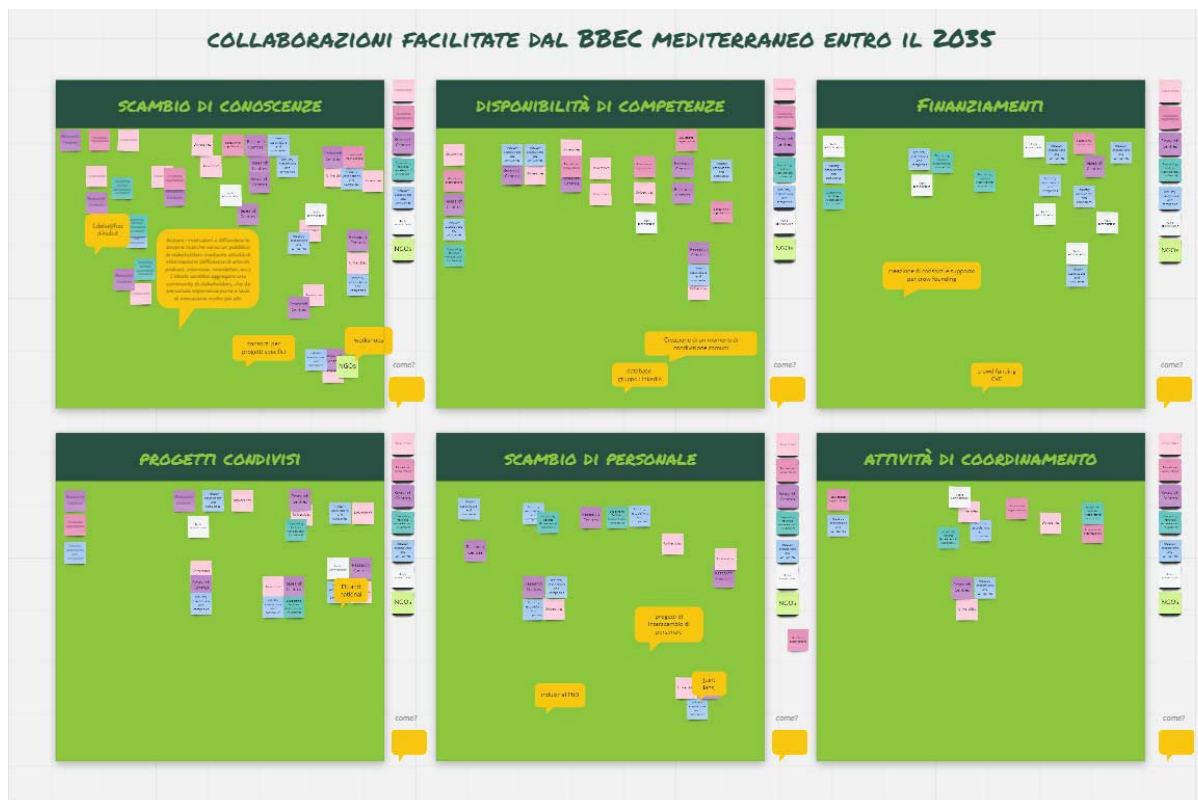


2. Additional connections and collaborations established by our BBEC

1. Please describe the changes on the stakeholder map that have been proposed during the workshop in your own words. Do not forget to send along the ppt with the two versions of the map: 2022 and 2035.
2. You may also present possible challenges or concerns that were raised regarding the new connections.
3. Please modify your stakeholders map according to the proposed new connections between existing actors and initiatives

It was decided to use Miro board in addition to an open discussion, and not to use the stakeholder map 2022, in order to reflect and speak about the additional connections and collaborations will our Mediterranean BBEC have to establish.

6 square corresponding to the 6 possible ways of collaboration (Exchange knowledge, Consult., Fund., Exchange staff., Create something new together, Coordinate) were created on the Miro board as well as post-it for indicating WHO and HOW, thus giving to the participants the possibility to indicate the main players to be involved for each of the possible collaboration and how to promote that collaboration way (see figure above).



The participants explained their view about connections and collaborations for several aspects:

Exchange of Knowledge:

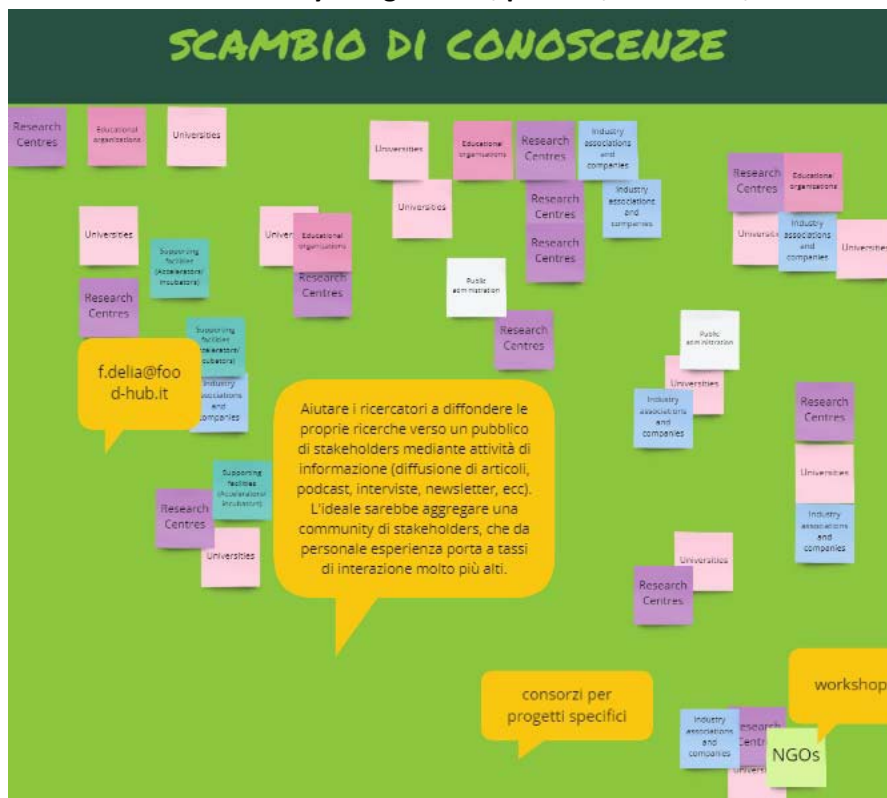
Research Centre and University were expected to collaborate constantly and to involve in the knowledge exchange also the other actors. In particular, it is quite strong the idea of an involvement of Industry Association and Companies or of Educational Organisation with the two main actors (Univ.&Res.), that was suggested many times.

In less cases the expectation for a knowledge exchange between Companies & Supporting facilities (Accelerators/incubators) is expected, as well as the Knowledge exchange between Public administration & Research Centres, and Public administration & University & Industry Associations.

Finally, also NGOs are expected to be involved in the knowledge exchange with Companies, Res.& Univ, for example by organising workshops together.

Some of the proposed ways for this Knowledge Exchange were:

(a) the setting up of Consortia for specific projects, (b) organisation of workshops, (c) building up a stakeholder's community and keep it informed, and finally (d) to promote a communication campaign aimed to support researchers in reaching general public. This campaign should be focused on the research results and the future prospective in this sector, and is to be carried out by using articles, podcast, interviews, newsletters, etc.



Availability of Competencies: the perception about this field of competences is that all the stakeholders should be available to share competences, and they can also act as single institution rather than in cooperation. In particular, the main institutions involved are: Universities, Research Centres, Industry associations and Companies, and Educational Organisations. To achieve this availability, suggestions refer to “creation of shared common

moments” and creation of “databases – LinkedIn groups.”

