



Bio-based Industries
Joint Undertaking

THE BBI JU SME LANDSCAPE: DRIVING IMPACT AND INNOVATION



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Bio-based Industries
Consortium

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FOREWORD

Last July, the new President-elect presented the political guidelines for the next Commission mandate. The European Green Deal, aiming to make Europe the first climate-neutral continent by 2050, is probably the topic that caught more attention because it gives an ambitious response to an urgent issue for our planet and for future generations. Delivering this target is a huge challenge that will mobilise every citizen and every economic operator in every sector.

A sustainable European bioeconomy can give a major contribution for achieving the climate-neutrality target.

One of the main enablers for achieving this transition are SMEs, first because SMEs are innovation hubs. They are the “laboratories” already delivering disruptive ideas that have allowed a number of sectors into their 2.0 era. I have no doubt that once more it will be up to the SMEs to pave the way for the transition of our societies and economies towards climate neutrality.

When talking about SMEs and their fundamental role in Europe’s Research and Innovation agenda, it is almost unavoidable not to mention the Bio-Based Industries Joint Undertaking (BBI JU), a stellar example of SME participation as illustrated in this report. The numbers truly speak for themselves: 41% SME participation in the BBI JU projects, outperforming H2020 programmes. SMEs received 35% of funding, against a target of 20%. Overall, 98% of BBI JU projects involved at least one SME.

These numbers are not a coincidence. They are the result of the programing process of this institutional PPP and the consequence of the SME strategy established up-front by the BBI JU programme office.

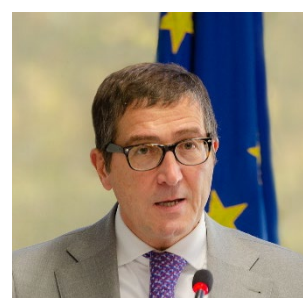
This is strong evidence of how BBI JU creates opportunities for SMEs to scale-up their technologies, get access to the market and find new business opportunities in the bio-based economy. It is also strong evidence of why SMEs are in fact “unavoidable” enablers for the development of the bio-based sector. SMEs are often the technology provider and the “out of the box” thinker. They bring along new products and processes by generating new knowledge and supplying customized technologies and services for testing, data analysis and validation.

SMEs are the backbone of European economy. They significantly contribute to employment and economic growth. The SMEs of today are the big companies of tomorrow. In the case of BBI JU, SMEs have been elevated to key players of the bio-value chain. In this report, we can certainly find inspiration to recommend good practices for boosting SME participation in R&I programmes. The pages that follow provide a wealth of information on how SMEs are helping with the development of a sustainable and competitive bio-based sector in Europe, paving Europe’s way to a greener future.

Enjoy the reading,

Carlo Pettinelli

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EXECUTIVE SUMMARY

Small and Medium-sized Enterprises¹ (SMEs) are the backbone of the European economy. SMEs employ almost 94.7 million people accounting for 67% of total employment in the EU-28 non-financial business sector, and for almost three-fifths (56.8%) of the value added generated by the non-financial business sector. SMEs significantly contribute to employment and economic growth in Europe. Moreover, they have a crucial role in bringing innovation to market and making the European economy more competitive. SMEs are also recognized as key players in the consolidation and further expansion of the emerging and still fragmented bio-based industrial sector² in Europe, acting as important drivers for innovation and technology development.

Excellent SMEs participation and broad geographical distribution

After five Calls, the BBI JU programme shows an excellent participation of SMEs (41%)³ compared to the whole Horizon 2020 programme, demonstrating the vital role that BBI JU plays for the development of SMEs and the key contribution of SMEs in the value chains of the bio-based economy at all levels. In terms of funding, 35%⁴ of funding from BBI JU for Calls 2014-2018 went to SMEs, which is well above the target of 20% established in H2020 for LEIT⁵.

BBI JU projects owe much of their success to the active engagement of innovative SMEs⁶. 471 SMEs were beneficiaries in 101 BBI JU projects between 2014 and 2018. SMEs in BBI JU projects have a broad geographical distribution across Europe, representing 25 EU Member states and 7 Associated Countries.

SMEs are engaged in numerous value chains within BBI JU projects, and they play a key role in different segments of the value chains. SMEs participating in BBI JU projects are particularly active in industrial sectors such as industrial biotech, chemistry, engineering food and feed, materials and plastics, while sectors such as agriculture, aquaculture, waste processing and recycling are gaining increasing relevance. 17% of SMEs are consulting firms, most of them acting as provider in communication, Life Cycle Assessment (LCA), ICT and process engineering, and some acting as project management leader. The distribution of SMEs is equally balanced between generation of new

¹ According to the current official EU definition, SMEs are companies with fewer than 250 employees. They have an annual turnover of no more than € 50 million, or a balance sheet total of no more than € 43 million. Source: EU Recommendation 2003/361/EC (http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/sme-definition/index_en.htm).

² The bioeconomy encompasses the production of renewable biological resources and the conversion of these resources, residues, by-products and side streams into value added products, e.g. food, feed, bio-based products, services, bioenergy.

³ The data refers to non-unique beneficiaries of projects funded (Calls 2014-2017) and retained for funding (Call 2018) by the end of activity year 2018.

⁴ The data refers to beneficiaries of projects funded (Calls 2014-2017) and retained for funding (Call 2018) by the end of activity year 2018.

⁵ The goal of Leadership in Enabling and Industrial Technologies (LEIT) is to reinforce Europe's industrial leadership and strengthen our industry's ability to continuously adapt and innovate by embracing new technologies, digitisation and the transition to a low-carbon and more circular economy.

⁶ In the context of this report, taking into account the lack of an official definition, we have considered as 'innovative SMEs' the SMEs that are contributing to the generation of new products, process or services.

knowledge and product/process optimisation⁷. A significant amount of SMEs also performs upscaling activities. In the chemical, industrial biotechnology and plastics sectors SMEs participate in research and development, testing, data analysis, validation and upscaling activities. In the industrial biotechnology sector, SMEs play a relevant role as technology suppliers. In summary, SMEs contribute to building an effective and well-balanced project portfolio and their participation is instrumental for structuring the sector.

SMEs are key enablers for the bio-based industries

SMEs have a prominent and varied role in the bio-based industries, providing specific expertise, innovation and technology development, which makes them essential for the projects and for the sector. SMEs are in fact enablers for the generation of new products and processes by generating new knowledge, supplying customized technologies and services for testing, data analysis and validation.

The SMEs added value for the projects

The BBI JU programme **holds significant opportunities for innovative SMEs** and their contribution to projects generates competitive advantages in terms of activities diversification, finding new business opportunities in the bio-based economy and accelerating access to markets thus increasing their profitability and productivity, while contributing to deliver real socio-economic and environmental impact.

The SMEs involved in BBI JU-funded projects make important contributions to the projects at different stages. SMEs are essential in providing valuable support to large industrial players, often in close cooperation with Research and Technology Organizations (RTOs), through the development of specific services, technologies or products.

- More than two thirds (69%) of the SME participants perform crucial research and technological development tasks for the generation and optimisation of new knowledge to be incorporated in products, processes and services. These include SMEs focused on testing/data analysis (22% of total SME beneficiaries), research and development (18%), technology supply (14%) and upscaling (9%) (see fig. 14). These tasks relied on SMEs' expertise and their specialized profiles, technology and expertise, which were key to fulfilling project requirements and resulted in added project value.
- Almost 20% of the SMEs carry out activities linked to the production of new bio based building blocks, new bio based materials and/or consumer products, making a remarkable contribution to the market uptake of bio based products and applications.
- SMEs also play a role at the starting point of the bio based value chain: 9% of SMEs contributed to fostering the supply of sustainable biomass feedstock.

⁷ SMEs were categorised as generating new knowledge or as involved in product/process optimisation based on the specific task they perform in the projects. Generally, R&D activities in new technologies or products fall under the generation of new knowledge.

SMEs provide effective project coordination and leadership, helping to lead the projects smoothly. Almost one third (29%) of BBI JU projects have SME as project coordinator.

SMEs perform core research and technological tasks but also fundamental services including project management, communication of project results and commercial exploitation, preparation of reports, and life cycle assessments.

BBI JU empowers SMEs to innovate and grow

The participation in the BBI JU programme enables securing funds and this is a key element to boost success among bio-based SMEs. What sets BBI JU apart is the creation of unique opportunities for SMEs to participate, cooperate, develop their knowledge and establish cross-sector connections to find new business opportunities in the bio-based economy.

The participation in BBI JU projects (particularly Innovation Actions) enables SMEs to develop novel technologies from lower TRL to commercial products and industrially integrated technologies, through collaborative projects. Their innovative approach helps SMEs not only to expand their network and achieve greater recognition in their respective sectors but also to move their technologies or products to a commercial scale more quickly and efficiently.

The involvement of SMEs in BBI JU projects had a beneficial impact on many facets of their business, including:

- developing applications and obtaining cutting edge methods, tools, processes and products developed as part of the projects;
- scaling-up technologies and accessing markets;
- increasing expertise in areas covered by the projects;
- expanding their network and finding cooperation possibilities in multiple industry segments;
- boosting the company's reputation.

STRUCTURE OF THE REPORT

This report is composed of two parts:

Part I presents the statistical analysis of SMEs participating in BBI JU projects. It provides a summary of the SME landscape in the BBI JU project portfolio that will help BBI JU in shaping the strategy and action plan necessary to further deploy the potential of SMEs in the bio-based industry in Europe.

Part II presents a number of SMEs cases studies to highlight individual stories and relevant results.

Two annexes accompany this report: Annex I includes the questionnaire used for the SME case studies, and Annex II includes additional graphs considered for the analysis.

INTRODUCTION

SMEs⁸ are the backbone of the European economy. According to the Annual Report on European SMEs⁹, 2017/2018, SMEs accounted for 99.8 % of all enterprises in the non-financial business sector in the EU-28. SMEs employ almost 94.7 million people accounting for 67% of total employment in the EU-28 non-financial business sector, and they contribute to almost three-fifths (56.8%) of the value added generated by the non-financial business sector. Almost all (93.1%) of the SMEs were micro SMEs employing less than 10 persons.

SMEs are a highly diverse population of enterprises, with activities ranging from the production of artisan food to the production of high tech solutions, from retail services to the provision of highly specialised professional services, from focusing primarily on serving domestic customers to focusing mainly on the export markets.

SMEs significantly contribute to employment and economic growth in Europe. Moreover, they have a crucial role in providing innovation to market and making the European economy more competitive. SMEs are also recognized as key players in the consolidation and further expansion of the emerging and still fragmented bio-based industrial sector¹⁰ in Europe, acting as important drivers for innovation and technology development. The bioeconomy is central to the functioning and success of the EU economy, as it accounts for a turnover value of €2.3 trillion and 8.2% of the EU's workforce¹¹. It has been acclaimed as a win-win for economy and environment, increasing jobs and competitiveness in both rural and urban areas while shifting society away from a reliance on fossil fuels towards renewable, bio-based resources.

In the bio-based sector, SMEs promote innovation and facilitate the transition of applications from the research lab to market. They are also essential in providing valuable support to large industrial players, often in close cooperation with Research and Technology Organisations (RTOs), through the development of specific services, technologies or products. Bioreactor design, process optimisation, new biocatalysts for biomass processing are some examples of areas where SMEs are deeply involved and of great relevance for the bio-based industry. SMEs often lack capital, but lead in innovation. They enjoy strong research collaboration relationships with academia and research organisations and have direct contact with the market. As such, they are ideally positioned to help connect academia and industry. Promoting their participation in BBI JU's research projects is essential.

The BBI JU aims to have a clear direct impact on SMEs' competitiveness, ensuring that innovative SMEs are an integral part of the BBI JU programme execution. Since the first Call the programme office and BIC undertook specific strategies towards SMEs participation with the proper monitoring

⁸ According to the current official EU definition, SMEs are companies with fewer than 250 employees. They have an annual turnover of no more than € 50 million, or a balance sheet total of no more than € 43 million (EU Recommendation 2003/361/EC, http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/sme-definition/index_en.htm).

⁹ Annual Report on European SMEs 2017/2018 (<https://publications.europa.eu/en/publication-detail/-/publication/a435b6ed-e888-11e8-b690-01aa75ed71a1>).

¹⁰ The bio-based economy comprises those sectors of the economy that use renewable biological resources from land and sea – such as crops, forests, fish, animals and micro-organisms – to produce food, materials and energy.

¹¹ European Commission, *A sustainable Bioeconomy for Europe: strengthening the connection between economy, society and the environment. Updated Bioeconomy Strategy*, October 2018, p. 5.

and reporting process. Based on the outcome of the first calls it appeared that statistically the participation of SMES was much higher than expected.

SMEs are recognised in the strategic objectives in the revised SIRA: “The BBI Initiative seeks to actively involve academia, research and technology organisations (RTOs) and SMEs in its work, applying the openness and excellence principles, so that the latter (i.e. SMEs) receive at least 20% of Horizon 2020 funds allocated through the Bio-based joint undertaking”¹². The private partner of BBI JU, BIC (Bio-based Industries Consortium), has facilitated and stimulated the involvement of SMEs in all its activities since its foundation. At the level of the BBI JU programme office the programme was shaped with the aim to be very attractive for SMEs, including topics and funding rates¹³ that offer pertinent opportunities for SMEs.

Being an institutional public private partnership, BBI JU is uniquely placed to address the specific needs of SMEs by providing an environment conducive to the uptake of innovations and the incorporation of innovative actors into future value chains and by offering the opportunity to work within a strong, international context.

On top of other key accomplishments, the high participation rate of SMEs was also recognized by the 2017 Interim Evaluation performed the EC14 as one of the main achievements of BBI JU since its launch. Since this was based on raw figures, the BBI JU’s Governing Board and advisory bodies asked the BBI JU programme office to undertake a more in-depth analysis of the SME participation.

The programme office undertook a thorough study to map the SMEs landscape in the BBI JU project portfolio, in order to have a deeper understanding of the SMEs’ role and impact on innovation in the BBI JU programme and of their contribution to the structuring effect on the bio-based industrial sector. The analysis provided in the present report is based on the results of this study.

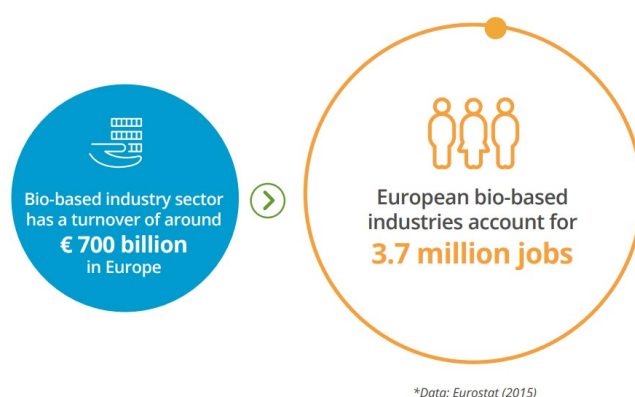
¹² Strategic Innovation and Research Agenda 2017.

¹³ 100% funding rate for SMEs in Research and Innovation Actions (RIAs) and Coordination and Support Actions (CSAs); 70% funding rate for SMEs in Demonstration and Flagship Actions

¹⁴ European Commission, *Interim Evaluation of the Biobased Industries Joint Undertaking (2014-2016) operating under Horizon 2020*, June 2017 (<https://ec.europa.eu/research/evaluations/pdf/bbi.pdf>).

About the bio-based industry sector in the EU

The bio-based industry is an emerging sector organised between inter-connected value chains, which aims at transforming renewable biological feedstocks such as dedicated crops, agricultural and forest residues, bio-waste and aquatic biomass, into bio-based products, materials and energy, replacing their fossil-based versions. According to Eurostat figures, in 2015 the bio-based industry sector accounted for 3.6 million jobs in EU28 and achieved a total turnover of around EUR 700 billion.