Financing: in this case it is clear the idea of a collaboration Public-Private with the predominant roles of Public administration, Industry associations and Companies, and Supporting facilities (Accelerators/incubators). Moreover, the possibility of financing the BBEC by crowdfunding was suggested, too.

predominant roles of Public administration, Industry associations and Companies, and Supporting facilities (Accelerators/incubators). Moreover, the possibility of financing the BBEC by crowdfunding was suggested, too.

Shared projects: The ideas in this field are more varied. Indeed, there is not a common framework: the proposed consortia differ from each other. More in detail, suggestions pathways are:

- a. "Research Centres-Educational organisations-Industry associations and Companies";
- b. "Research Centres- Industry associations and Companies-Universities-Public administration";
- c. "Research Centres-Industry associations and Companies-Universities";
- d. "Research Centres- Industry associations and Companies-Universities- Supporting facilities (Accelerators/incubators)";
- e. "Research Centres-Universities-Supporting facilities (Accelerators/incubators)";
- f. "Universities-Industry associations and Companies".

The framework b. was proposed twice, and in one of them was underlined the need of EU and national connections.

Exchange of personnel: In this case the connections among Research Centres, Industry associations and Companies, and Universities are clear. However, the suggestions on HOW to do this exchange of personnel indicate "industrial PhDs", "Joint Labs" and "Personnel exchange projects" as possible solutions.



Coordination activities: Also in this case there is no a predominant subject considered leader but rather all the subjects are expected to be active (Universities, Research Centres,

Industry associations and Companies, Educational organisations, Public administration). In this case we can underline the involvement of the Educational organisations, less represented in the other fields.

3. Engagement to and expected support from our BBEC

4. *Please list all participants and their institutions and how they are willing to engage.*
5. *Please separate different contributions originally formulated in one sentence.*
6. *List and describe the ways how your BBEC is expected to support the stakeholders.*
7. *Please separate the requests from the stakeholders originally formulated in one sentence.*

List of all participants [Italian workshop + Spanish consultation] (name, affiliation): 42

1. Kerline – Italy
2. Louis Ferrini (FVA) – Organizer – Italy
3. Uni Ferrara-CNR Bologna – Italy
4. Uni Ferrara – Italy
5. CNR-ISOF – Italy
6. CNR-ISOF-Kerline – Italy
7. Amadori – Italy
8. Giacomo Rinaldi (Uni Bologna)
9. Uni Bari – Italy
10. Uni Bologna – Italy
11. Uni Urbino – Italy
12. Antonio Hurtado (CTA) – Spain
13. Maria Garcia Alegre (CTA) – Spain
14. FoodHub – Italy
15. Cluster Agrifood – Italy
16. Uni Napoli-CNR-IPCB – Italy
17. Aleix Barrera (Uni Barcelona) – Spain
18. CNR-ISOF -Italy
19. Uni Bologna – Italy
20. Uni Milano Bicocca – Italy
21. CNR-STIIMA – Italy
22. Uni Sapienza – Italy
23. Agroils – Italy
24. CNR-ISOF – Italy
25. Uni Ferrara – Italy
26. CNR-ISOF, Uni Ferrara – Italy
27. Uni Bari – Italy
28. N. Gabrielli- Italy
29. Roma Business School – Italy
30. Agrifood FVG-Fondazione FAB FVG – Italy
31. CNR-STIIMA – Italy
32. CNR-STIIMA – Italy
33. Armida Torreggiani CNR-ISOF- Organizer
34. CNR-IPCB – Italy
35. Susanna Albertini (FVA) - Organizer
36. Selenia Marinelli (FVA) - Organizer

- 37. Davide Viaggi (Uni Bologna)
- 38. Andalucian Agency for Knowledge (AAC) – Spain
- 39. Uni of Jaen – Spain
- 40. Andalusian Institute of Agrarian and Fishing Research and Training (IFAPA) – Spain
- 41. Oleofat S.L.U. – Spain
- 42. BLC3 Association – Campus of Technology and Innovation – Portugal

Some Feedbacks:

- 1. Interesting project especially for the ever-increasing importance of the biosustainable approach in the field of biopolymers (recently also from a biomedical point of view).*
- 2. It could be considered useful to extend the consortium to Mediterranean countries outside the EU (emerging countries) that show an increasing sensitivity towards bioeconomy also due to the local availability of raw materials and biomasses, and therefore also potentially interesting for knowledge exchange on synthesis/extraction processes and industrial development.*
- 3. Agrifood sector needs workers with specific skills (certifications, bioenergy, ecodesign ...).*
- 4. It could be useful to invite someone from BIOBec to present the project results to the Agrifood cluster.*
- 5. BBEC should create a community of stakeholders involved in bio-economy.*
- 6. Made surveys to gather useful information from and for the BBEC community.*
- 7. Strong needs of professionals with skills in bio-based pilot plants and biomasses managements. Currently, there is no connection with bio-economy in conventional technical courses. Mandatory to train professional figures such as technicians in a double key: 1) training/support to the company 2) case study of how to implement a training course in bio-economy.*

As regards the expectation about Mediterranean BBEC, the training of professional of medium profiles (i.e. Technicians) is expected

Availability to contribute:

1. Agroils is available for any involvement in internship/training. The trainings could be done as training/support to company, and/or as case-study to be inserted in a training educational course
2. availability to give lessons in the bio-economy field at high schools
3. Food Hub gives its availability to create link with their community composed by 25,000 stakeholders who can be useful as a potential pool of potentially interested users on which to carry out initial tests or from which to collect insights.
4. In addition, Food Hub gives its availability to involve their team for stakeholder engagement activities; design thinking workshops, organisation and management of schools oriented towards talent acquisition, creation of communities of specific stakeholders
5. Availability to contribute to basic definition for the personnel involved in marketing: Sometimes with the desire to sell more and more, unsustainable choices are made that are not in line with the bioeconomy
6. Contribution in the adoption of digital marketing skills to enhance communication and dissemination of any project activities and outcomes. It is very important that in

the team there is at least one competent person in the relevant scientific field.

4. Summary of the workshop

Please quickly describe in your own words how the workshop went, how the atmosphere was and what could have been improved in the design.

The workshop went well. Indeed, the participants were proactive and helped to develop the discussion both on Miro and by voice. The topic was perceived compliant with the current needs of the Bioeconomy, especially the industry ones. The Education and Training of new skilled human resources are considered fundamental. Moreover, the need of networking and create connections among different actors are still in a sort of “start-up” phase. The workshop was the opportunity for some actors to meet each other and create links, and many of them are strongly interested to keep in contact with the BIOBec community.

North-West Europe Hubs-Finland

1. Our vision of what our BBEC will have achieved by 2035

- 1. List the most important achievements expected by the workshop participants from your BBEC.*
- 2. Please formulate full sentences, such as „Active professionals in the region have access to formal courses“.*
- 3. Please use present tense.*
- 4. Please separate different goals originally formulated in one sentence/ on one card.*

Different education organisations are collaborating actively and synergies are sought. Teachers from different education levels meet actively to exchange ideas and knowledge. Students from different education levels meet actively to gain better understanding of the bioeconomy and studying and working possibilities. Educational organisations provide informative knowledge and visions of job opportunities for students within bioeconomy. Different level education is served through different education organisations. Bioeconomy educators share same understanding of bioeconomy. Bioeconomy educators are aware of each other's capabilities in bioeconomy education. High-quality education is served online and onsite. University students have better practical skills in bioeconomy. Education organisations join forces for developing and marketing education export services. Local economy benefits from education collaboration. More educational technology is shared between organisations. Tailored and unique education exchange services and expert trips to the area are offered jointly.

2. Additional connections and collaborations established by our BBEC

- 1. Please describe the changes on the stakeholder map that have been proposed during the workshop in your own words. Do not forget to send along the ppt with the two versions of the map: 2022 and 2035.*
- 2. You may also present possible challenges or concerns that were raised regarding the new connections.*
- 3. Please modify your stakeholders map according to the proposed new connections between existing actors and initiatives*

Companies within the forest sector and outside it will have more role in GreenHub in education activities in the future. Several fields of sciences and other universities will be part of bioeconomy education. International actors such as universities and companies as well as political actors from EU are involved.

3. Engagement to and expected support from our BBEC

1. *Please list all participants and their institutions and how they are willing to engage.*
2. *Please separate different contributions originally formulated in one sentence.*
3. *List and describe the ways how your BBEC is expected to support the stakeholders.*
4. *Please separate the requests from the stakeholders originally formulated in one sentence.*

- Ville Kuittinen, Karelia University of Applied Sciences
- Mikko Saarimaa, Riveria vocational education
- Tiina Ynnilä, University of Eastern Finland, continuous learning
- Kalle Kärhä, UEF, department of forest sciences
- Piritta Torssonen, UEF, department of forest sciences
- Each organisation is willing to participate in developing the GreenHub platform by providing information and communicating actively. Organisations want to participate in joint meetings and events and provide teaching to other organisations. Organisations are willing to provide education technologies for other organisations' use.
- GreenHub (BBEC) will enhance collaboration between these three institutions by bringing together teachers and students through joint events, meetings and trainings. GreenHub will provide new knowledge and future forecasts regarding bioeconomy development. GreenHub will enhance joint education export services and expert visits to the area.

4. Summary of the workshop

Please quickly describe in your own words how the workshop went, how the atmosphere was and what could have been improved in the design.

The workshop received less interest than it was expected and hence there were not many participants. However, this was probably because of simultaneous meetings etc. Participants seemed interested in the topic and were taking actively part in discussions. It seemed that there was a need for a discussion regarding education collaboration and need for similar meeting in the future. Participants seemed optimistic about the GreenHub development and collaboration it can enhance. In the future such workshop could be arranged as a combination of a workshop and a regular meeting. Workshops tend not to receive as much interest nowadays and thus smaller meetings, also face-to-face, can attract people better. In addition, such meetings could be arranged more regularly so that information can be changed more frequently, and cooperation can be improved. A strict structure for a workshop does not necessarily lead to open conversation and idea exchange, and thus, more open workshop formats are encouraged.

North-West Europe-Denmark

1. Our vision of what our BBEC will have achieved by 2035

1. *List the most important achievements expected by the workshop participants from your BBEC.*
2. *Please formulate full sentences, such as „Active professionals in the region have access to formal courses“.*
3. *Please use present tense.*
4. *Please separate different goals originally formulated in one sentence/ on one card.*

- We have a partnership/ a hub with courses that match the needs of business and other skilled professional needs. The courses are both very narrow (eg. in insect cultivation), and others also rather broad (eg on circularity, on green business models, or LCA)
- We have ‘no new buildings’ but an agile hub with some research-/demo-facilities and close cooperation on internships with bio-based industry
- We have a bio-based incubation environment on several localities
- Professionals can use a living lab to take ideas to practical scale to integrate these with other technologies into relevant solutions to societal challenges
- Skilled workers can understand and use the terms cascading, symbiosis – i.e. they have system competences, but in some cases also detailed new technical knowledge

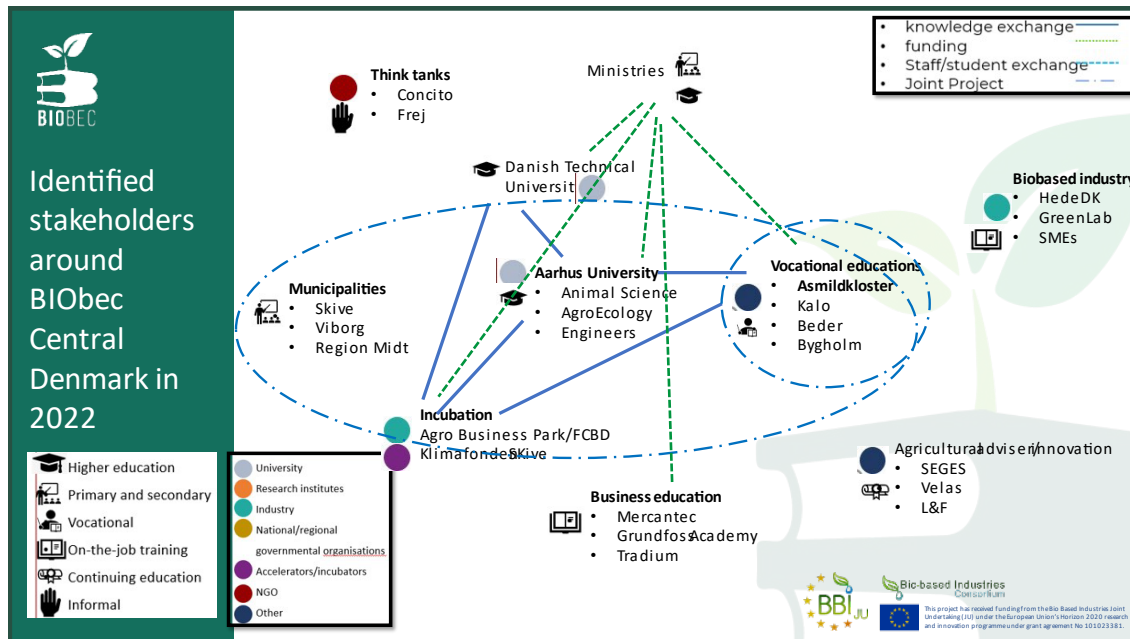
2. Additional connections and collaborations established by our BBEC

1. *Please describe the changes on the stakeholder map that have been proposed during the workshop in your own words. Do not forget to send along the ppt with the two versions of the map: 2022 and 2035.*
2. *You may also present possible challenges or concerns that were raised regarding the new connections.*
3. *Please modify your stakeholders map according to the proposed new connections between existing actors and initiatives*

- The stakeholder map of today and the future map was ‘merged’ into a mix of present realities and future opportunities
- The future BBEC has a core of few organisations with a more specific and agile cooperation than today addressing innovative solutions (eg. pyrolysis and biogas combined, grass protein for human food; regenerative agriculture; veterinary challenges for new types of climate friendly fodder etc)
- Erasmus projects foster closer cooperation between eg VET institutions in the region; more educational projects can stimulate cooperation

- Drawing the stakeholders map gave new ideas for cooperation
- The students pay for the education (employers pay) in future BIOBec

Stakeholder map present/future:



It is obvious, that there is today a good basis for more cooperation. However, the core of this diagram is probably also going to be the core of future cooperation (Aarhus University, three institutes, Asmildkloster, municipalities and FBCD), but depending on what the BIOBec will offer, more can be associated/become integrated.

It would be speculative yet to specify, but more connections will be made.