The bio-based industry is considered an emerging sector due to the fact that it is extremely fragmented in both the geographical and business organisation contexts. Industry therefore perceives risks in investing in it. It is also facing certain specific challenges and risks in terms of feedstock supply, notably the lack of an efficient logistical infrastructure to transport the feedstock from its place of generation to the biorefinery location. The biorefineries require a substantial level of investment, which is not without risk. In addition, the sector is faced with various regulatory hurdles impacting several levels of the value chains.

In 2012, as part of the impact assessment of the initiative, the European Commission (EC) conducted a public consultation. From the 638 responses received, 94.3% of them recommended an EU initiative and a large majority viewed a public-private partnership (PPP) as the most appropriate mechanism. The impact assessment concluded that a Joint Undertaking between public and private sectors was necessary to:

- de-risk investment at all levels, from research to full-scale deployment;
- organise the sectors by building bridges and collaboration between actors that had never collaborated in the past;
- reach a critical mass at European level, where a single country or small group of organisations is not sufficiently large to address such a strategic challenge.

The main expected impacts of BBI JU are thus to contribute to the structuring and mobilising effect of the bio-based industry sector and to trigger, keep and attract investment in Europe to create competitiveness and jobs, in particular in coastal and rural areas.

The interim evaluation report of BBI JU, carried out by the EC with the assistance of independent experts and published in October 2017, states that the specific tasks given to BBI JU in the Council Regulation are well aligned with the initial long-term objectives of the BBI JU, which are still highly relevant in order to keep the EU competitive and at the forefront of the global bioeconomy development.

In addition to these key aspects, other important achievements are highlighted in the report¹⁵:

- the effectiveness of implementation;
- the significant private sector participation with an important mobilisation of private investment enabling to show a high leverage effect;
- the KPIs specific to BBI JU which are all well on track (based on agreed monitoring process);
- the high SME participation level.

The **Bio-Based Industries Joint Undertaking (BBI JU)** is a public-private partnership (PPP) between the EC and the Bio-based Industries Consortium (BIC). The Council Regulation (EU) No 560/2014 sets the basis for the establishment of the BBI JU.

The **mission** of BBI JU is to implement the Strategic Innovation and Research Agenda (SIRA) developed by the Bio-based Industry Consortium and endorsed by the EC. BBI JU operates its programme as the catalyst to enable the EU and Industry to align their strategy and vision while respecting H2020 principles of openness, transparency and excellence for the call for proposals organised each year.

The **objective** of BBI JU and of its founding partners is to contribute to the development of a sustainable and competitive bio-based industries in Europe based on advanced biorefineries that source their biomass sustainably and in particular to:

- demonstrate technologies that enable new chemical building blocks, new materials, and new consumer products from European biomass and which replace the need for fossil-based inputs;
- develop business models that integrate economic actors along the whole value chain from supply of biomass to biorefinery plants to consumers of bio-based materials, chemicals and fuels, including through creating new cross-sector interconnections and supporting cross industry clusters; and
- set up flagship biorefinery plants that deploy the technologies and business models for biobased materials, chemicals and fuels and demonstrate cost and performance improvements to levels that are competitive with fossil-based alternatives.

¹⁵ European Commission, *Interim Evaluation of the Biobased Industries Joint Undertaking (2014-2016) operating under Horizon 2020*, June 2017.

These activities are carried out through collaboration between stakeholders along the entire bio-based value chains, including primary production and processing industries, consumer brands, SMEs, research and technology centres and universities.

BBI JU implements open Calls for proposals supporting research and innovation actions that operate under Horizon 2020 rules and procedures. BBI JU Calls are open to private & public ‘for-profit’ and ‘not-for-profit’ organisations, including large enterprises and SMEs, research and technology organisations (RTOs), universities, associations, and any other type of legal entity interested in BBI JU activities.

Types of Action



Research & Innovation Actions (RIA)

Research & Innovation Actions aim to fill the technological gaps within specific value chains, leading to the development of new knowledge or a new technology. RIAs cover actions with a Technology Readiness Level* (TRL) 3 – 5 by the end of the project.



Innovation Actions - Demonstration Actions (IA-DEMO)

Demonstration Actions include the establishment of a demo-scale production facility in Europe, being a new installation, a substantial modification of an existing facility, or the use of existing demo facilities. Demonstration projects aim at reaching TRL 6-7 by the end of the project, so that the scale-up of the technology and the business case are demonstrated.



Innovation Actions - Flagship Actions (IA-Flagship)

Flagship Actions aim to support the application / market introduction of an innovation that has already been demonstrated but not at a size enabling commercial deployment. A flagship project must be the first of its kind in Europe and address a complete value chain from procurement, growth, feedstock supply via biorefineries to the final product or products. Flagship projects should aim to reach a TRL 8 by the end of the project.



Coordination and Support Actions (CSA)

Coordination & Support Actions typically address cross-sectorial challenges, and support value chains through knowledge development, studies and networking. Funding covers the coordination and networking of research and innovation projects, programmes and policies.

PART I

1. METHODOLOGY

Participation of SMEs in BBI JU projects

This report presents the results of the analysis of SMEs' participation in the Bio-based Industries Joint Undertaking programme (Calls 2014-2018) including:

- statistical analysis of **471** SMEs that were beneficiaries in 101 BBI JU projects between 2014 and 2018.
- in depth analysis of each individual SME participating in BBI JU for calls 2014-2017: this analysis concerns **359** SMEs participating in 82 projects. This analysis is representative of the BBI JU project portfolio. The analysis covers only the successful SMEs in retained proposals for funding; it does not cover the SMEs that were part of unsuccessful proposals.
- **13** SME case studies selected from the project portfolio (Call 2014-2017).

The study applied the definition of SME provided by the *European Commission Recommendation*¹⁶ about Micro, Small and Medium-sized Enterprises. The data presented in this report is based on the self-assessment questionnaire¹⁷ performed by the SME beneficiaries allowing each organisation to determine whether it qualifies as SME according to the parameters of the European Commission.

Individual analysis of SMEs participation in BBI JU projects

The data used to analyse the participation of SMEs in BBI JU projects have been extracted from CORDA¹⁸ and PDM¹⁹ in August 2018, and further elaborated. It comprises information on **359 SME project beneficiaries** from 25 Member States and 7 Associated Countries.

The role of SMEs in Research and Innovation Actions (RIAs) and Innovation Actions (DEMOs and FLAGSHIPS) has been scrutinized in this analysis. The role of SMEs participating in Coordination and Support Actions has not been analysed in depth in this first analysis of the BBI JU portfolio since CSAs do not address technological issues.

Based on the statistics extracted from CORDA and PDM, the Grant Agreements of BBI JU projects were analysed in order to examine the specific role and contribution of the 359 SME beneficiaries.

¹⁶ EU Recommendation 2003/361/EC.

¹⁷ The self-assessment exercise is based on a questionnaire that allows to determine whether an organisation qualifies as a Micro, Small or Medium-sized Enterprise (SME) according to the relevant criteria of the European Commission. This questionnaire collects financial data from the latest closed accounting period (balance sheet, profit and loss accounts, staff headcount).

¹⁸ The E-CORDA (External Common Research Data Warehouse) database contains data on applicants/proposals and signed grants/beneficiaries concerning the European Framework Programme for Research. For this study, an extract from the E-CORDA database has been used (status August 2018).

¹⁹ Participants Data Management.

This allowed to extract the relevant information on the location, sector of activity, specific position in the value chain, type and number of actions in which companies participates and type of activity performed in the projects.

SME case studies

A set of questionnaire-based interviews were conducted with a selected number (13) of SMEs participating in BBI JU projects (Calls 2014-2017). In order to have a balanced representation of SMEs within the BBI JU project portfolio, the selection took into consideration different characteristics such as location, type of action, size of the company, origin of feedstock, industrial sector, roles and activities performed in the project. This is representative of the BBI JU project portfolio, but it covers only the successful SMEs in retained proposals for funding. Although this limited selection cannot be entirely representative of the full spectrum of SMEs participating in BBI JU, it helps to illustrate some of the findings of this analysis and highlight success stories of the BBI JU project portfolio.

The questionnaire that the SMEs filled in included relevant information such as basic facts about the company, motivations and drivers to participate in BBI JU projects, opportunities and benefits derived from their participation in BBI JU projects, and contribution to BBI JU initiative.

The information gathered has provided insights to identify not only opportunities that BBI JU holds for innovative SMEs in the bio-based sector, but challenges and gaps in the participation of SMEs in specific regions and sectors that need to be addressed.

2. THE SME LANDSCAPE OF BBI JU

2.1. Overall SMEs participation in BBI JU projects

BBI JU has attracted a significantly higher number of SMEs compared to the whole Horizon 2020 programme. Overall, 98% of BBI JU projects²⁰ from Calls 2014-2018 involved at least one SME. The high share of SME applicants (33%)²¹ and of SME beneficiaries in retained proposals (41%)²² shows that SMEs are the backbone of BBI JU projects (fig. 1).

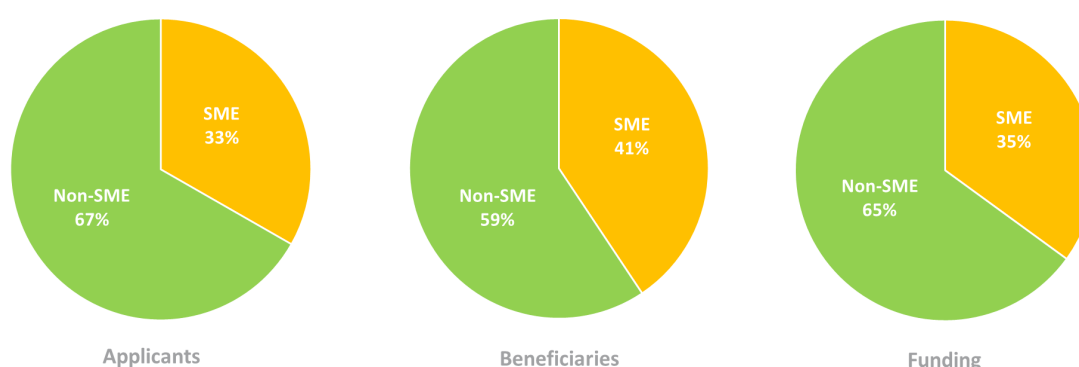


Figure 1. Calls 2014-2018. Share of SME applicants, participants in projects and share of funding (data for Call 2018 refers to retained proposals)

This level of participation corresponds to an overall level of **allocated funding of 35% to SMEs**²³ as well as an overall success rate for SMEs of 24% higher than the average success rates in BBI JU calls (22.3%).

According to the Interim Evaluation of the Joint Undertakings operating under H2020²⁴ performed by EC in 2017, and to the most recent figures from the Annual Activity Reports 2018, BBI JU represents an outstanding case among all JUs in terms of SME participation and funding rates. Based

²⁰ 98 of the 101 projects from BBI JU Calls 2014-2018. Call 2018 was only considered for data on share of SME applicants, participants in projects, and share of funding. For all other analyses data from Calls 2014-2017 was used.

²¹ 1,938 SMEs have applied overall in 2014-2018 BBI JU Calls (33% of total).

²² 471 SMEs (non-unique beneficiaries) are participating in 101 projects selected for funding from BBI JU Calls 2014-2018 - last updated on 06.06.2019. The total number of SMEs that are unique beneficiaries (Calls 2014-2017) is 249. The participation rate of SME beneficiaries in every BBI JU Call between 2014 and 2018, as well as the total participation rate of SMEs, has been always considerably higher than the Horizon 2020 participation rate average for SMEs (20%). Moreover, it has been constantly higher than the SMEs participation rate in SC2 (27%) and LEIT (32%).

²³ 35% of funding from BBI JU for Calls 2014-2018 went to SMEs, totalling 192.5 MEUR (on average 0.4 MEUR per SME). Calls 2015 to 2018 have also seen a constant, significant increase in the amount of funding assigned to SMEs. Annually and as a total, the funding rate for SMEs from BBI JU has always been higher than the 20% funding rate target of Horizon 2020. For each individual Call 2014-2018, the percentage of funding for SME beneficiaries has also been always higher than for SC2 (25%) and LEIT (27%).

²⁴ [Interim Evaluation of the Joint Undertakings operating under Horizon2020.](#)

on available data from 2018, BBI JU has higher SME participation and funding rates than all JUs. Similarly, SME participation and funding rates of BBI JU have been also higher than SPIRE²⁵, a contractual public private partnership in a comparable area of activity²⁶.

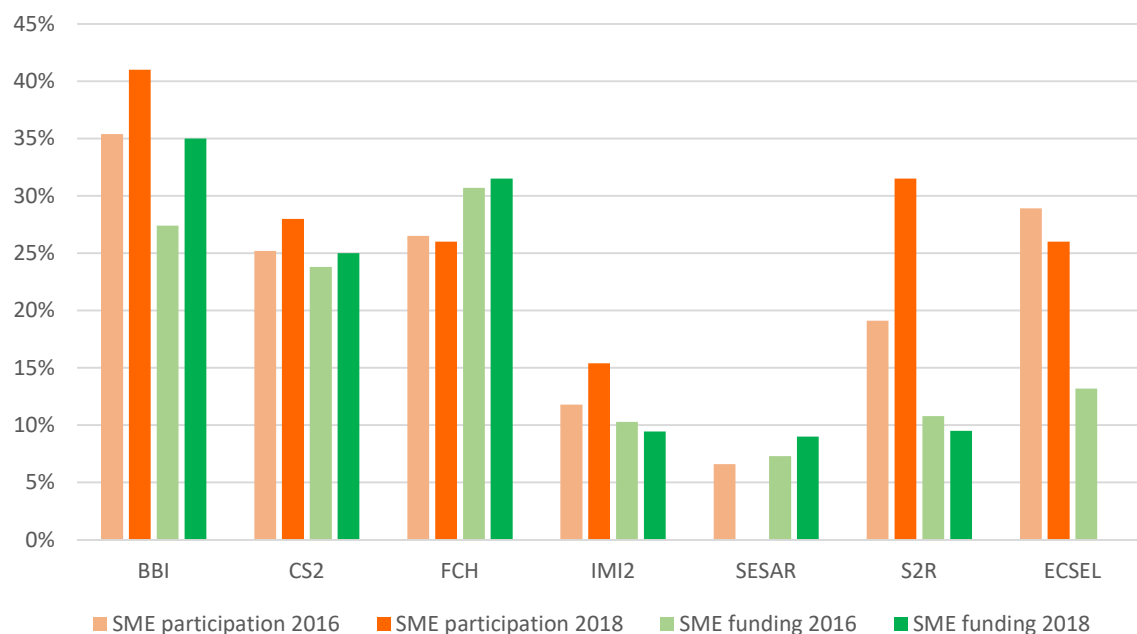


Figure 2. SME participation rates (non-unique beneficiaries) and share of EU funding in funded projects for JUs under Horizon 2020 (2016 and 2018 data)²⁷

Based on the analysed data, SMEs allocated funding exceeds the objective stated in the updated SIRA 2017: “at least 20% of Horizon 2020 funds”. In addition, as shown in figure 3, the SMEs participation in BBI JU Calls 2017-2018 is considerably higher than SC2 and LEIT.²⁸

²⁵ Sustainable Process Industry through Resource and Energy Efficiency.

²⁶ In SPIRE, SMEs accounted for 27.3% of project participations, and 26.6% of EU project funding went to SMEs in 2018 (SPIRE 2019 Progress Monitoring Report).

²⁷ 2016 data from EC calculations based on CORDA, data extraction on 17 January 2017; 2018 data based on 2018 Annual Activity Reports of the JUs.

²⁸ Even in comparison to areas that were performing well under FP7, such as Biotechnology, in terms of SMEs’ participation and share of funding, BBI JU has been performing even better. Under the FP7 Activity ‘Biotechnology’, SMEs received 25% of the EU contribution, while in BBI JU this figure is at 35%. In terms of participants, in FP7 Biotechnology about 38 % of the participants were SMEs, while in BBI JU they are 41%.

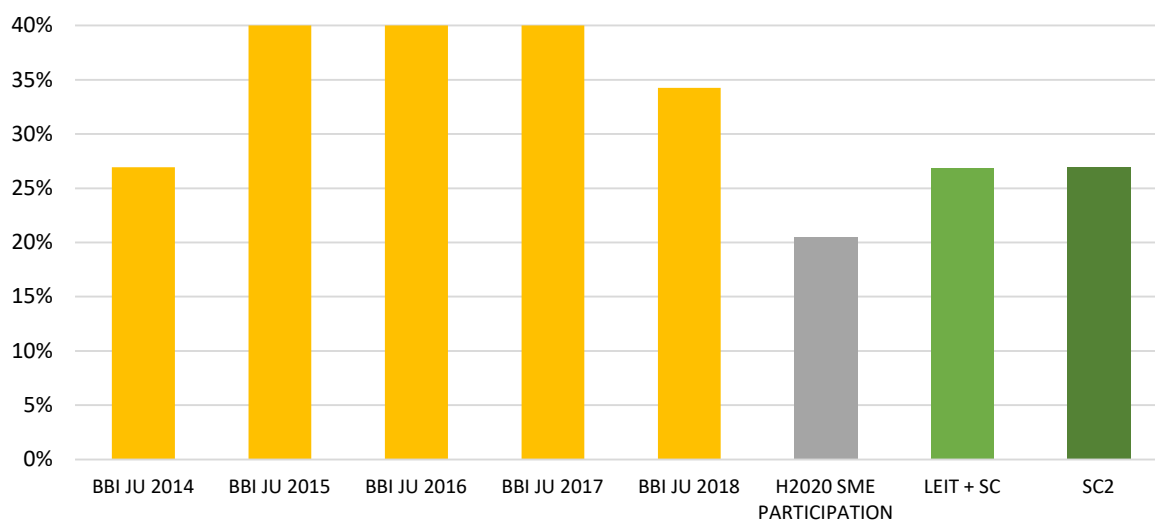


Figure 3. SME participation in BBI JU projects (Calls 2014-2018) in comparison with overall H2020 total SME participation, as well as SME participation in SC2 and LEIT + SC

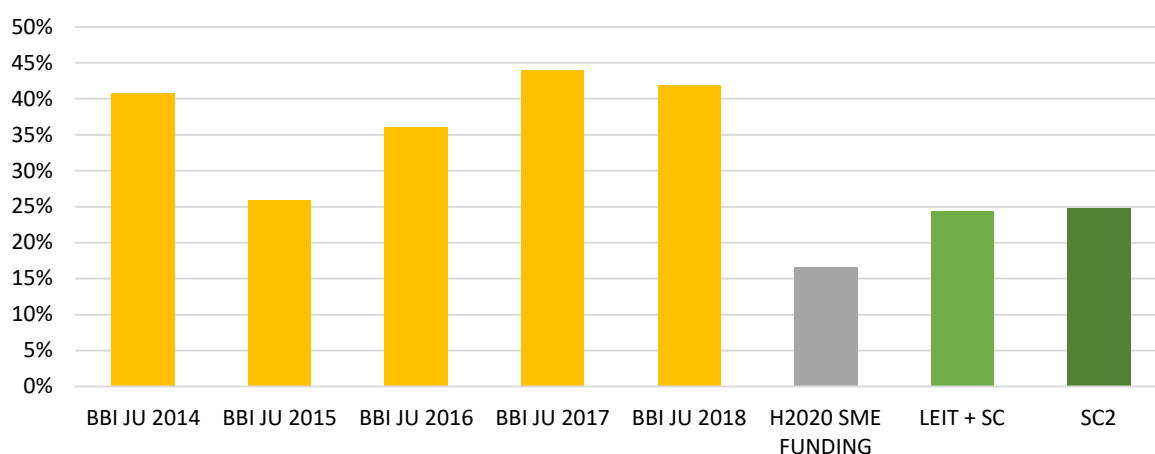


Figure 4. SME funding in BBI JU projects (Calls 2014-2018) in comparison with overall H2020 total SME funding, as well as SME funding in SC2 and LEIT + SC. Under H2020, the EC aims at granting SMEs no less than 20% of the total combined budget allocated to the 'pillar' "Societal challenges" and the specific objective "Leadership in Enabling and Industrial Technologies" (LEIT)

Furthermore, 81% of the SMEs participate in only one BBI JU project, bringing their unique contribution, knowledge and expertise to each project. This can be interpreted as the fact that SME beneficiaries are very focused, targeting only their priority areas. However, the analysis of SMEs participating shows they provide solutions for different types of actions along the value chains.

Examples of these SMEs providing participating in different projects are **MetGen**, an SME beneficiary participating in five BBI JU projects: [BIOFOREVER](#) (DEMO), [BIOrescue](#) (RIA), [SWEETWOODS](#) (FLAG), [UNRAVEL](#) (RIA), and [WoodZymes](#) (RIA). It supplies a wide variety of enzymatic solutions contributing to 18 different value chains. Enzymes are natural catalysts that speed up chemical

reactions. This is vitally important for industry, as enzymes do not just save time, they also crucially save energy, and as a consequence money.

Another example of SME beneficiaries participating in multiple projects is **Mi-plast**, a Croatian company which provides the technological processes to enable transformation from monomers and polymers to final applications ([AFTERLIFE \(RIA\)](#), [FUNGUSCHAIN \(DEMO\)](#), [HYPERBIOCOAT \(RIA\)](#), [PULPACKTION \(DEMO\)](#), [RefuCoat \(RIA\)](#)).

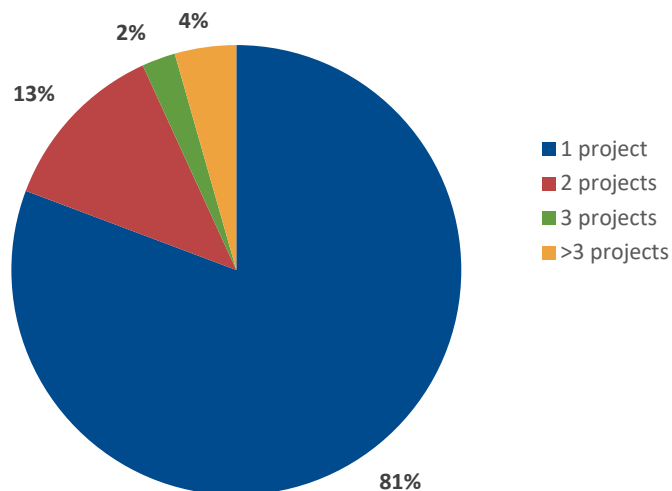


Figure 5. A large majority of SME beneficiaries are partners in one BBI JU project (Calls 2014-2017)

SMEs also play an important and leading role in bringing innovation to market. A total of **30 BBI JU projects (29%) from Calls 2014-2017 have an SME as project coordinator, providing valuable leadership**. The analysis of project coordinators of BBI JU portfolio shows a positive trend of SMEs engaged as project leaders over the calls 2014-2018. In particular, SMEs have a leading role in 40% of the proposals retained for funding in Call 2018. Almost half of the projects (44%) coordinated by SMEs are DEMO actions (TRL 6-7), having a relevant role both in technical and scientific coordination. A unique example in the BBI JU portfolio is the case of the SME **Ynsect** in France, being the first SME coordinating a **BBI JU FLAGHSIP** (Call 2018), which is opening avenues to other SMEs to lead in scaling up innovation. Examples of SMEs leading BBI JU projects can be found in all sectors concerned to the bio-based industries including chemical, engineering, aquaculture and waste management:

- **Global Bioenergies** (France) produces light liquid hydrocarbons derived from agricultural products using biological methods. It coordinates the project [OPTISOCHEM](#) (DEMO), which aims to convert poorly valorised residual wheat straw into bio-isobutene derivatives for subsequent conversion into oligomers for use in numerous applications (lubricants, rubbers, solvents, plastics, or fuels);
- **Arbiom SAS** (France) converts wood into a high-protein ingredient for aquaculture and animal feed. It coordinates [SYLFEED](#) (DEMO), a project launched to upscale Arbiom's technology platform to commercial production and assemble the key players in the value chain from wood to food;

- **Industrias Mecanicas de Alcudia – IMECAL** (Spain), an engineering SME in the metal sector with a more recent business line in biofuels, bioproducts and bioenergy. It coordinates the project [URBIOFIN](#) (DEMO), which aims to demonstrate an integrated innovative biorefinery for the transformation of municipal solid waste (MSW) into new bio-based products, and the **PERCAL (RIA)** project, which will use MSW as a feedstock for intermediate chemical products;
- **EggPlant srl** (Italy) reuses wastewater as raw material to manufacture, through a zero waste process, eco-friendly, hi-tech and valuable bioplastic products. It coordinates [AFTERLIFE](#) (RIA), a project which proposes a flexible, cost- and resource-efficient process for recovering and valorizing the relevant fractions from wastewater;
- **Greensea SAS** (France) is specialized in microalgae cultivation and processing of algae for innovative ingredients. It coordinates the project [SpiralG](#) (DEMO), which aims to demonstrate the sustainable feasibility of biorefining EU produced Spirulina biomass in the agro-food and health sectors.

The Bio-Based Industries Consortium promotes SME participation at all levels

The Bio-Based Industries Consortium (BIC) represents the private sector in a public-private partnership (PPP) with the EU, represented by the European Commission, known as the Bio-based Industries Joint Undertaking (BBI JU), established in June 2014 as one of the pillars of the EU's Bioeconomy Strategy.

The BBI JU is driven by the Vision for a circular bio-society and by the Strategic Innovation and Research Agenda (SIRA) developed by the industry. BIC's Vision is to accelerate innovation and market uptake of bio-based products and to position Europe as the global hub for bio-based industrial investment and the international reference point for the circular bioeconomy.

BIC is host to a unique mix of sectors including agriculture, food and feed, aquaculture and marine, chemicals and materials, forestry and pulp & paper, technology providers and beyond. It has more than 200 industry members which include large enterprises, SMEs and SME Clusters, RTOs, universities, technology platforms and associations spread across Europe. BIC brings together an authoritative pool of cross-sector and multi-disciplinary expertise of the bio-based industries. Any interested stakeholders along the bio-based value chain may apply for membership.

30% of BBI JU beneficiaries in Calls 2014-2017 were members of the Bio-based Industries Consortium (for data on BIC members among SME unique beneficiaries, see fig. 3 in Annex II). SMEs are the 'innovation engine' within the bio-based industries, and this is why BIC has facilitated and stimulated the involvement for SMEs in all activities since the beginning.

As an example, SMEs not only can become full industry member at a reduced membership fee, but BIC also allows SMEs to become member via a regional SME cluster. The SME cluster organisation pays a membership fee equal to the fee of a single SME, and can represent all their SMEs for which the CEO has signed a 'mandate letter'. These SMEs have the same rights as any other full member

– large or small – during BIC’s activities, e.g. sending input for the development of the annual work programme.

As a result, out of the 220 industry members of BIC, three quarters are SMEs. As established by BIC’s Internal Rules, BIC also reserves a minimum of two seats in its board to SMEs and SME representatives. Moreover, among the five BIC Directors who represent BIC to the BBI JU Governing Board there is an SME representative.

Finally, where BIC proposed that large companies do not receive funding for RIA projects, SMEs receive the normal funding rate. All this resulted in a high and successful participation of SMEs in the BBI initiative.

2.2. Sector coverage: wide range of sectors of activity

The bioeconomy covers the use of renewable biological resources and their conversion into food, feed, bio-based products and biofuels via a range of technologies. Bio-based industries are a significant sub-sector of the bioeconomy. Bio-based industries use renewable and sustainably sourced biological raw materials, called biomass, as the basic materials for producing intermediates and end-user products. However, a distinct and coherent single European bio-based industry sector does not yet exist, and currently comprises a wide range of different industrial sectors, often working in isolation. Existing economic segments like the chemical, forestry, pulp and paper sectors, as well as technology providers including biowaste industries, all have an interest in moving from an unsustainable petroleum-based economic model to a bio-based one.

Overall 50% of SMEs are predominantly active in four sectors of the Bio-based industries: namely industrial biotechnology (19%), engineering sectors (12%) and chemical industry (9%), and food/feed industry (8%)²⁹. Consultancy companies involved in different tasks represent 17% of SME beneficiaries.

Moreover, the spread of industrial sectors shows the diversity of the bio-based industries with SMEs active in materials, plastics and packaging, aquaculture, waste processing and recycling.

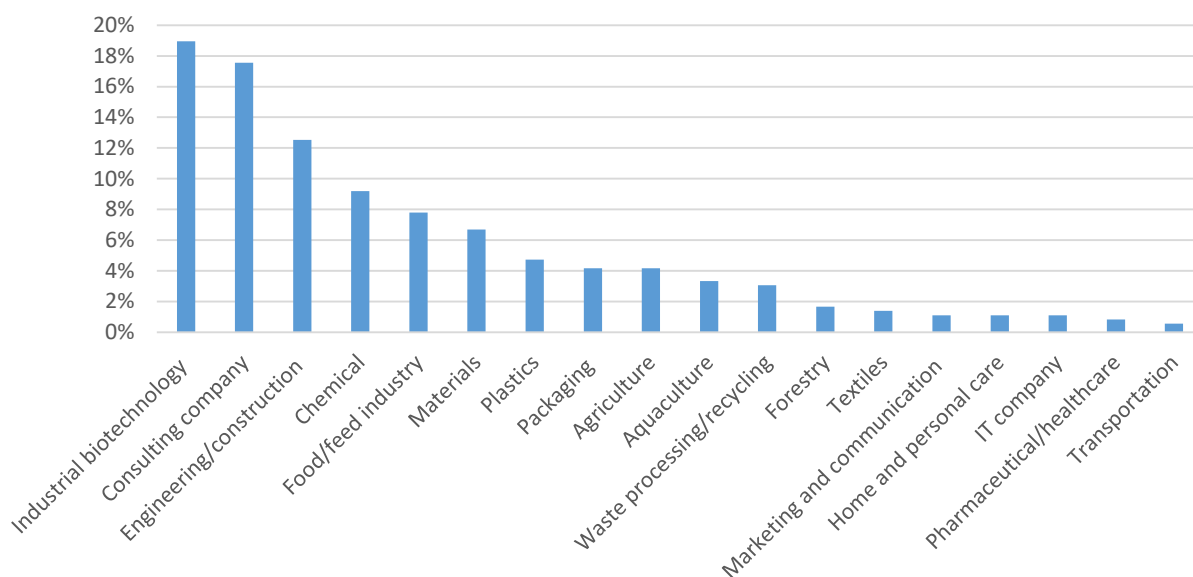


Figure 6. Overall distribution of SMEs per industrial sector (Calls 2014-2017)

Between 2014 and 2017, the average level of participation of SMEs from most sectors has remained relatively constant or increased over the years (fig. 3 Annex II). Following Call 2015, beneficiaries

²⁹ Despite the important role that higher value products (e.g. health and nutrition) are currently playing in the bio-based industries sector, pharmaceutical/healthcare and food/feed are relatively underrepresented among BBI JU's SME beneficiaries, also as a result of those sectors not being a priority under the first SIRA.

from sectors less represented in BBI JU such as plastics, packaging, forestry, IT, pharmaceutical, aquaculture, and marketing, were mobilised and have seen their presence grow constantly since then.

The sector coverage is broadening along the different calls: a reinforced coverage of some topics linked to waste management and aquaculture has affected positively the sector mobilization.