3. Engagement to and expected support from our BBEC

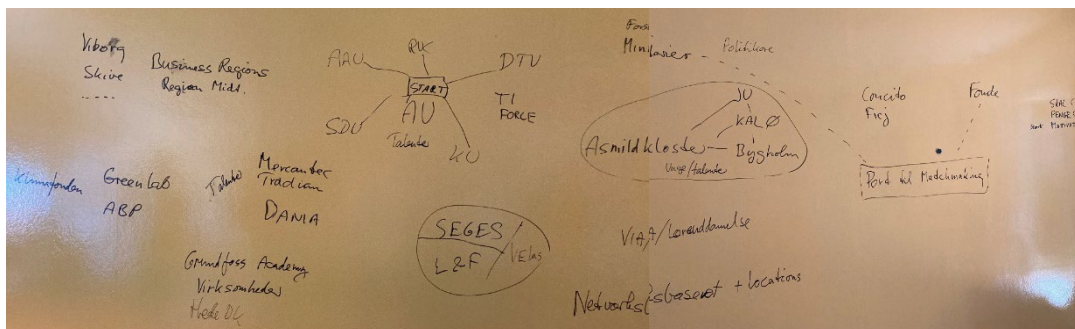
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2. Please separate different contributions originally formulated in one sentence.
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4. Please separate the requests from the stakeholders originally formulated in one sentence.

- Viborg Municipality: Very interested, can perhaps co-finance partly as it is a strategic goal
- Skive Municipality: Very interested, as it is strategic goal for employment
- Aarhus University: will involve up to 5 institutes and contribute with deep knowledge and can easily establish summer schools
- Asmildkloster Vocational school: Has established a 'vocational education project hub' and are very interested in cooperation – e.g. through projects

'value chain'). But we also need new specialists, eg. to cultivate insects, to refine grass proteins, to produce biochar etc, we need green lawyers/solicitors to the new challenges; education in green business models. We need new specializations, but indeed also cross-over and transdisciplinarity

Stakeholder Map for 2035

The stakeholder map was drawn directly on the wall. A rather broad stakeholder map, to become narrowed down when approaching operationality.



The main actor groups are

- Universities (Especially AU and DTU) – START cooperation, new veterinary education
- Tech service institutions: Danish Technological Institute,
- Vocational Education (Asmildkloster, Beder, Kalø, Bygholm) for farmers etc, and school teachers (VIA)
- Farmers advisory service and related educations (SEGES, VELAS, L&F)
- Business education: Mercantec, Tradicum, Grundfoss Academy and the like, Business regions
- Municipalities (Viborg, Skive, more?)
- Innovation hubs (GreenLab/klimafonden, Agro Business Park)
- Ministry of higher education, but also local politicians to pave the political/strategic way for financing
- Relevant think tanks: Concito; Frej

However, this 'ideal' stakeholder group will probably be reduced, when we reach more specific steps, due to financial aspects etc.

The BBEC could be seen as a gateway firstly to individual/institutional matchmaking, but also for education-matching – to define the next type of education. Born from legislation, from project funding and/or strong motivation.

The employers should generally pay for the courses – typically weeks (?)
The BBEC should be based on network among partners and experimental facilities (Greenlab/ Hjarbæk Fjord and Foulum research station as examples), not new buildings.

North-West Europe-Ireland

1. Our vision of what our BBEC will have achieved by 2035

5. *List the most important achievements expected by the workshop participants from your BBEC (Bio Based Education Centre's).*
6. *Please formulate full sentences, such as „Active professionals in the region have access to formal courses“.*
7. *Please use present tense.*
8. *Please separate different goals originally formulated in one sentence/ on one card.*

- In 2035 the BBEC is a significant and well established centre of excellence for both the circular economy and bioeconomy sectors.
- We are known as the main national institution with the capability to co-ordinate, consolidate and create best practice education for industry, academia and civic society, responsive to the real-time needs of stakeholders.
- Learners have access to an overarching platform to select appropriate career paths and education and training programmes in circular economy, bioeconomy and sustainability.
- All stakeholders have access to data and statistical information on a national and European scale across all bioeconomy related thematic pillars via the BBEC.
- All training and education programmes, micro-courses and micro-credentials are accredited, certified and authenticated by the BBEC across the QQI Framework.
- Funding opportunities and collaborations are clearly available and the BBEC connects potential partners to potential projects and finance.
- Researchers and job seekers use the BBEC as the go-to platform for jobs, research opportunities, and industry projects related to the circular and bioeconomy.
- The BBEC in Ireland provides direct access to specialized programmes, mentors and industry across the entire European BBEC network. In return it provides these services to the European BBECs in accordance with its expertise and thematic pillars.
- In 2035 the BBEC co-ordinates R&I partnerships resulting in record numbers of green tech startups filtering through BBEC accelerator programmes, creating employment and growth in the bioeconomy, blue economy and agritech sectors..

- In 2035 the BBEC is the main of curricula activities and educational resources for pre-school, primary and secondary school sectors in conjunction with the Department of Education.
- The BBEC coordinates the 'BBEC Professional Academy' where employers and/or students select from a range of stackable micro-credentials that can be built up into an EU/internationally recognised qualification. These are paid for by employers and/or students or heavile subsidised by government to meet skills gaps and develop talent.
- Policy makers both nationally and local government seek advice from the BBEC on policy development and the distribution of funding mechanisms that support and enhance the circular and bioeconomy sectors.

2. Additional connections and collaborations established by our BBEC

1. *Please describe the changes on the stakeholder map that have been proposed during the workshop in your own words. Do not forget to send along the ppt with the two versions of the map: 2022 and 2035.*
2. *You may also present possible challenges or concerns that were raised regarding the new connections.*
3. *Please modify your stakeholders map according to the proposed new connections between existing actors and initiatives*

The main concern was that there is as little cross over as possible of existing services and far more mapping and consolidation of education & training pathways for the circular and bioeconomy. The future BBEC has very strong relationships with both vocational education and primary & secondary education system. The BBEC proposes to be the central co-ordinator of education & outreach for this region by providing streamlined pathways developing skills and talent in real time to meet industry and society needs.

(See Powerpoint MTU & IBF Stakeholder Map)

3. Engagement to and expected support from our BBEC

1. *Please list all participants and their institutions and how they are willing to engage.*
2. *Please separate different contributions originally formulated in one sentence.*
3. *List and describe the ways how your BBEC is expected to support the stakeholders.*
4. *Please separate the requests form the stakeholders originally formulated in one sentence.*

- Technological University Dublin will collaborate on programme design and development
- University College Dublin will collaborate on programme design, funding partnerships and research and development

- Trinity College Dublin
- Department of Agriculture, Food and Marine will collaborate on policy development and national funding
- TEAGASC the state agency providing research, advisory and education in agriculture, horticulture, food and rural development will collaborate on programme development, training, education and outreach.
- COILLTE Ireland's largest producer of certified wood will collaborate on policy, training and education.
- Circular Bioeconomy Cluster Southwest will collaborate with the BBEC on industry specific needs and accessing business supports from Enterprise Ireland.
- SOLAS is a leader in the vocational education sector and will collaborate on accessing vocational training and assessing gaps to enable the BBEC to design and fill voids.
- The RDI Hub is a lead in the national network of innovation hubs. They will support the BBEC with access to the startup ecosystem and associated accelerators and venture capital opportunities.
- Shannon ABC and IMaR research centres will provide direct access to 16 technology gateways, each with its own speciality. These gateways provide research & development supports for industry to create new IP and STEM solutions.
- Science Foundation Ireland will support the BBEC by disseminating and sharing communications with its large national and international audiences.
- BiOrbic is a world class SFI research centre devoted to the bioeconomy. They will support the BBEC by liaising on research projects and research funding proposals.

4. Summary of the workshop

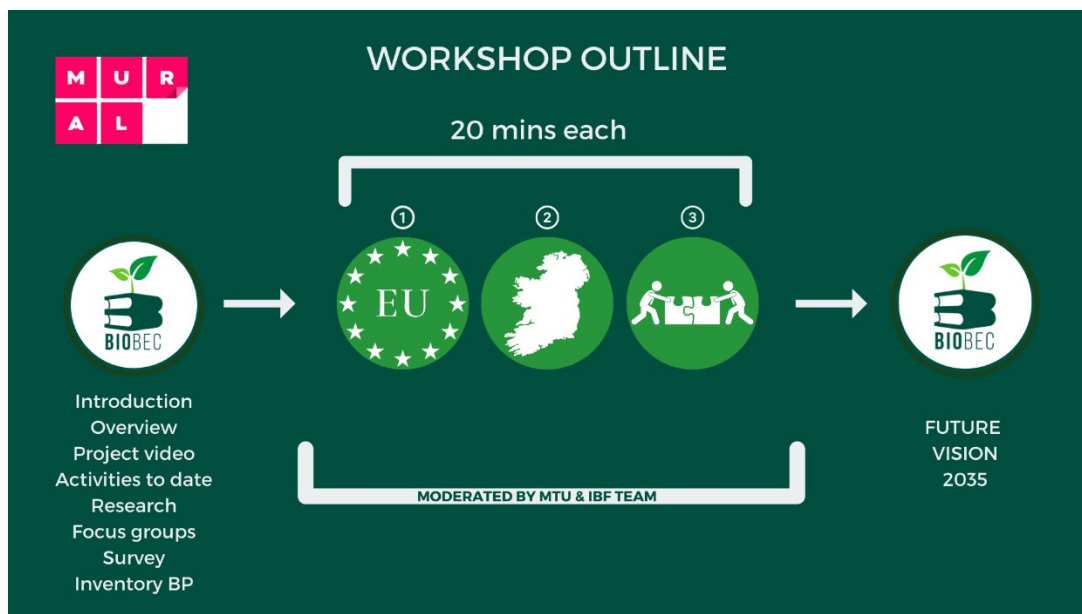
Please quickly describe in your own words how the workshop went, how the atmosphere was and what could have been improved in the design.

MTU & IBF conducted this workshop together to complete the full regional perspective for the future BBEC. There were 12 participants in total – 3x industry, 4x universities, 1x vocational education, 1x cluster org, 1x local government, 2x research centres. The workshop was conducted as follows:

BIObec | Co-creation Workshop | Agenda



- | Welcome
- | Aim of the BIObec.eu Project for the future development of the bioeconomy
- | EU project partner organisations
- | Vision of a Bio-Based Education Centre (BBEC) network
- | Overview of BIObec regional bioeconomy expertise & knowledge capabilities
- | Summary of key project findings and results to date
- | BIObec Co-creation Workshop - 3 X breakout rooms
- | Introduction - MURAL
- | Step 1 - BIObec as a gateway to Europe
- | SHORT BREAK
- | Step 2 - BIObec and strategic benefits for Ireland
- | Step 3 - BIObec an opportunity for strategic and focussed network collaboration
- | Step 4 - BBEC Vision Defined
- | Review summary
- | CLOSE



What can the European BIObec Network do for you?



Step 1

BBEC as a Gateway to Europe

- | Types of services the EU BBECs can provide to you
- | Strengthening & developing your existing networks
- | Overcoming barriers and bridging gaps
- | Funding, finance & referrals targeting EU partners
- | Collaborative projects and programmes of work
- | Additional supports and activities

What can the BIObec Network do for you?



Step 2

BBEC - Strategic Benefits, Ireland

- | Types of services the BBEC can provide to you
- | Strengthening & developing your existing networks
- | Cultivating pace in the bioeconomy sector
- | Funding, finance and referrals, targeting partners
- | Collaborative projects and programmes of work
- | Additional supports and activities?

What can the BIObec Network do for you?



Step 3

BBEC - Business opportunities & Collaboration

- | To support your existing activities & programmes
- | Promote new activities & programmes
- | Designing and developing new initiatives
- | Building, strengthening and consolidating networks
- | Collaborative projects and programmes of work
- | Platform for collective action

Step 4 - BBEC VISION



| Academia | Industry | Government | Society | Environment |

MTU and IBF were pleased with the workshop overall and the data collected will inform the BBEC business model design and governance structures as required in T2.3 and T2.4. The workshop was also the starting point of real and meaningful collaboration with the specific stakeholders that can provide the most appropriate supportive networks for the future BBEC.

Central-East Europe-East

1. Our vision of what our BBEC will have achieved by 2035

- 1. List the most important achievements expected by the workshop participants from your BBEC.**
- 2. Please formulate full sentences, such as „Active professionals in the region have access to formal courses“.**
- 3. Please use present tense.**
- 4. Please separate different goals originally formulated in one sentence/ on one card.**

The most important achievements expected by the stakeholders:

- Bioeconomy is part of curricula at all levels of education in the region.
- Universities and companies have designed and implemented joint training programmes.
- Academia and industry regularly exchange knowledge via established formats and channels.
- Theory-based education is complemented with internships, innovation sprints, deep dive sessions and site visits, activities in pilot plants, and entrepreneurial training.
- There is a clear understanding of bioeconomy and its potential

- The BBEC provides tools, didactical resources, contents, expertise, etc. to educational institutions.
- The BBEC has lists all education providers in the bioeconomy to better orient students, scientists, and qualified workforce.
- The BBEC disposes of empirical analysis of the existing solutions and practices and can demonstrate technological, economic and social contribution.

Additional expected achievements mentioned by the stakeholders:

- The BBEC raises awareness, provides information about international funding opportunities and supports creating of project consortiums.
- The BBEC is a platform for bioeconomy that support finding partners for projects. Especially SME's.
- The BBEC provides consulting in preparing applications for funding in the area of bioeconomy and consults new business models
- It should create a map of valuable and promising companies, especially SME, that operate in the field of bioeconomy.
- The BBEC is a place where public administration establishes connections with science and industry.
- The BBEC is able to give certificates for training institutions and qualified work force.
- The BBEC is support for the universities in the field of cooperation with industry and indicating changes in the curricula or training programmes.
- The BBEC is a place for expertise I the field of economy and law regulations connected the bioeconomy.
- The BBEC supports international mobility of students and science staff in the field of bioeconomy.
- The BBEC provides information about training entities in the field of bioeconomy. It has database with training possibilities and can point valuable training offer.
- The BBEC provides information about innovative approach to bioeconomy.

Achievements that were not important to the stakeholders:

- Professional profiles for a bioeconomy related skills set are defined and available.
- Institutions of bioeconomy education in our region coordinate their programmes and courses.
- The BBEC gives direction to education content, based on constant observation of the dynamics of bioeconomy development.
- The BBEC should not become a training company in the field of formal training, but initiate mutual learning based on the dissemination of good practices resulting from the development of qualifications characteristic of the bioeconomy in professional environments.

2. Additional connections and collaborations established by our BBEC

1. *Please describe the changes on the stakeholder map that have been proposed during the workshop in your own words. Do not forget to send along the ppt with the two versions of the map: 2022 and 2035.*
2. *You may also present possible challenges or concerns that were raised regarding the new connections.*
3. *Please modify your stakeholders map according to the proposed new connections between existing actors and initiatives*

In the stakeholders map 2022 we have diagnosed connections between multiple stakeholders involved in the bioeconomy. The knowledge exchange is mainly focused on the industry. Research and education entities provide knowledge and expertise to the private sectors, mainly large business. That also concerns various types of NGO's that support industry with know-how or consulting.