- In the aquaculture sector new companies cultivating macroalgae in open shores such as **Ocean Rainforest** (Faroe Islands) in the [MACRO CASCADE](#) (RIA) project; microalgae such as **GreenSea** (France) and **Mial** (Germany) in [SpiralG](#) (DEMO), and **Nomasico** (Cyprus) in [VALUEMAG](#) (RIA) have joined the BBI JU initiative.
- In the waste management sector there are companies dedicated to Municipal Solid Waste (MSW) such as **IMECAL** (Spain), an engineering company working on the use of MSW feedstock for intermediate chemical products, and on its transformation into new bio-based products in [URBIOFIN](#) (DEMO). Other companies, such as **EggPlant srl** (Italy) participating in the project [AFTERLIFE](#) (RIA), are reusing wastewater as raw material to manufacture bioplastic with an eco-friendly zero waste approach.
- In the forestry sector the company **Forets et Bois de l'est Societe Cooperative Agricole** (France) is participating in [EFFORTE](#) (RIA) as feedstock provider;
- In the pharmaceutical and healthcare sector the company **Mavi Sud** (Italy), partner in the [POLYBIOSKIN](#) (RIA) project, is developing skin-contact bio-polymer based product parts derived from biomass and food waste.

Consultancy companies represent 17% of SME beneficiaries. They are not only involved in core project implementation tasks (Life Cycle Assessment, research and development, testing, data analysis and validation) beyond the project management assistance, but also contribute to maximising the impact of the project by carrying out commercialisation, dissemination and communication activities.

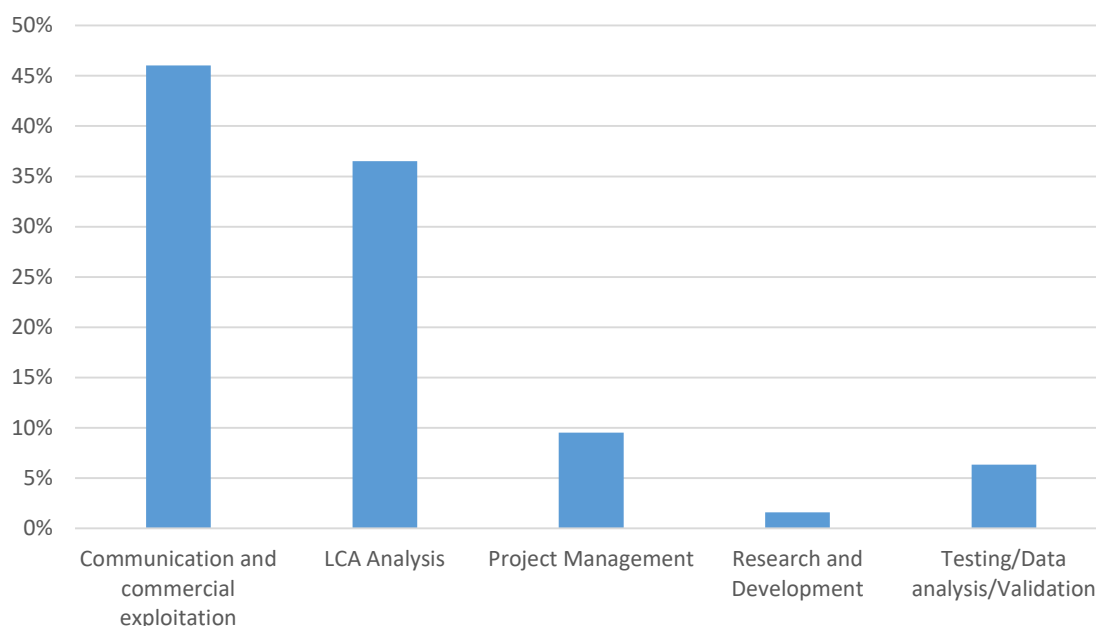


Figure 7. Distribution of consultancy SMEs activity per type of activity (Calls 2014-2017)

The following examples illustrate the variety of tasks performed by consulting SMEs in BBI JU projects:

- **ZABALA Innovation Consulting** (Spain), an RTD and Innovation consultancy supporting the coordinator and all partners of [BIOrescue](#) (RIA) in the management of the project, which intends to develop and demonstrate a new innovative biorefinery concept based on the cascading use of spent mushroom substrate supplemented by underutilised lignocellulosic feedstocks;
- **Institute for Energy and Environmental Research Heidelberg – IFEU** (Austria), a limited liability company and non-profit with expertise in the field of life cycle assessment (LCA) and environmental impact assessment. It assesses the sustainability of [UNRAVEL](#) (RIA), which aims to develop advanced pre-treatment, separation and conversion technologies for complex lignocellulosic biomass;
- **RTDS Association** (Germany), a non-profit SME supporting implementation of ‘research to market’ EU collaborative projects. For [SUSBIND](#) (RIA), which produces and tests bio-based binders as an alternative to formaldehyde binders currently used for wood-based panel boards in furniture mass products, RTDS develops IP-based business models for post-project exploitation of results;
- **Woodilee Consultancy Ltd** (UK), a consultancy working in partnership with management companies giving advice and forest management expertise in investment and valuation. It executes tests and data analysis for [EFFORTE](#) (RIA), a research and innovation project aiming

to use Big Data to improve the sustainability, efficiency and productivity of Europe's forestry sector;

- **Proman Management GmbH** (Austria), an R&I consulting company that develops, designs and manages innovation, R&D projects for business and non-profit organisations. It is a R&I partner for [NewFert](#) (RIA), which aims to design and develop technologies that will re-use and valorise biowaste components, making them suitable as secondary raw material in the fertilizer industry.

2.3. Geographical distribution

There is a **broad geographical distribution** of SME beneficiaries across Europe. The SMEs participating in BBI JU projects are from 25 EU Member States and 7 associated countries. The top 10 countries for SMEs involvement in Calls 2014-2017 are: Germany (55), Spain (54), Italy (47), the Netherlands (35), Belgium (33), France (31), United Kingdom (28), Austria (14), Finland (10), Denmark and Portugal (both 9). This contributes to the mobilisation effect generated by the BBI JU programme.

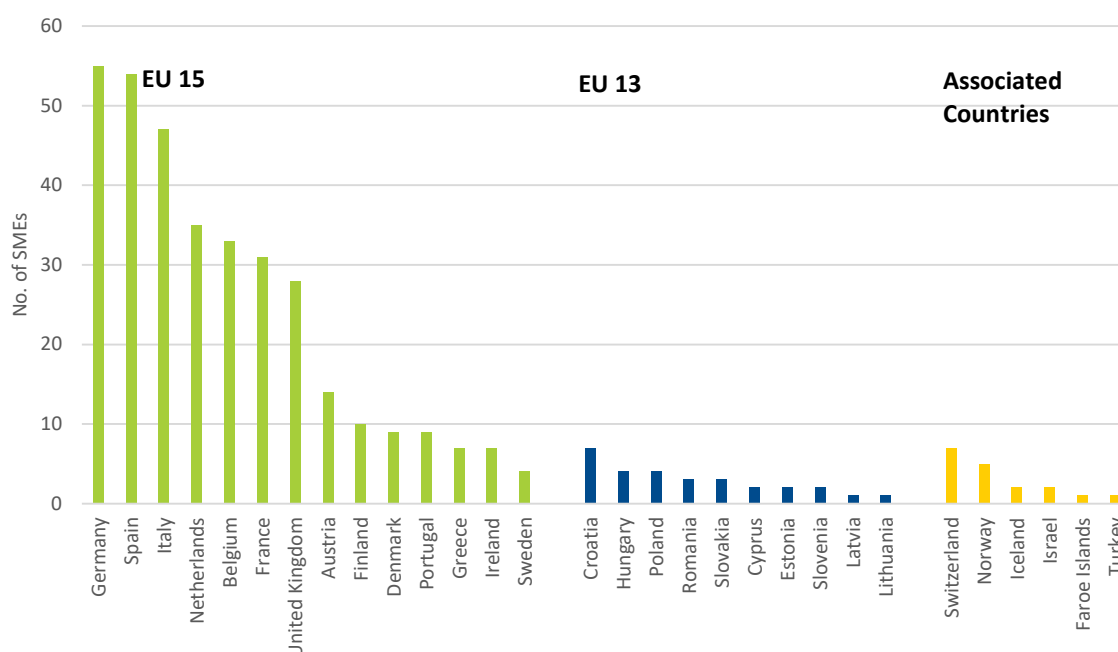


Figure 8. Distribution of SME beneficiaries per country from EU-15, EU-13 and Associated Countries in Calls 2014-2017

A lower participation can be observed in absolute values in Central and Eastern Europe. Further mobilization of SMEs is possible in those countries, considering their vast resource potential for bio-based industries.



Figure 9. Map showing Member States and Associated Countries where SME project participants are based (Calls 2014-2017), including CSAs. Blue refers to 1 SME, red to multiple SMEs.

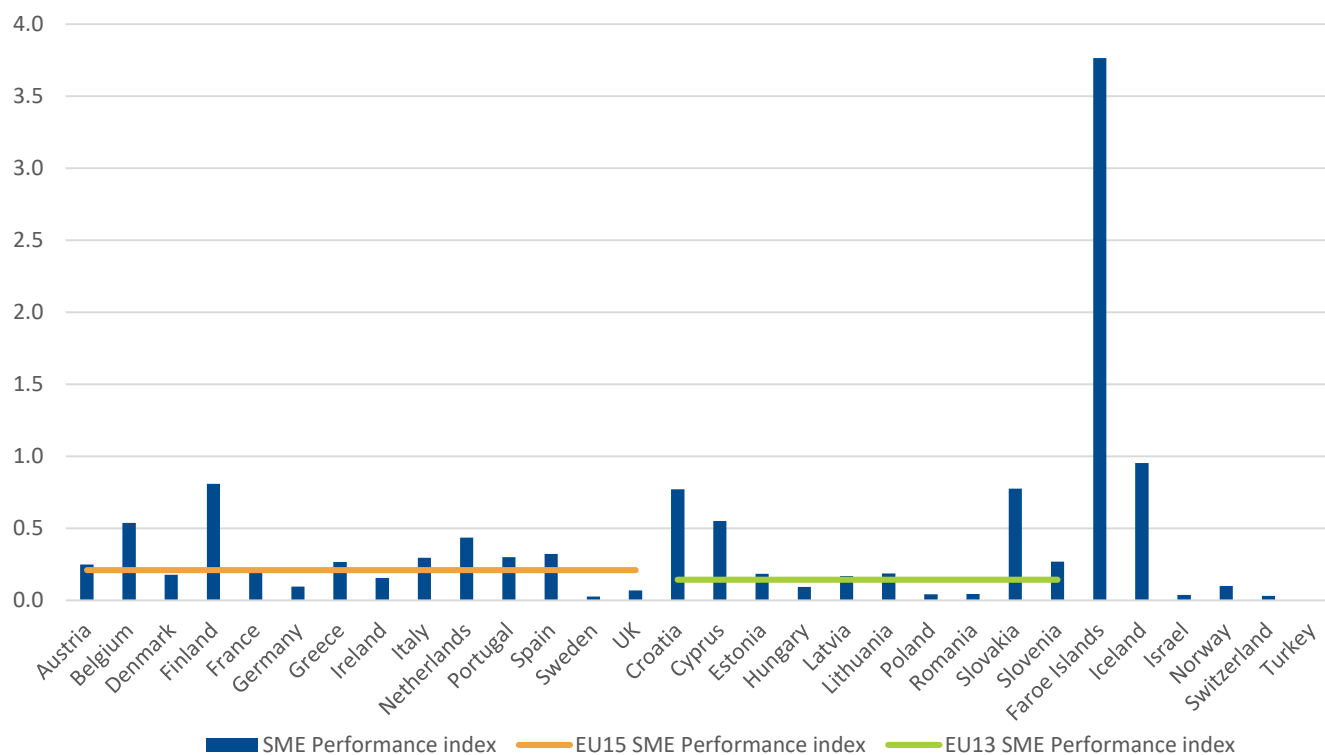


Figure 10. Distribution of funding per country (Calls 2014-2018), normalised by GERD (normalised performance index 0-10)

The normalisation of the BBI JU funding by GERD³⁰ in Figure 8 shows that the highest success of SMEs in obtaining BBI JU funding compared to the national investment in R&D comes in the Faroe Island and Iceland. The particular case of Faroe Island is due to the participation of the company **Ocean Rainforest** in the project [MACROCASCADE](#) (RIA). Countries such as Finland and Slovakia are performing very well, thanks to the projects [EXILVA](#) (FLAG) and [BIOSKOH](#) (FLAG) respectively. Other countries, such as Croatia and Cyprus, also appear to perform well. Moreover, the overall comparison between EU15 and EU13 demonstrates that despite the higher BBI JU funding received by EU15 SMEs in absolute terms, EU13 SMEs perform more than two times better than EU15 countries, when the investment in R&D is considered as normalisation parameter in the analysis.

The strong mobilization effect of BBI JU is demonstrated by the participation at each new call of new beneficiaries from countries that were not present or underrepresented in earlier calls (fig. 11). A high percentage of BBI JU beneficiaries within most countries is composed by SMEs, which often receive a large amount of BBI JU funding (fig. 12).

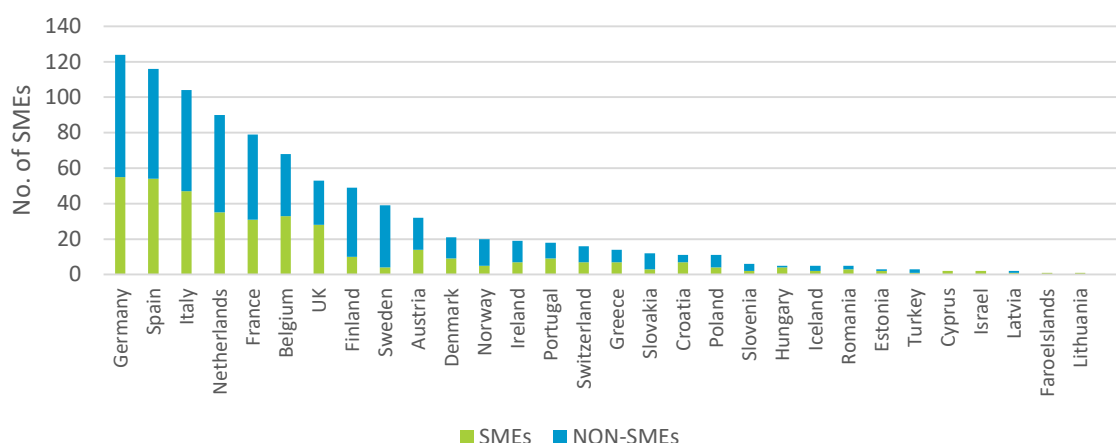


Figure 11. Number of SME and non SME beneficiaries by country (Calls 2014-2017)

³⁰ Gross domestic expenditure on R&D (GERD) includes expenditure on research and development by business enterprises, higher education institutions, as well as government and private non-profit organisations, as a summation of years 2007-2016.

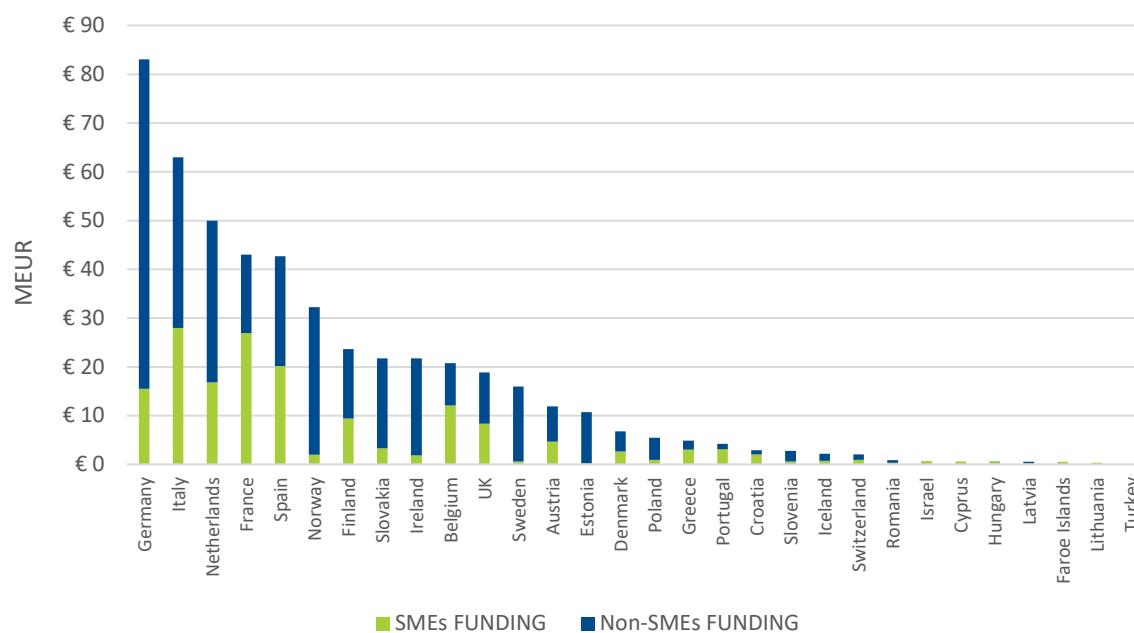


Figure 12. Funding for SMEs and non SMEs by country (MEUR) (Calls 2014-2017)

The wide thematic coverage of the SMEs contributes to make BBI JU a unique programme. This diversity also shows the **success of BBI JU's mobilizing effect of key stakeholders**. It is important for the future of the bio-based economy in Europe that BBI JU continues to mobilize more relevant stakeholders and bring together and integrate different production sectors, in order to develop a sustainable and competitive bio-based industry.

2.4. Role in BBI JU projects and value chain coverage

In the Call 2014-2017 BBI JU project portfolio there were 43 RIA projects, 24 DEMOs and 7 Flagships. The most common funding instrument for BBI JU's SME beneficiaries is **Research and Innovation Actions**, where RIA projects represent more than half of the portfolio. Additionally, a third of SME project partners are engaged in **Innovation Actions**: on average, we observe 3.6 SMEs / FLAG, 4.8 SMEs / DEMO and 5.1 SMEs / RIA.

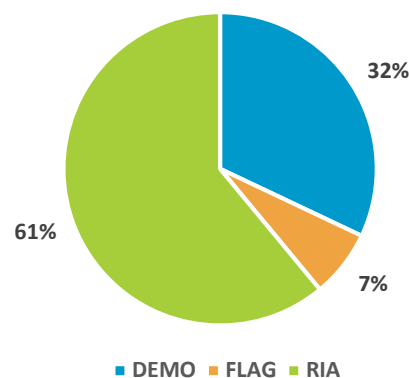


Figure 13. Distribution of SMEs per type of action (Calls 2014-2017)

Overall SMEs have a unique role depending on the sector of activity and are crucial for the successful implementation of BBI JU's projects. Based on the type of activity performed, the **distribution of SMEs is equally balanced between generation of new knowledge and product/process optimisation**. These activities include testing/data analysis, research and development, and technology supply. A significant amount of SMEs also perform **upscaling activities**.

Distribution of SMEs per type of activity in BBI JU projects (Calls 2014-2017)

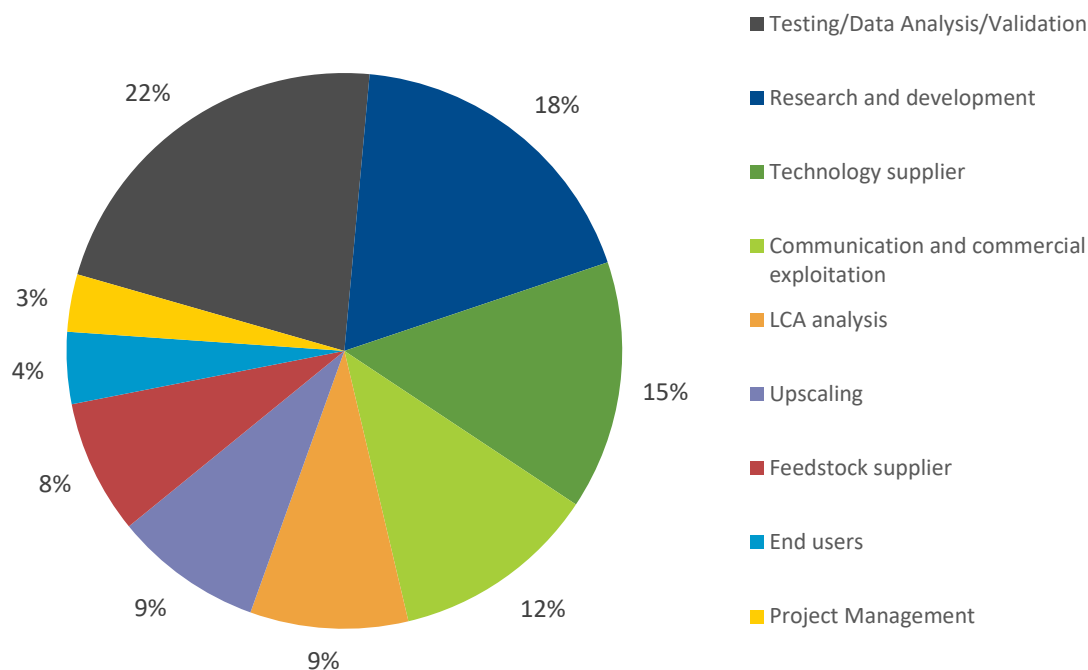


Figure 14. The wide variety of type of activities performed by the SME beneficiaries within the value chains

SMEs are enablers for the generation of new products and processes by generating new knowledge, driving innovation and technological advancement, and supplying customized technologies and services. Overall, more than two thirds of the SME participants perform essential research and technological development tasks, for the generation and optimisation of new knowledge to be incorporated in products, process, and services. These include SMEs focused on testing/data analysis (22% of total SME beneficiaries), research and development (18%), technology supply (14%) and upscaling (9%). These tasks relied on SMEs' specialized profiles, technology and expertise, which were key to fulfilling project requirements and resulted in added project value.

Examples:

- Through its participation in the project [Relnvent](#) (DEMO), **Ritols** (Latvia) is providing technology to produce and apply rigid polyurethane foam thermal insulation derived from sustainable feedstock;
- **Nomasico** (Cyprus) is developing a revolutionary solution in [VALUEMAG](#) (RIA) for microalgae cultivation and harvesting in order to produce and purify high-value biomolecules in an affordable and environmentally friendly manner.

Moreover, the participation in Flagship projects offers the opportunity to build relationships with large industry and to be part of high TRL projects, to scale up technologies and to valorise their IP. Some examples can illustrate the great potential for SMEs in large industrial scale projects:

- **Metgen** (Finland) is expanding its contact network and finding cooperation possibilities in multiple segments for lignocellulosic biomass conversion through their participation in [SWEETWOODS](#) (FLAG);
- **Chimar Hellas** (Greece) has access to the technologies developed in the framework of [EXILVA](#) (FLAG) to produce new bio-based Micro Fibrillated Cellulose adhesive technology and is able to access new markets.

More specifically:

a) Feedstock Suppliers

Feedstock suppliers are the SMEs that provide raw material for further processing. Examples:

- **Oljarna Krozera Franka Marzi S.P.** (Slovenia), a family owned olive mill processing company. They supply raw material of olive pomace for project [Pro-Enrich](#) (RIA), which extracts functional protein molecules and bioactive compounds from olive pomace and other feedstock such as rapeseed, tomato and citrus fruit side streams to be used for food, adhesives, cosmetics and pet food industries;
- **Necton S.A.** (Portugal) cultivates and harvests microalgae for project [MAGNIFICENT](#) (RIA), which converts microalgae into valuable ingredients for food, feed and cosmetics.

b) Research & Development

This encompasses SMEs conducting activities to improve existing products and procedures or to lead to the development of new ones. Examples:

- **Bio-On** (Italy) produces bio-based polymers obtained from biomass such as waste materials collected from agriculture industry. They provide the technology required for project [BioBarr](#) (RIA), which aims to produce PHAs for food packaging materials with enhanced barrier properties;
- **Ynsect** (France) is a biotech company that develops products and processes using insects for high-quality natural ingredients (e.g. proteins). It collaborates in project [Zelcor](#) (RIA) to demonstrate the feasibility of transforming lignocellulose recalcitrant side streams into high added-value bio-based products.

c) Testing/Data Analysis/Validation

This group includes SMEs that conduct activities to ensure that a product, process or service meets the requirements or needs of the customer and other stakeholders. They also evaluate whether or not a product, service or system complies with a regulation, requirement, or specification of imposed condition. Examples:

- **Bio-Mi** (Croatia) is dedicated to the processing and recycling of bioplastic materials. It validates the developed materials into large consumer applications for project [EFFECTIVE](#) (DEMO), focuses on advanced eco-designed fibres and films for large consumer products from bio based polyamides and polyesters;
- **Texol s.r.l.** (Italy), a manufacturer of films and raw materials for the hygiene and medical industry. It performs biocompatibility tests for project [POLYBIOSKIN](#) (RIA), which aims to broaden the use of biopolymers in biomedical, cosmetic, and sanitary skin-contact applications.

d) Technology Suppliers

Technology suppliers are SMEs that provide consultancy service of technological solutions to the projects. Examples:

- **Fibroline** (France) has expertise in dry impregnation technology. It is currently collaborating in project [POLYBIOSKIN](#) (RIA) for the production of bio-based polymers for skin-contact products in the biomedical, cosmetic and sanitary industries;
- **Compagnie Industrielle de la Matière Végétale - CIMV** (France) is an SME working in the field of lignocellulosic biorefinery technologies. The technology developed in the project [LigniOx](#) (DEMO) can efficiently convert lignin feedstock into high-value products.

e) Life Cycle Analysis (LCA)

These SMEs assess environmental and/or economic impacts associated with the different stages of the product's life. Examples:

- **Vertech Group** (France), a high-tech environmental engineering company carrying out the environmental and social LCAs of [AQUABIOPRO-FIT](#) (RIA). This project is developing high-quality proteins and bioactives from aquaculture, fisheries and agriculture by-products for applications in fitness, health and animal feed;
- **Kompetenzzentrum Holz GmbH** (Germany), a research institute performing LCA for [SmartLi](#) (RIA), a project developing valorisation routes for the conversion of industrial lignins into sustainable materials.

f) Upscaling

This encompasses SMEs that provide unique equipment and infrastructure to perform bioprocesses at pilot/demonstration/production plant scale. Examples:

- **Bio Base Europe Pilot Plant VZW** (Belgium), a pilot plant for the development and scale up of new, bio-based and sustainable processes. It implements, optimizes and scales up novel solvent production for [ReSolve](#) (RIA). This project intends to replace two hazardous solvents with safer alternatives derived from non-food carbohydrates;

- **A4F Algafuel SA** (Portugal), a bioengineering company that designs, builds, operates and transfers microalgae biomass industrial production plants. It is in charge of upscaling the production of microalgae of [ABACUS](#) (RIA). This project aims to provide new molecules synthesized from microalgae and able to bring competitive products on the market.

g) End Users

These SMEs contribute to the market uptake of the products. Examples:

- **Biosensor** (Italy) produces wearable electronics and skin attached sensors based on the materials developed by project [EUCALIVA](#) (DEMO), which aims to valorise eucalyptus lignin for advanced materials and carbon fibres such as stretchable electronics and smart fabrics;
- **Katty Fashion** (Romania), specialized in short run production of women's wear, participates in [NeoCel](#) (RIA). This project seeks to develop innovative processes for sustainable production of high quality fibers from reactive high-cellulose pulps in connection to existing pulp mills.

h) Communication and commercial exploitation

This includes SMEs that promote the project objectives and its results, or exploiting project results for commercial purposes. Examples:

- **Nova-Institute** (Germany), an independent institute that offers research and consultancy with a focus on bio-based economy. It performs market research for [BIOFOREVER](#) (DEMO), a project that intends to demonstrate the feasibility of conversion of lignocellulosic feedstocks into chemical building blocks and high added value products;
- **FoodCompanions BV** (The Netherlands) is a communication company involved in [PROMINENT](#) (RIA). This project aims to develop techno-economically and environmentally viable protein ingredients and foods from wheat and rice side streams.

i) Project Management

These SMEs provide technical and financial administration services to the projects. Examples include:

- **Spinverse OY** (Finland), a consulting company specialized in the commercialization of emerging technologies, is in charge of project management for [SWEETWOODS](#) (FLAG), which aims to transform hardwood into innovative high value-added products, including biocompounds for fuels, bioplastics, insulation materials, cushions, panels;
- **BioDetection Systems B.V.** (The Netherlands), an SME providing bio-based screening technologies for safety, quality and bioactivity assessment. It coordinates project [FUNGUSCHAIN](#) (DEMO), which aims to extract high value molecules from residues from the

agricultural offcuts of commercial mushroom farming for eco-friendly cleaning products, proteins for food supplements, and bioplastic.

Main activity within the value chain by sector

The bio-based industries seek to convert a broad range of biomasses into bio-based chemicals and materials for further processing into high added-value products for specific applications.

Market sectors that are already using high added-value bio-based products include: packaging, agriculture, medical, healthcare, home and personal care, pharmaceuticals, food and feed additives, paper and pulp, textiles, construction, automotive, and transportation.³¹

Regarding the main activity of the companies in the most represented industrial sectors:

- **Chemical, industrial biotechnology and plastics sectors** SMEs participate in research and development, testing/data analysis/validation, and upscaling activities. In the industrial biotechnology sector SMEs play mainly the role of technology suppliers.
- In the **aquaculture, agriculture and food/feed sectors**, SMEs act generally as feedstock suppliers, and are involved to a smaller extent in research & development and testing, data analysis and validation.
- In both the **waste processing/recycling** and **engineering/construction** sectors, the most common type of activity performed by SMEs is technology supply, followed by testing, data analysis and validation.