For example, in CZ the R&D organisations are providing a wide range of educational activities focused on education target both on professionals (adults) and also students, in particular:

- events - such as open science, night of scientists, field days, participation on trade and fairs (Země živitelka, Nabočany)
- webinars that boosted during COVID pandemic
- exploitation of international project results (Enabling H2020 project) to the national level <https://atlasbestpractices.com/>

The public sector is mainly responsible for financing projects for education/science actors and industry (especially EU funding).

There are noticeable student and staff exchange between universities and industry (internships, study visits, etc.). There are cases when industry representatives give occasional lectures to students.

Because of the EU funding requirements (especially Poland, Czech Republic) there is very wide cooperation in R&D projects between industry and science entities.

But it is crucial to establish new connections between the actors and enhance or stimulate those which already exist. In each country some regional barriers were diagnosed and they should be analysed to be an inspiration for future.

CZECH REPUBLIC

Bioeconomy is still a new term, the participants tackled the issue of common understanding "biomass" that is still not properly understood among policy makers and entrepreneurs.

Their focus is agriculture technologies, technical plants, pellets, biogas, digitalization. Participants want to continue in development of Bioeconomy projects as they can see a huge potential given the geo political situation, food, energy and climate challenges.

As concerns their client /partners the proper understanding and political support will enhance stakeholders' involvement.

A few factors were outlined as key barriers:

- a) Complicated legislation that prevent implementation of new perspective technology (sludge, composting, digestate application)
- b) Lack of national support, e.g. there is no support for business support organisations that might enhance implementation of Bioeconomy projects in SMEs
- c) Negative perception of the Green Deal . "It is going to be more complicated and expensive."

BULGARIA

For 2022 the focus is on generating knowledge, competencies, and therefore the prevailing role is given to educational and academic organisations. The generated change in labour market needs as well as consumer/industrial needs will lead to a change in the profile of the sectors by region, new businesses and business models. In this medium-term perspective, business and organisations representing it at regional/national level appear at the forefront.

The most important challenge pointed is that the bioeconomy domain is still emerging and in Bulgaria the ecosystem is weak. Therefore, it is crucial to support cross-proliferation of ideas and crosslinking of resources among partners (see section 3 of the report). It is also the very reason that the national workshop in Bulgaria had an international character, Bulgaria's bioeconomy is still limited and does not have strong roots in education.

POLAND

Science and Universities have many contacts with the industry. But the problem is lack of good communication in the field of industry needs. Especially SME's. Science need to know more about the problems of the industry related to bioeconomy. The real problems and needs will generate new and dedicated knowledge that will be exchanged with the economic environment.

Supporting bioeconomy should be focused on regional specialisations of each country. It should be regional based.

The big problem is legislation and lack of understanding in the local and national decision makers how to support, enhance and stimulate the development in the field of bioeconomy. The law and regulations are often a significant barrier.

In the stakeholders map 2035 very important change is involvement of other actors - the society. The knowledge about the bioeconomy should be disseminated to the societies to build a public awareness. On every stage of the education students should be aware of the

circular economy, the bioeconomy and it's importance for future economy, environment and quality of life.

Science and education entities should enhance cooperation with the industry. The knowledge exchange and student/staff exchange should be working both ways. The industry should provide information about their needs and technological problems to stimulate the science actors to work on innovative solutions. The science should be also more flexible and should be able to adjust the education offer to the actual needs.

The public sector should be more open to knowledge from the industry and adjust the legislation and regulations in order to help or support the cooperation between the main stakeholders.

3. Engagement to and expected support from our BBEC

1. *Please list all participants and their institutions and how they are willing to engage.*
2. *Please separate different contributions originally formulated in one sentence.*
3. *List and describe the ways how your BBEC is expected to support the stakeholders.*
4. *Please separate the requests form the stakeholders originally formulated in one sentence.*

CZECH REPUBLIC (8 stakeholders)

- 2 represented SMEs
- 6 represented private research organisations (that have also a status of SMEs)

BULGARIA (20 stakeholders)

- Trakia University (BG) – training, dissemination, stakeholder groups;
- BAUN (TR) – training, dissemination, stakeholder groups;
- COMU (TR) – training, dissemination, stakeholder groups;
- University of Pannonia (HU) – training, dissemination, stakeholder groups;
- BIA (BG) – training, dissemination, stakeholder groups;
- Fortes (IT) – training, dissemination, stakeholder groups;
- Phasegrowth (EE) – training, dissemination, stakeholder groups.

Requests:

- Training materials and best practices;
- Contacts with industry, especially international or scaling up globally, that would like to cooperate with educators, entrepreneurs and scholars from Bulgaria in the bioeconomy field;
- Collection of opportunities for workshops, events, scholarships to further boost collaboration across regions.

POLAND (14 stakeholders)

Kielce University of Technology – education, joint projects, knowledge exchange, staff/student exchange

Kielce City Hall, Entrepreneurship Office - knowledge exchange, training

Institute of Environmental Protection - joint projects, knowledge exchange

University of Agriculture in Krakow - education, joint projects, knowledge exchange, Staff/student exchange

The Institute of Sustainable Technologies, an expert in the field of industry education - joint projects, knowledge exchange

University of Warsaw - education, joint projects, knowledge exchange, Staff/student exchange

Center for Preclinical Research and Technology - joint projects, knowledge exchange

ERPD – SME, consulting, establish and facilitate contacts between stakeholders important for bioeconomy, provide experts for feasibility studies, various expertise, analysis, evaluation and audits, project management, preparing applications for external funding, enabling technology transfer between science and industry

Inneco – SME, joint projects

Agricultural Institute of Warsaw University of Life Sciences - education, joint projects, knowledge exchange, staff/student exchange

Institute of Experimental Medicine - joint projects, knowledge exchange

The BBEC would support the stakeholders with tools, didactical resources, contents, expertise, etc. to educational institutions and other actors to raise awareness of the bioeconomy. It should also help and support the education providers in the bioeconomy to better orient students, scientists and qualified workforce (internships, site visits, international mobility of students and science staff in the field of bioeconomy).

The BBEC would provide information about international funding opportunities and will match partners for project consortiums. It should also provide consulting in preparing applications for funding in the area of bioeconomy. The BBEC should map the promising companies, especially SME, that operate in the field of bioeconomy in order to match them with science/education entities. The BBEC should also provide expertise to public administration. Thanks to that decision makers will gain knowledge about problem, needs and expectations of science and industry. The BBEC should be able to give certificates for training institutions and qualified work force. The Centre also should support the universities in the field of cooperation with industry and indicating changes in the curricula or training programmes.

4. Summary of the workshop

Please quickly describe in your own words how the workshop went, how the atmosphere was and what could have been improved in the design.

CZECH REPUBLIC

The key findings can be summarized as follows. Both SMEs and also RTD organisations are actively involved in national and also international projects, therefore they have a wider perspective and experience concerning the challenges in the Bioeconomy education (or in this case the lack of it). The most efficient education forms for the SMEs are the practical case studies, workshops organized in a peer review style. There is a need to demonstrate practical examples. Bioeconomy is still a new term, the participants tackled the issue of common understanding "biomass" that is still not properly understood among policy makers and entrepreneurs. The stakeholders are aware that development of Bioeconomy projects as they can see a huge potential given the geo political situation, food, energy and climate challenges.

BULGARIA

The workshop was held in an atmosphere of open dialogue and discussion, a common vision for the role of the participants in the green transition, a desire for joint initiatives and an interest in the progress of the project. The cross-regional aspect of bioeconomy has been emphasized by participants as a key message, adding on the importance to share knowledge within the project and beyond it, with interested stakeholders with global scaling ambition (companies, entrepreneurs) and educational organisations with international profile/network.