³¹ Strategic Innovation and Research Agenda 2017

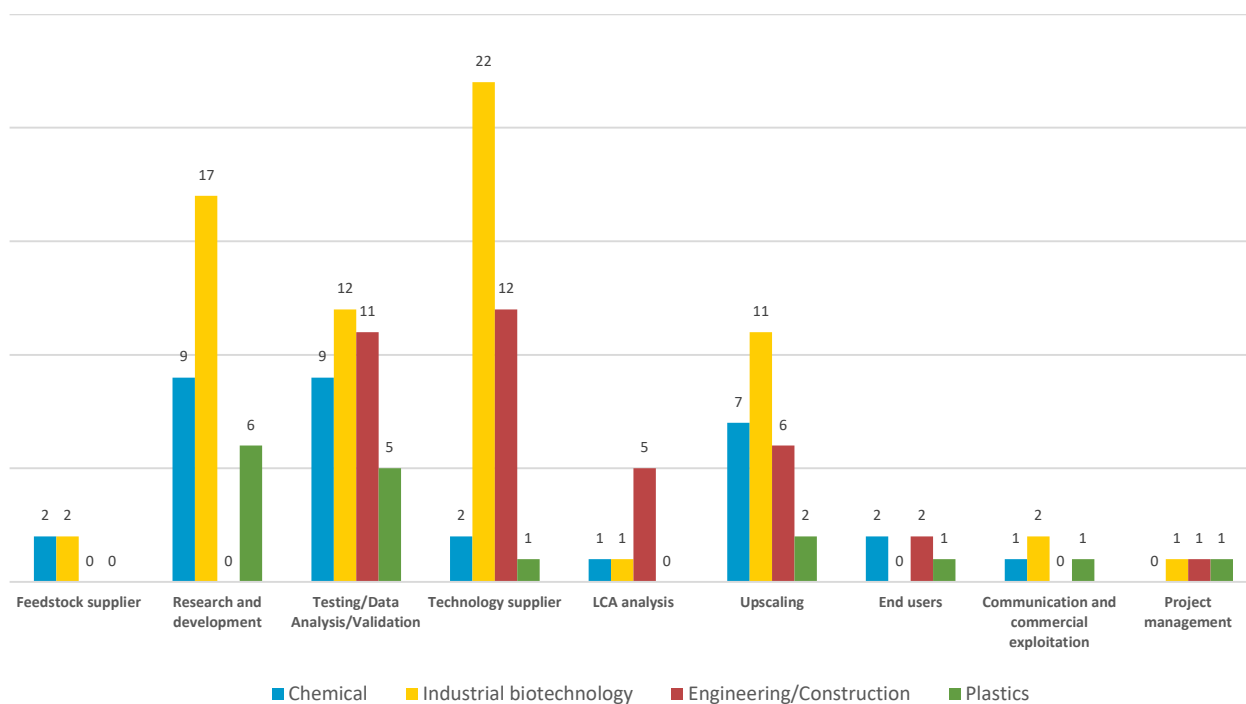


Figure 15. Main activity within the value chain for chemical, industrial biotechnology, engineering/construction and plastics (Calls 2014-2017)

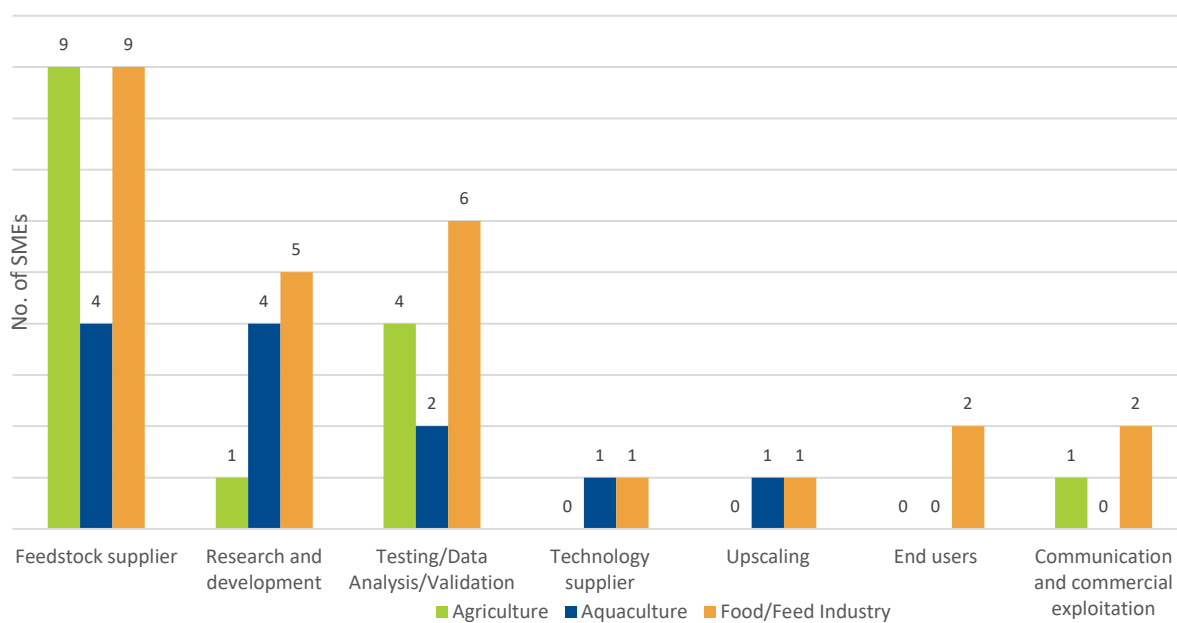


Figure 16. Main activity within the value chain for aquaculture, agriculture and food/feed (Calls 2014-2017)

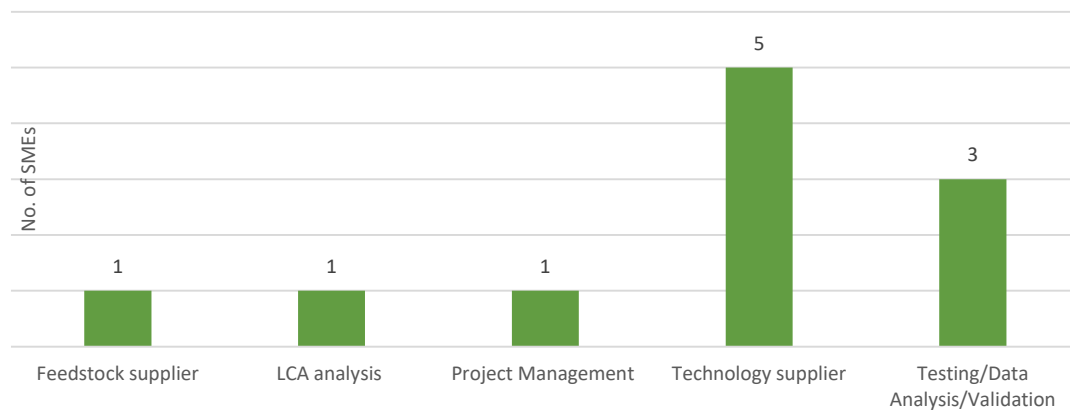


Figure 17. Main activity within the value chain for waste processing/recycling SMEs (Calls 2014-2017)

3. HIGHLIGHTS FROM SMEs CASE STUDIES

BBI JU holds opportunities for innovative SMEs

Based on the interviews conducted via questionnaire with a group of 13 SMEs representing successful participation cases in BBI JU projects, some key highlights were identified. A selection of the motivations and drivers to participate in BBI JU projects, of the opportunities that BBI JU holds for innovative SMEs in the bio based sector, and of the contribution of SMEs to generate impact and successfully achieve BBI JU objectives are presented in the sections below.

The chance to collaborate with, and transfer knowledge between, different public and private research centres and other SMEs, and the prospects for greater visibility are considered as a real opportunity by the participants. BBI JU provides **unique opportunities for SMEs** to participate, cooperate, develop their knowledge and establish cross-sector connections to find new business opportunities in the bio-based economy. The benefits obtained by SME project partners have a positive impact on multiple business aspects:

SMEs participating in the questionnaire-based interview pointed out that the main motivations and drivers of SMEs to participate in BBI JU projects were not limited to the funding for research and demonstration but expanded to growing in a sustainable way, boosting innovation, demonstrating the potential of their technologies, accelerating time to market, increasing productivity, and accessing new markets.

3.1. Motivations and drivers to participate in BBI JU projects

- **Grow in a sustainable manner:** Through BBI JU, SMEs have been able to tackle social and environmental challenges while safeguarding industry sustainability. Many industrial sectors need to develop and provide sustainable solutions and technologies to be competitive in their respective markets. Textile production and consumption, for instance, have important social and environmental challenges (water consumption, CO2 emissions and waste generation) to be solved. The Romanian SME **Katty Fashion** is aiming to grow in the textile sector in a sustainable way. It has participated in a BBI JU project as pilot partner to test new fabrics based on sustainable viscose yarns production to create highly fashionable and sustainable apparel. Creating added value for clients by growing sustainably is well aligned with the environmental values of the innovative SME **CHIMAR**, a Greek company working in the wood panel industry. CHIMAR technology concerns the industrial production of adhesive resins, resin additives as well as their application in the industrial manufacturing of wood-based panels or composite wood panels. These wood products are used mainly in furniture manufacturing and as materials for house construction, insulation and decorative improvement. The main driver for CHIMAR to participate in BBI JU was the opportunity to explore and evaluate the functionality and applicability of a new biomass-derived material in its adhesives and adhesive systems used in the production of composite wood panels.
- **Boost R&D and innovation capabilities:** SMEs have the opportunity to exploit new know-how or technology, enhancing or consolidating know-how and expertise in particular areas. **Metgen** in Finland has been able to move forward in three key areas: aiding the demonstration and deployment of novel technologies to enable new chemicals, building blocks, materials and consumer products to commercial level; developing value chain in linking biomass production through to B2B and B2C in the market; and setting up flagship biorefineries that show that bio-based materials can offer cost, performance, societal and environmental advantages to outperform current fossil-based alternatives.
- **Scale-up and demonstrate the potential of their technologies:** BBI JU has offered the SME **IMECAL** in Spain an opportunity to demonstrate the potential of its PERSEO Bioethanol® technology to contribute to solve the large problem caused by the increasing generation of MSW and the opportunity to reach the market with a feasible process developed by the company.
- **Increase competitiveness, visibility and sector recognition:** SMEs gained an edge over other competitors and were able to boost the companies' reputation and gain greater visibility. The **Bio-based Europe pilot plant** in Belgium was aware of BBI JU from the very beginning and actually stood at the cradle, as it realised that the European bioeconomy would greatly benefit from this initiative, as this was the only way to keep the exploitation of bio-based innovations largely inside Europe. For this company, the contribution of BBI JU to its visibility in Europe and beyond has been key, as BBI JU makes an enormous effort in communicating about the impact of the funded projects, allowing them to show their expertise and accomplishments, and to disseminate the impact that they leverage by the work done at European level and worldwide.

- **Increase profitability and productivity:**

SMEs were able to extend their range of services, offering new or improved services, production lines or products, entering new markets, and create new jobs. The Croatian SME **Mi-plast** is participating in different BBI JU projects, recognising the opportunity of this initiative for creating new jobs and new opportunities in the long-term in the bioplastic sector, even though the bioplastic industry was still a niche market in Croatia when it first participated in BBI JU projects.

“Public-private partnership funding opportunities, in particular the Bio-Based Industries Joint Undertaking (BBI JU), have been crucial for us to develop new products and applications, together with other industries from the European continent.

Thanks to the current BBI JU and the support of the European Commission, in particular DG RTD, we were able to scale up the development of processes and products with public support which for our kind of R&D activities was not available in the private sector.”

Mi-plast, Croatia.

[Letter to Commissioner Carlos Moedas]

- **Expand their network and alliances** that provide access international markets, by building strategic relationships and collaboration with complementary companies. For **Ritols**, an SME located in Latvia, taking part in the BBI JU project remarkably opened **access to international markets** and the **creation of new green technologies** for the construction industry. The materials they developed within the project allowed to **reach new market sectors**, especially as more and more customers are willing to use green materials in buildings.
- **Accelerate time to market:** it can take a long time to develop bioeconomy technologies and bring them to the market. SMEs often face significant market barriers related to the restrictive costs associated with capital assets needed to test new bio based technologies. Commercialisation of new technology often implies long timetables to achieving value, and high risks along the way. BBI JU provided the opportunity to reduce the risk of investing in the development of new biotechnologies. The SME **Nomasico**, based in Cyprus, believes that the industry driven nature of the BBI JU programme enables the company to accelerate the development of novel products and services to the market, thanks to the support provided by the programme, and to the collaboration and networking opportunities that originate from interaction with other research and industrial partners.

3.2. SME contribution to the BBI JU initiative

SMEs provide **key contributions** to the successful achievement of valuable results of the **BBI JU initiative** in unique ways, through:

- **creation of new bio-based value chains**
- **production of new bio-based building blocks and materials**
- **increase in maturity of key technologies for the bio-based industries**
- **generation of favourable environmental and socio-economic impact**

Creation of new bio-based value chains

“The work carried out by Chimar in the [EXILVA](#) (FLAG) project is mainly oriented to wood adhesives and their reinforcement with the use of MFC (...). If the use of such a bio-based material in adhesive systems for wood products proves beneficial, it could replace petrochemicals used for the same reason, thus creating new bio-based industrial value chains.”

Chimar Hellas S.A., Greece

“The aim of IMECAL is to provide new competitive, sustainable and environmentally friendly solutions to the current limitations of the MSW management. [URBIOFIN](#) (DEMO) and [PERCAL](#) (RIA) projects will contribute to create new bio-based value chains starting from OFMSW. Advancements in this field will also support the generation of new regulations and policy recommendations as well as the development of EU and national initiatives to reduce waste.”

IMECAL S.A, Spain

“Within the BBI projects, we have participated in forming a total of 18 new and complete value chains, with the aim on end-user products.”

MetGen, Finland

“The programme provides the possibility to create a new bio-based value chain for the production and co-valorisation of microalgae-based products through the [SpiralG](#) (DEMO) project.”

Milis Energy, Italy

“We are contributing to different KPIs and BBI JU goals through cross sector interconnections, creating something valuable and needed, for example new bio-based value chain for bioplastics.”

Mi-Plast, Croatia

Production of new bio-based building blocks and materials

"We are contributing to the production of new bio-based building blocks and/or materials or the market uptake of new consumer products based on bio-based chemicals and materials where we are contributing with our 38 years knowledge of plastics."

Mi-Plast, Croatia

"The [NeoCel](#) (RIA) fibres are expected to be of higher quality than standard viscose but produced at lower operating cost and with lower environmental impact. Katty Fashion's role in the project is to demonstrate that the fabrics obtained from the [NeoCel](#) yarns can be successfully used in the clothing industry for the fashion market, gradually replacing cotton based materials, whose production has a strong negative impact on the environment. (...) NeoCel is an innovative project aiming to manufacture a novel type of man-made cellulose textile fibres with major impact for the textile and clothing industry. Its results are expected to demonstrate the potential for new environmental friendly textile production, to raise consumers' awareness and to increase the market uptake."

Katty Fashion, Romania

"We are convinced and enthusiastic about being able to demonstrate the goodness of our process and its potential contribution to the reduction of MSW, offering high-value, marketable and sustainable building blocks and bioproducts."

IMECAL S.A., Spain

Cooperation with companies from different sectors

"Milis Energy contributes to the BBI JU initiative by cooperating with companies from different sectors and by increasing maturity of key technologies for the bio-based industries."

Milis Energy, Italy

"Mial is a developer of new consumer products with a very specific market niche."

Mial GmbH, Germany

Increase in maturity of key technologies for the bio-based industries

“AEP Polymers’s main achievement in [SmartLi](#) (RIA) was to bring an industrial perspective in the study of different types of lignins, which allowed to focus on the more promising ones and to highlight their performance advantages. AEP Polymers cooperated with upstream and downstream partners to decide the most promising valorisation routes able to fulfil the technical requirements of the materials to be produced, and it offered its portfolio of business contacts in the polymer industry to complete one value chain with the necessary partner.”

AEP Polymers, Italy

“BBEU is also coordinating one CSA project, [Pilots4U](#) (CSA), where they are setting up a European network of open access pilot facilities. With that project, BBEU is trying to provide all European companies in need with access to a scale-up facility fitting their needs. The company envisions this as regional development, and as lowering the bar for any company to develop industrial production of their new product.”

Bio Base Europe Pilot Plant, Belgium

“The participation in a DEMO project is pivotal, since it is designed to allow validation of the complete process at a scale and with equipment representative of large-scale operations, showing also the project partners that their innovation can address the market. Overall, Greensea contributes to de-risking future flagship projects.”

Greensea SAS, France

Through their participation in BBI JU projects, SMEs also generate positive **environmental and socio-economic impact**, such as:

Creation of bio-based products with lower GHG emissions

“Through the maximization of the lignin content in [SmartLi](#) (RIA), AEP Polymers contributed to create formulations with lower environmental impact and GHG emissions.”

AEP Polymers, Italy

“Use and application of developed bio-based thermal insulation material will allow to reduce CO2 emissions not only due to replacement of petrochemical carbon, but also during the lifetime of insulated buildings due to lower energy demand.”

Ritols Ltd, Latvia

Improved resource efficiency in the production process

*"The **VALUEMAG** (RIA) project aims to develop an innovative technology to cultivate algae at the lowest possible cost, much lower than the current cost of micro-algae cultivation, and integrate this with other new technologies in a pilot-scale biorefinery. The new integrated production system will have the potential to increase the efficiency and the environmental sustainability of modern biorefineries by lowering the cost of cleaner energy and to sustain food security."*

Nomasico, Cyprus

"We aimed to reduce the energy required for microalgae production in comparison with the conventional microalgae way of cultivation and transformation."