POLAND

The workshop went well. The stakeholders were interested in the deliverables from WP1 which was presented. During the talks it was mentioned and well received. It was noticeable that the BBEC should be implemented in stages and not be very formal in the beginning. Perhaps it's a good idea to establish cooperation with stakeholders within various projects, get financing and then be more solid structure. It is certain that it should be a process based on already functioning entities. It should build its capacity, networks and knowledge base. It should focus in some regional bioeconomy specializations, which are connected to the region. Not every aspect of bioeconomy.

BIObec Central-East Europe-Germany

1. Our vision of what our BBEC will have achieved by 2035

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3. *Please use present tense.*
4. *Please separate different goals originally formulated in one sentence/ on one card.*

Topic 1: BBEC with its own educational mission:

- Updated educational offers for people working on bioeconomy fields
- It is important to foster the exchange between demand and offer
- BBEC as a contact point (hub)
- There is the need to recognize degrees
- Include interdisciplinarity in the educational offers
- Assure that the bioeconomy education is linked to practice

Topic 2: Interlocking of different bioeconomy stakeholders

- Achieve cooperation between universities and companies
- Jointly develop training formats and close exchange between stakeholder groups, e.g. by trainers/trainees themselves learning in industry.

Topic 3: Clusters: Supra-regional exchange and coordination to strengthen and complement regional focal points

- Develop jointly training profiles (also for professionals)
- Exchange of actors to identify and address needs (especially from practice)
- Formal recognition? Fit for the future labor market, overarching: socially relevant

Topic 4: Develop and adapt common teaching formats and professional profiles

- Integration of practice in bioeconomy training
- Joint training formats of universities and companies (with exchange of personnel: trainees in industry / professionals as trainers)
- Constantly updated overview of educational programmes and events
- All levels of education, students should grow up with the topic, define professional profiles, what is possible in the bioeconomy (professionally), Train the Trainer

Topic 5: Common understanding of 'what is bioeconomy' in society, industry and politics.

- Clear understanding of bioeconomy important (what counts and how)
- Bioeconomy is part of all educational formats
- Present diversity of the bioeconomy or clearly defined focus

Topic 6: Strategic positioning

- Look into the future to pick up directional trends, developments and challenges and communicate them to stakeholders at an early stage

Cross-cutting issues:

- Offer expertise and supervision
- Didactic support and quality assurance of teaching by BIObec
- Regular exchange of stakeholders in appropriate formats important
- Networking of regional focal points (educational focal points as well as regional clusters of industrial sectors) and supraregional coordination of teaching focal points
- Ensure long-term funding

2. Additional connections and collaborations established by our BBEC

1. *Please describe the changes on the stakeholder map that have been proposed during the workshop in your own words. Do not forget to send along the ppt with the two versions of the map: 2022 and 2035.*
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3. *Please modify your stakeholders map according to the proposed new connections between existing actors and initiatives*

Integration of other actors such as :

- Startup accelerators & co-working spaces & regional startup networks.
- Local institutions / associations with thematic focus to break out of the academic / industrial bubble: e.g. Solarverein Stuttgart, Kulturinsel Stuttgart (art & culture, StartUp promotion, training centre
- Teacher training centres & conferences
- Bioeconomy-relevant stakeholders at regional level such as German Institute for Textile and Fiber Research (DITF)
- Financing: Co-funding by sponsored employees
- Research institution at interface between knowledge transfer and consulting -> Bringing new knowledge into application
- Involve consulting organisations & professional advice and exchange knowledge
- Involve associations & NGOs as multipliers in society

3. Engagement to and expected support from our BBEC

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3. *List and describe the ways how your BBEC is expected to support the stakeholders.*

4. Please separate the requests from the stakeholders originally formulated in one sentence.

Petra Arteman (experimenta), Gabriel Baum (LEL), Folkert Degenring (UHOH Weiterentwicklung Lehre), Sandra Domenek (AgroParisTech), Daniel Fenrich (FZB), Robin Ganser (EBU Sekretariat, M.Sc. Student Bioeconomy, UHOH), Elisabeth Gerhardt (BOKU), Viola Hoffmann (experimenta), Philipp Kühner (Landw. Bildungszentrum Hochburg), Volker Horsthemke (Taifun-Tofu), Kea Purwing (M.Sc. Studentin Bioeconomy, UHOH), Elisabeth Saken-Braunstein (UM), Alejandra Salem (M.Sc. Studentin Bioeconomy, UHOH), Petra Stiewe (UHOH, Weiterentwicklung Lehre), Juliane Stoye (Geschäftsstelle Bioökonomie, UHOH), Annette Weidtmann (MLR), Anna Walch (BOKU), Philip Zeitner (M.Sc. Student Bioeconomy, UHOH)

- **Petra Stiewe: Develop "small" formats to involve companies.**
- **Folkert Degenring: Co-thinking and further developing the BBEC concept / expertise in continuing education, networking with other universities.**
- **Gabriel Baum: Further education of teachers in close contact with the BÖ-Bildungszentrum (also on site in the education centre)/ exchange of competences / database / documentation of cooperations and participants**
- **Sandra Domenek: Integration of existing infra-structures (students, StarUp platforms) starting at the master level**
- **Volker Horsthemke: Need for suitable persons with organic background (employee search)/ persons working as IT's in the organic sector; cultivation & production of soy or soy products.**

4. Summary of the workshop

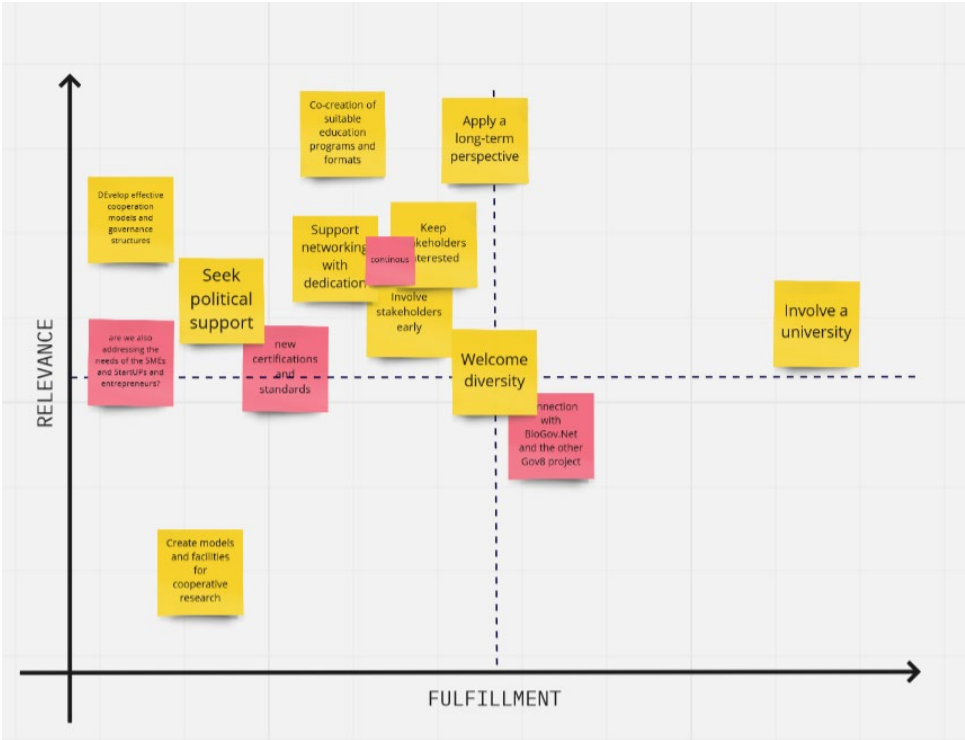
Please quickly describe in your own words how the workshop went, how the atmosphere was and what could have been improved in the design.