Milis Energy, Italy

"By investing and adapting new equipment to improve resource efficiency of processes and products in general, we contribute to sustainability and to the reduction of environmental impact."

Mi-Plast, Croatia

Regional and local development

*"The **ReInvent** (DEMO) work contributed to the exploration of the industrial applications of lignin, which are expected to support the value gain of the pulp and paper industry and to strengthen the regional development especially in Central and Northern Europe, where the forest-based industry finds its larger diffusion."*

AEP Polymers, Italy

"A significant growth is also expected in the years to come. Having its quarters in islands, (Ocean Rainforest) is an example on a knowledge based and innovative company in a rural/costal region."

Ocean Rainforest, Faroe Islands

Bio-based economy awareness raising

"By hiring local staff and by organizing info days on plant activity promotion, Milis Energy wants to create and enforce awareness and knowledge of the local bio-based economy".

Milis Energy, Italy

"Since we are pioneers in this activity in Eastern and South Eastern Europe, we hope that we can inspire and encourage other companies that are not aware of the potential of contributing to the bioeconomy in Eastern Europe."

Mi-Plast, Croatia

Creation of knowledge or new markets

“Through the participation in [SpiralG](#) (DEMO) project, Greensea contributes to the creation of knowledge, since the company is strongly focused on R&D to deliver appropriate extraction and conservation solutions.”

Greensea SAS, France

“Through the participation in the [EXILVA](#) (FLAG) project, Chimar contributes to the creation of knowledge on the use of MFC in adhesives for wood panels dedicated for the manufacture of furniture and housing parts.”

Chimar Hellas S.A., Greece

CONCLUSIONS

The first analysis of the results of the SMEs' participation in BBI JU demonstrates that BBI JU went beyond the expectations, coupling industry driven research while meeting quantitative targets for funding SMEs, thus allowing them to play a salient role in the bio-based industries innovation.

The analysis further confirms the vital role that SMEs play in the bio-based economy and the valuable instrument for innovation that BBI JU represents. De-risking investment via BBI JU offers SMEs a unique opportunity to scale-up their technologies, access markets and get recognition, while protecting the ownership of their technologies and know how.

The findings of this analysis provide input for the preparation of the SME participation strategy in line with the new **EU SME strategy** in the context of the **European Green Deal**. Beyond keeping up with the high SME uptake in the initiative, the BBI JU SME strategy will propose tailored actions to address specific gaps identified, including broaden geographical distribution and sector coverage. In terms of geographical distribution, it will address the participation of countries with great potential to be deployed and in particular EU13, while increasing the performance of EU15. Increasing awareness of BBI JU in underrepresented regions should remain as a priority, and would contribute to increase innovation through cooperation projects with the support of dedicated policy measures. In terms of sector coverage, it is essential to maintain and enhance even more SME participation in future BBI JU Calls from less represented sectors so that the full potential of the bio-based industries can be fully harnessed.

Moreover, BBI JU will continue its efforts to establish synergies with SME-dedicated EU instruments such as the Enterprise Europe Network, and the cooperation with dedicated instruments - such as SMEs clusters - that are crucial to leverage the participation of SMEs in the bio-based industries and the bioeconomy.

PART II

SME CASE STUDIES

The following case studies highlight the **success stories of 13 SMEs** with a diverse range of profiles. They show that BBI JU holds enormous opportunities for innovative SMEs in the bio-based sector.

Each case study highlights the motivations and drivers for the SME to participate in the BBI JU programme, opportunities and benefits, and contributions to the BBI JU initiative. The information was collected through a voluntary questionnaire addressed to 13 SME beneficiaries.

In order to have a balanced representation of SME beneficiaries, several criteria were considered for the selection of the companies presented, such as: location, type of action (RIA, DEMO, FLAG, CSA), size, origin of feedstock, industrial sector, roles and activities performed in the project.

The following companies are presented in their own words:

1. AEP Polymers (Italy)
2. Bio Base Europe Pilot Plant (Belgium)
3. Chimar Hellas S.A. (Greece)
4. Greensea Technologies (France)
5. IMECAL S.A. (Spain)
6. Katty Fashion (Romania)
7. MetGen (Finland)
8. Mial GmbH (Germany)
9. Milis Energy Società Agricola (Italy)
10. Mi-Plast (Croatia)
11. Nomasico Ltd. (Cyprus)
12. Ocean Rainforest (Faroe Islands)
13. Ritols Ltd. (Latvia)



Milis Energy Società Agricola Srl



NomaSico



AEP POLYMERS

LOCATION	Trieste (Italy)
ESTABLISHMENT YEAR	2013
SIZE	6 employees
NUMBER OF PROJECTS	2 RIAs (VIPRISCAR, SmartLi) 1 DEMO (Reinvent)
BBI JU GRANT	0.74 MEUR
SECTOR	Chemical & Industrial biotechnology
WEBSITE	www.aeppolymers.com



AEP Polymers is an innovation-based SME, specialized in industrial R&D in the field of industrial building blocks, polymers and formulations from bio-based, non-edible purified biomasses and oils, with applications in composites, polyurethanes, coatings and adhesives. AEP Polymers aims to explore new valorisation routes in order to offer to the market bio-based monomers and polymers having at least the same technical performances as their commercial fossil-based counterparts.

The business model is based on four revenue streams:

1. Industrial Cooperation Agreements with industrial Partners, for the dedicated development of new bio-based polymers and tailor-made formulations;
2. Consultancies for third Parties;
3. Sales of low volume, high value product for functional coatings;
4. R&D funded projects.

AEP is located in the AREA Science Park of Trieste (Italy), one of the main multi-disciplinary technological and scientific parks in Europe. To support the growth of the business, it has recently doubled the size of the R&D laboratory and planned to select new employees. The value of production in 2017 was around € 0.5M.

Main motivations and drivers to participate to the BBI JU programme

Thanks to previous experiences in FP6, FP7 and ERDF programmes, AEP Polymers was already, since 2013, very active in exploring grant opportunities for R&D collaborative projects. We discovered the BBI JU opportunities in 2014 thanks to business development meetings with European companies and RTOs, one of which invited us to join the [SmartLi](#) (RIA) consortium. We decided to proactively participate in the BBI JU programme to explore new opportunities in the bio-based economy, differentiate our activities through the valorisation of different biomasses and to expand our network of qualified contacts across Europe. In our first project ([SmartLi](#)), we were able to cover two industrial applications (epoxy and polyurethane systems) and provide WP management. AEP Polymers also joined [Reinvent](#) (DEMO) upon invitation from a partner of a past FP7 project. The company actively cooperated with upstream and downstream partners to decide the most promising valorisation routes able to fulfil the technical

requirements of the materials to be produced, and it offered its portfolio of business contacts in the polymers' industry to complete one value chain with the necessary partner.

Opportunities and benefits

The BBI JU programme has allowed us to develop new knowledge in the use of low TRL, developmental bio-based materials in the polymers' industry, to expand our network of qualified contacts across Europe and to build our company's reputation, which facilitates new business opportunity. The industrially driven BBI JU programme fits the intrinsic nature of AEP of facilitating the new products development, acting as a bridge between RTOs and industrial manufacturing partners. The BBI JU projects have been an excellent occasion to strengthen AEP Polymers' cross border collaboration with other companies and RTOs as well as to broaden their portfolio of competences and developed products in different value chains. The income generated by the projects has been supporting the company's growth in parallel to the other revenue streams.

The work carried out in the project [SmartLi](#) allowed AEP Polymers to perform application testing on many lignin grades in thermosetting polymers, demonstrating the industrial usability of the most performing ones in polyurethane foams and epoxy and polyurethane adhesives. Through a final business case AEP Polymers demonstrated that the use of lignin in the industrial applications of interest for the project can be economically sustainable, recommending further developments to improve their adoption by industry and their performance properties.

Contribution to the BBI JU initiative

All AEP Polymers's activities are strongly oriented towards industrial utilisation of the developed products. The company's assessment method is based on benchmarking the performance of bio-based products against those of fossil-based counterparts through multi-level testing protocols, designed on the basis of its industrial experience to understand the usability of new bio-based candidates.

AEP's main achievement in [SmartLi](#) was to bring an industrial perspective in the study of different types of lignins, which allowed to focus on the more promising ones and to highlight their performance advantages, namely improved fire reaction properties in rigid polyurethane foams and enhanced adhesion strength in epoxy and polyurethane adhesives.

AEP Polymers selected and optimized lignin dispersion methods easily scalable on the industrial level and acquired a wide knowledge in the troubleshooting of lignin-based polyurethane and epoxy formulations, essential to bring those bio-based materials to further industrial developments. The company also contributed to explore new value chains from lignocellulosic biomasses to rigid foams for thermal insulation and industrial adhesives, promoting the cooperation of companies of different sectors through their role as work package leader. AEP Polymers also created novel bio-based building blocks with very good performance properties for polyurethane and epoxy formulations, which may open new routes of industrial exploitation in the next years, when modern depolymerization and separation technologies should make the liquefaction of lignin easier and economically viable.

Through the maximization of the lignin content in [SmartLi](#), AEP Polymers contributed to create formulations with lower environmental impact and GHG emissions, as demonstrated by LCA study. The work contributed to the exploration of the industrial applications of lignin, which are expected to support the value gain of the pulp and paper industry and to strengthen the regional development especially in Central and Northern Europe, where the forest-based industry finds its larger diffusion.

BIO BASE EUROPE PILOT PLANT

LOCATION	Ghent (Belgium)
FOUNDED	2009
NUMBER OF EMPLOYEES	70 employees
NUMBER OF PROJECTS	6 RIAs (AFTERLIFE, CARBOSURF, iFermenter, NEWPACK, PROLIFIC, ReSolve) 2 DEMOs (DEMETER, PULP2VALUE)
BBI JU GRANT	5.65 MEUR
SECTOR	Industrial biotechnology
WEBSITE	www.bbeu.org



The Bio Base Europe Pilot Plant is a flexible and diversified open access pilot plant for the development and upscaling of new, bio-based processes. It is capable of scaling up and optimizing a broad variety of bio-based processes up to an industrial level (from 5L to 15m³ scale), and it can perform the entire value chain, from the resources up to the final product.

BBEPP intends to close the gap in the innovation chain of the bio-based economy, bridging science and industrial production. It is operating according to the open innovation service model: both companies and research institutes throughout the world, active in the bio-based economy, can make use of this test facility for their technological developments. BBEPP was selected by the European Commission as a multi-KET Pilot Lines demonstrator (www.mkpl.eu), and won the Regiostars 2017 award with the project Bio Base NWE. The Bio Base Europe Pilot Plant started its first operation in 2010, becoming fully operational in 2012.

Main motivations and drivers to participate to the BBI JU programme

The Bio Base Europe Pilot Plant is a co-founder of BIC, the Bio-based Industries Consortium. We were aware of BBI JU from the very beginning and actually stood at the cradle, as we realized that the European bioeconomy would greatly benefit from this initiative, as this was the only way to keep the exploitation of bio-based innovations largely inside Europe. Before BBI JU a lot of promising European discoveries were in fact exploited in North-America or Asia.

Our mission is very similar to that of BBI JU, aiming to develop the bio-economy in Europe. The Bio Base Europe Pilot Plant works for this goal by offering their equipment and expertise in an open innovation setting to anybody in need of pilot and demo-equipment. As such, it stands in between technology developers and companies with bio-based products on the market. Through this extended network, we are regarded as a reference, also for participating in BBI JU projects. We are often invited to join BBI JU project consortia, and when we see a call that fits our expertise, we also coordinate applications.

Opportunities and benefits

As a service provider, we need to keep confidential the bilateral projects that we undertake. In BBI JU, communication about the impact of the funded projects is key. BBI JU allowed us to publicize our expertise and accomplishments, and to disseminate the impact that we leverage by the work done at European level and worldwide.

The outcome is that we are currently well known in Europe and beyond. Thanks to BIC and BBI JU, we now see that companies, for instance from the US, are coming to Europe and start manufacturing their innovative products in Europe. We also play a role in this, as we assist in scale-up and production during market introduction. The main challenges that BBEU typically addresses in projects are related to the scale-up of new processes to pilot and /or demo scale, including:

- To provide sufficient sample material for testing the new component in end-applications;
- To assess the robustness of the process at industrial scale;
- To provide data to enable the calculation of techno-economic viability and life cycle assessment of the process.

Contribution to the BBI JU initiative

The Bio Base Europe Pilot Plant is involved in several BBI JU projects. The first ones, started in 2015, are now ending. We see it as a main achievement when the products that we worked on are launched on the market. The [Carbosurf](#) (RIA) project, for instance, resulted in three biobased product leads of which two are already on the market and one is about to be introduced. The products that BBEU works on are often new-to-the market, and they only reach the market if they have a clear advantage over traditional products. Health benefits, regulations limiting the use of the traditional products, and economic benefits are the most powerful drivers in this regard. Since BBEU is involved in process-optimization, it has an influence on the techno-economics and the environmental footprint of the processes that are improved during the course of a project. BBEU is also coordinating one CSA project, [Pilots4U](#), where they are setting up a European network of open access pilot facilities. With that project, BBEU is trying to provide all European companies in need with access to a scale-up facility fitting their needs. The company envisions this as regional development, and as lowering the bar for any company to develop industrial production of their new product.

CHIMAR HELLAS S.A.

LOCATION	Thessaloniki (Greece)
FOUNDED	1977
NUMBER OF EMPLOYEES	30
NUMBER OF PROJECTS	1 RIA (Pro-Enrich) 1 FLAG (EXILVA)
BBI JU GRANT	0.44 MEUR
SECTOR	Materials
WEBSITE	www.chimarhellas.com



Chimar Hellas S.A. develops and provides all over the world competitive chemical technology, R&D and engineering services for the industrial production of adhesives and chemicals as well as for their application in the industrial manufacture of wood-based panels or composite panels. The wood panels are used mainly in furniture making and building construction. The company is strong in introducing new chemical products and technologies in its field of activities, in solving industrial problems through R&D and meeting the most stringent requirements worldwide.

Focusing on environmentally friendly products and technologies and promoting eco-efficiency and sustainability are the core principles of CHIMAR. Since the early 1990s, the company has been developing bio-based adhesive systems for wood panels, by substituting their petrochemical raw materials with renewable ones derived from natural biomass materials and wastes. Bio-based adhesives developed by Chimar have been evaluated in the production of wood panels at laboratory, pilot and (the most successful ones) at industrial scale, in direct comparison with commercial adhesives. For instance, the lignin-based resins developed in cooperation with UPM as well as the engineered biopolymer-binders developed in cooperation with EcoSynthetix are produced industrially.

CHIMAR counts an international experience of over 40 years, starting back in 1977 when its predecessor company was founded by the Markessini family. Its technology has been applied via licensing agreements in numerous industrial plants in more than 40 countries. Today, the wood panels produced each year using CHIMAR technology and services account for over 10% of the global wood panel production. In 2013, CHIMAR lab became the very first lab in Greece accredited according to EN ISO/IEC 17025 for formaldehyde testing as per EN ISO 12460-3 & 5. The following year CHIMAR was nominated National Champion in the Exports category of European Business Awards. In 2018, CHIMAR relocated in a new facility in Thessaloniki, Greece, integrating its laboratory, pilots and offices in one building. CHIMAR team consists currently of 30 people and in 2017 revenues reached € 2.3 M.

Main motivations and drivers to participate to the BBI JU programme

Chimar is strongly involved in the development of technologies for the production of bio-based chemicals (adhesive systems for wood products) in the framework of self-funded or EU R&D projects. Through this

work, it aims to be part and to support the bio-based economy, and that is how it became aware of BBI JU.

Chimar is committed to developing and providing the adhesive and wood panel industry with environmentally friendly product technologies safeguarding industry sustainability. Since the 1990s it has been developing bio-based adhesive systems for wood panels, by substituting their petrochemical raw materials with renewable ones derived from natural biomass materials and wastes. This commitment and the company's high expertise combined with the opportunity to explore and evaluate the functionality and applicability of a new biomass-derived material (i.e. micro-fibrillated cellulose, MFC) in its systems were the main drivers to participate in the BBI JU program. Moreover, Chimar appreciated the potential of being part of a strong team formed through an EU project.