In general, the workshop went well. The participants show interest in the project. Some participants are willing to participate in the BBEC as soon as the educational offers and design is defined. It would have been even better if we had a more diverse group of participants

Annex 5. Relevance vs. Fulfilment Guidelines

These matrixes were the result of the pan-European workshop with the BIObec partners

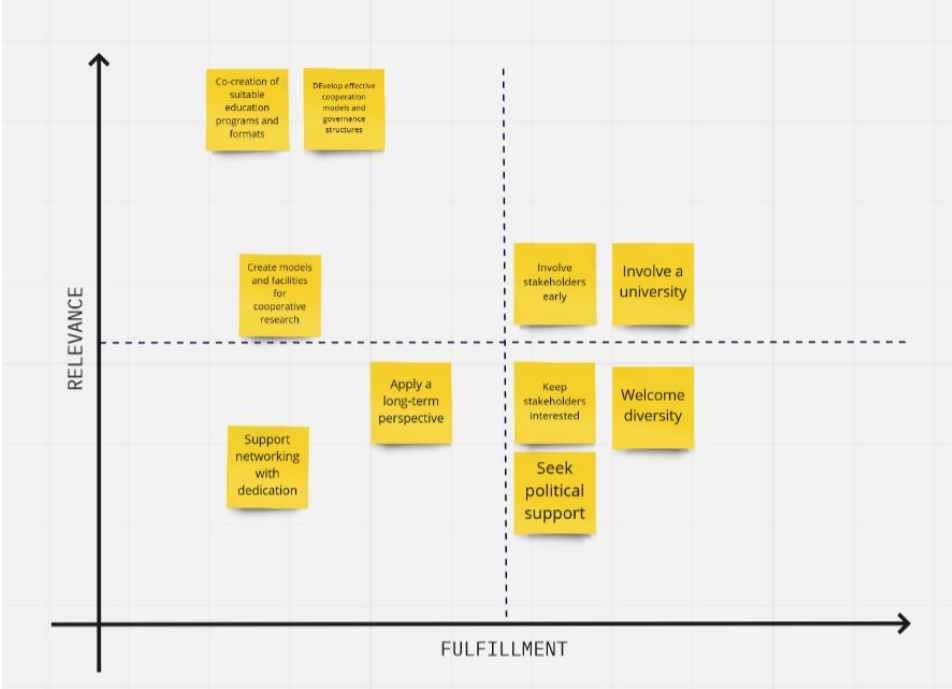
Mediterranean Europe Hub



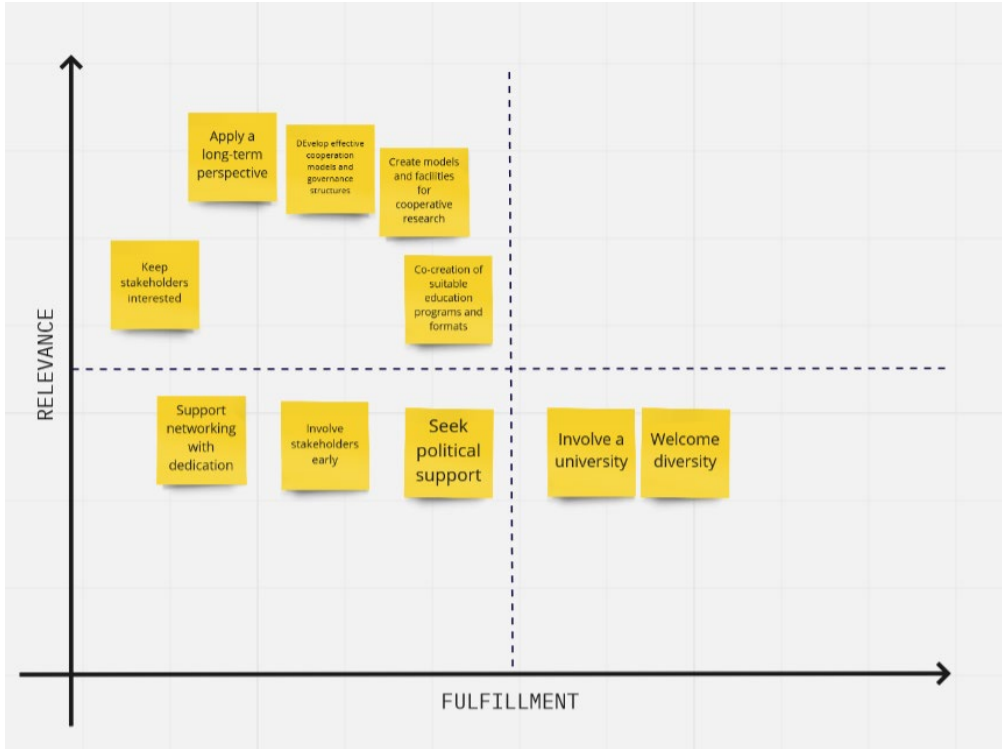
North-West Europe – Finland



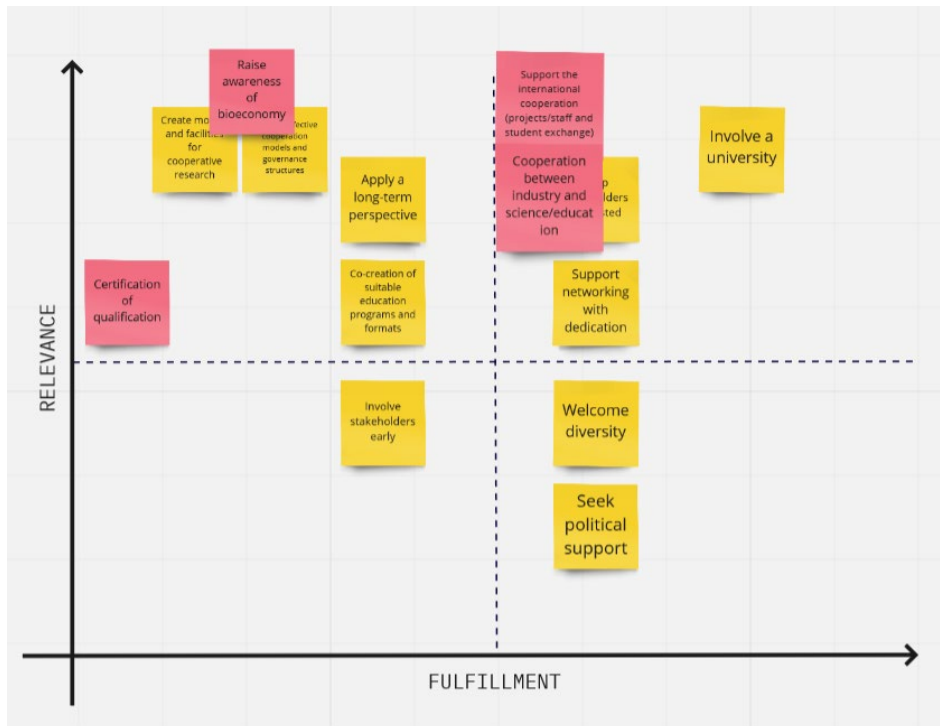
North-West Europe - Denmark



North-West Europe - Ireland



Central-East Europe - East



Central-East Europe - Germany