CHIMAR was invited to the project by the lead beneficiary, who traced the company with the help of its consultant company. This partner had cooperated with the Chimar team in the framework of a previous EU project, in the field of circular economy and thus they were familiar with Chimar activities and expertise.

Opportunities and benefits

CHIMAR operates as a developer and provider of competitive technology and services for the industrial production of adhesives, chemicals and wood-based panels, having strong R&D expertise in and an already significant portfolio of bio-based adhesive technologies. By participating in the BBI JU programme, CHIMAR was able to explore and evaluate the functionality and applicability of a new biomass-derived material (i.e. micro-fibrillated cellulose, MFC) in its adhesive systems and thus enrich its bio-based product technologies portfolio. Moreover, CHIMAR was able to be part of a strong industry-oriented team, involving the key partner in the field of MFC industrial production and supply. This is intended to help reducing the time for the commercialization and market uptake of the new technology under development.

The new bio-based MFC adhesive technology are designed to provide CHIMAR with a business advantage over its competitors necessary to access new markets. Specifically, the market segments that give high priority to the use of renewable benign non-toxic raw materials will be easily accessible by CHIMAR through the technologies developed in the framework of [EXILVA](#) (FLAG), markets that would remain closed without this approach.

Provided that the goal of [EXILVA](#) is reached, Chimar will have developed a technology transforming a currently largely wasted functional biopolymer into a component of adhesive formulations. Currently the wood adhesive market is looking for alternatives, since formaldehyde, phenol and isocyanates are of high toxicity while the bio-based alternatives cannot satisfy market demand yet. Once the [EXILVA](#)-based adhesives are accepted by the market, Chimar could increase its market outreach by 15%, resulting in an improvement of its EBITDA by 40% within a 3 year period, as measured by previous similar breakthrough technologies invented and marketed by Chimar. Our biggest challenge in [EXILVA](#) is to develop MFC-based adhesive technologies that will combine performance, ease of use and safety under the umbrella of economic value for the final products, the wood-based panels.

Contribution to the BBI JU initiative

Chimar's target within [EXILVA](#) is to expand its knowledge and technology portfolio upon the utilization of natural biomass products and sustainable technologies in the field of adhesive systems for wood-based panels. The R&D work carried out in the framework of [EXILVA](#) on the use and applicability of MFC in adhesive systems for the production of wood-based panels has already revealed the main effects of the use of this material and the optimum ways of its application in this adhesives field. This was made possible thanks to our research and development facilities and the experience of our team as well as thanks to the excellent collaboration with the partner providing the MFC.

The work carried out by Chimar in this project is mainly oriented to wood adhesives and their reinforcement with the use of MFC, in order to improve the adhesive properties and bonding performance during the production of wood-based panels, commodities used in furniture making and building construction. If the use of such a bio-based material in adhesive systems for wood products proves beneficial, it could replace petrochemicals used for the same reason, thus creating new bio-based industrial value chains.

Lately, the concern of the industry all around the world about specific petrochemical components used in the synthesis of adhesive systems for wood-based panels has increased exponentially. The introduction of renewable natural components, which could potentially reduce the use of conventional petrochemical materials, thus decreasing the carbon footprint of the final products, is creating a high environmental and socio-economic impact, making the market much wider and acceptable from the concerned producers and consumers. Through the participation in the [EXILVA](#) project, Chimar contributes to the creation of knowledge on the use of MFC in adhesives for wood panels dedicated for the manufacture of furniture and housing parts.

GREENSEA SAS

LOCATION	Mèze (France)
FOUNDED	1988
NUMBER OF EMPLOYEES	17
NUMBER OF PROJECTS	1 DEMO (SpiralG)
BBI JU GRANT	1.14 MEUR
SECTOR	Aquaculture
WEBSITE	http://greensea.fr/en



Founded in 1988, Greensea specializes in the production of microalgae for a wide range of customers and applications. The company is well known for its production capacities, up to 100,000 liters instant volume, which have allowed for the supply of several microalgae families at commercial scale. Greensea has also experience in various extraction methods, allowing the company to offer added value above the single production capacity. The products offered range from macerated medium to proven active molecules. With a relative high R&D capacity for an SME, Greensea is active in the discovery and optimization of polysaccharides producing microalgae strains. Through its extensive knowledge of algal growth requirements and the manipulation of culture conditions (adapted from previously successful products development), the company has identified promising strains, both in terms of their production capacities, and their novelty.

Main motivations and drivers to participate to the BBI JU programme

Greensea was invited in 2017 to join a BBI JU proposal, offering the opportunity to have additional information about BBI JU ending up with the idea to prepare their own proposal. Greensea is currently at a turning point: “We have know-how and knowledge but we have to demonstrate our capacity to modernise, automatise and scale up, in particular our pigment extraction capacities.” For the company the main advantage participating in BBI JU projects goes beyond the financing for demonstration activities: is to build relationships and collaboration with complementary companies. The success is a very good communication tool, and “to communicate that a small size SME managed to go through a hard selection and evaluation process is very rewarding at scientific and industrial level.”

Opportunities and benefits

Participating in the BBI JU programme gave Greensea the opportunity to improve its know-how in automation. The extraction procedures were set up in the company to supply high quality phycocyanin and other pigments for various applications. However, two major breakthroughs were necessary to access the scale up: the integration of various big equipment working together and the implementation of a biorefinery concept in collaboration with other partners of the consortium. This structure enables to lower the production costs and to reach new markets and new clients. Moreover, automation is a key

helper in controlling the bacteriological level, which is key in the process. Currently, Greensea is competing at European level to become a main supplier of natural blue pigments extracted from algae.

Contribution to the BBI JU initiative

The aim of Greensea is to expand research and development to render the production of food grade phycocyanin cheaper and safer. This will contribute to answer to partners and clients' needs and requests. Greensea's goal is to unlock key points at the mixing level and the extraction procedure, followed by the filtration at various steps in order to deliver a useful product to partner industries. The solution presented is a biorefinery in order to valorize all the by-products. In order to achieve this, Greensea mobilizes several researchers and engineers. Through the participation in [SpiralG](#) project, Greensea contributes to the creation of knowledge, since the company is strongly focus on R&D to deliver appropriate extraction and conservation solutions. This intends to be a sustainable approach: algae are cultivated and not harvested, so they contribute to the CO2 recycling. The pigment extracted is FDA approved which explains why major companies seek phycocyanin at world level. The participation in a DEMO project is pivotal, since it is designed to allow validation of the complete process at a scale and with equipment representative of large-scale operations, showing also the project partners that their innovation can address the market. Overall, Greensea contributes to de-risking future flagship projects.

LOCATION	L'Alcudia (Spain)
FOUNDED	1979
NUMBER OF PROJECTS	1 RIA (PERCAL) 1 DEMO (URBIOFIN)
BBI JU GRANT	2.43 MEUR
SECTORS	Waste processing / Recycling
WEBSITE	www.imecal.com



IMECAL S.A. is an SME founded in 1979 in L'Alcudia (Valencia) as an engineering company in the metal sector, manufacturing metal-mechanical equipment for civil works, petro-refineries and petrochemical, transportation, refrigeration industry, industrial auxiliary motor and ceramics industry, among others. The innovation department of the company started its activities in 2004 for the development of its patented technology and process PERSEO Bioethanol®, aimed at obtaining bioethanol from the Organic Fraction of Municipal Solid Waste (OFMSW), jointly with CIEMAT. In 2007 IMECAL built a 2G bioethanol semi-industrial plant with a capacity to process 25 ton/day of OFMSW. Since then, several projects have been performed to improve the process and the technology. IMECAL is currently working on several EU projects for the development of additional process routes to valorize the whole OFMSW using its patented technology.

IMECAL participates actively in national and international conferences on the valorisation of the OFMSW and of biofuels. In 2017, the company was awarded with the “Innovative SME Seal” from the Spanish Ministry of Innovation.

Main motivations and drivers to participate to the BBI JU programme

The innovation department team of IMECAL has been very active in developing a network of collaborators working in the field of waste valorization. Throughout this partners' network, all potential initiatives addressed to reduce waste are continuously assessed. The BBI JU Call offered all of us a unique opportunity to demonstrate the potential of our PERSEO Bioethanol® technology combined with others to contribute to solve the large problem caused by the increasing generation of MSW. These initiatives have allowed us to get in touch with many other players working in field, who pursue the same objectives, thus joining efforts to move towards a circular bio economy.

The [URBIOFIN](#) (DEMO) and [PERCAL](#) (RIA) projects were prepared together with technology and research centers specialized in the field of waste valorization. This allowed a wide vision of the potential of combining technologies to achieve an integral and efficient biorefinery concept. Additionally, all stakeholders in the value chain (waste management entities, technology providers, intermediate/end-products developers and end-users) provided an essential feedback to understand the technological, economic and market constraints. The main motivation for us to participate in the BBI JU program is to reach the market with a feasible process developed for our company and perfectly aligned with the BBI JU goals and values.

Opportunities and benefits

The BBI JU program has offered us the possibility to put IMECAL on the map, as an outstanding company in the field of MSW valorization and municipalities, as well as to valorize our PERSEO Bioethanol® technology. The visibility of IMECAL has been reflected in a greater presence in conferences as speaker and in its involvement in relevant working groups in the field of waste management, both at national and European level. The ongoing projects have allowed the company to increase its staff in several sections of the company, such as the innovation and the engineering departments. Even though the current research investments have not produced direct revenues, these BBI JU initiatives are key for the successful market entrance of our technology in the coming years. According to IMECAL, the main challenges of large demonstrative projects, such as [URBIOFIN](#), are related to unforeseen technological constraints. Every step is assessed at the proposal stage. However, the process development at large scales has a higher degree of complexity: the project opportunity reduces the technological risks of IMECAL's process in the first industrial plant.

Contribution to the BBI JU initiative

Our projects are still at the initial stage. We are convinced and enthusiastic about being able to demonstrate the goodness of our process and its potential contribution to the reduction of MSW, offering high-value, marketable and sustainable building blocks and bioproducts. The aim of IMECAL is to provide new competitive, sustainable and environmental friendly solutions to the current limitations of the MSW management. [URBIOFIN](#) and [PERCAL](#) projects will contribute to create new bio-based value chains starting from OFMSW. Advancements in this field will also support the generation of new regulations and policy recommendations as well as the development of EU and national initiatives to reduce waste.

KATTY FASHION

LOCATION	Iasi (Romania)
FOUNDED	2003
NUMBER OF EMPLOYEES	51 employees
NUMBER OF PROJECTS	1 RIA (NeoCel)
BBI JU GRANT	34,735 EUR
SECTOR	Textiles
WEBSITE	www.katty-fashion.com



Katty Fashion is specialized in short runs production of women's wear. Its mission is to provide quality manufacturing services to European apparel brands. After starting with only 16 employees and a sub-contracted production, KF currently owns a production facility with 51 high-skilled people, specialized in short runs production of all categories of women's wear. Our team has the expertise and know how to handle projects of any complexity, as we are a regular supplier for over 50 mid to high range European fashion labels, achieving in the last 3 years an annual turnover of around EUR 1 million. Ethical work environment and environmentally sustainable production processes are at the core of Katty Fashion's value system. The company is located in Iasi, the most important economic center in north-east of Romania, and is a member of the Romanian Textile Concept Cluster Bucharest, the European Technology Platform for the Future of Textiles and Clothing, and of the Ethical Fashion Forum.

Since 2009, Katty Fashion has participated as partner in 3 European funded projects: [Neocel](#) (H2020-BBI JU), [InKreate](#) (H2020-ICT) and [E&E Fashion](#) (Erasmus+), and is the main founder of Reginnova NE, a professional non-profit association established to support innovation and sustainable development of the clothing industry in the North East Development Region of Romania.

Main motivations and drivers to participate to the BBI JU programme

In October 2015 the Technical Research Institute of Sweden (SP) proposed Katty Fashion to participate in the BBI JU 2015 Call, as an industrial partner with relevant expertise in the production value chain. SP, together with Innventia, Södra and VTT, was looking for industrial partners for Södra Cell with relevant expertise in the production value chain (e.g. process equipment manufacturers, staple fibres/filament/film producers, yarn spinners, fabric & non-woven producers, and possibly fashion retailers and composite manufacturers).

The project's main goal was to develop innovative processes for sustainable production of high quality fibres from reactive high-cellulose pulps in connection to existing pulp mills. Being fully aware of the major negative impact of the present models of garments production and consumption under both social and environmental aspects, and also, being a company aiming to grow in a sustainable way, we adhered to this consortium as pilot partner to test the new fabrics based on sustainable viscose yarns production to create high fashionable and sustainable apparel.

Opportunities and benefits

Since 2010, we have been developing a project of our own, the Concept of Eco-Chic Ethical Wear: creating high fashionable collections using 100% sustainable materials, to fulfil social responsibility of maintaining and protecting the local and global environment while offering beautiful and ecologically healthy clothing. Katty Fashion's team saw the possible benefits of [NeoCel](#)'s results for developing its concept by designing new collections of garments based on viscose sustainable fabrics, thus consolidating its business and creating a leap in value for the company and its customers.

NeoCel is an innovative project aiming to manufacture a novel type of synthetic cellulose textile fibres with major impact for the textile and clothing industry. Its results are expected to demonstrate the potential for new environmental friendly textile production, to raise consumers' awareness and to increase the market uptake.

Viscose based fabrics are increasingly used to produce fashion products because of their hygienic-functional qualities, similar to those made of natural fibres of cotton or silk, as well as their aesthetic and processing features: soft touch, nice draping, stable and easy to iron. They can be used to develop a great variety of garments, which customers often prefer in viscose material compared to those made of polyester or polyamide yarns. Moreover, Katty Fashion has built new beneficial partnerships which could lead to future projects and collaborations.

Contribution to the BBI JU initiative

The [NeoCel](#) fibres are expected to be of higher quality than standard viscose but produced at lower operating cost and with lower environmental impact. Katty Fashion's role in the project is to demonstrate that the fabrics obtained from the [NeoCel](#) yarns can be successfully used in the clothing industry for the fashion market, gradually replacing cotton based materials, whose production has a strong negative impact on the environment. So far, the company has produced a series of prototype garments based on viscose and modal woven obtained in the project with current technology, as reference samples to be compared with the prototypes that will be designed in the last months of the project's implementation. The new products will be based on fabrics obtained from the new [NeoCel](#) fibres. Katty Fashion's partners have also tested several innovative treatments to improve the features of those fabrics, both under hygienic-functional and aesthetic aspects, in order to obtain high fashionable and sustainable fabrics for the fashion industry.

METGEN

LOCATION **Kaarina (Finland)**

FOUNDED **2008**

NUMBER OF EMPLOYEES **24 employees**

NUMBER OF PROJECTS **3 RIAs (BIOrescue, UNRAVEL, WoodZymes)
1 DEMO (BIOFOREVER)
1 FLAG (SWEETWOODS)**

BBJ JU GRANT **8.76 MEUR**

SECTOR **Industrial biotechnology**

WEBSITE **www.metgen.com**



MetGen, based in Kaarina, Finland, was founded in 2008 and is currently backed by some leading venture capital investors and an industrial partner. MetGen's core competencies lie in protein engineering and the company has gathered an international team of 24 dedicated professionals, highly experienced in genetic engineering, microbiology, and industrial biotechnology, sales, marketing, and customer support. Together the unique set of competencies form a technology platform – ENZINE® - capable of producing new and novel enzymes at industry-leading speed: less than 6 months from the idea to the industrial supply.

MetGen's enzymes – MetZymes® – are industrial, highly-active, natural catalysts that accelerate chemical reactions. MetZyme® are designed to survive in harsh industrial environments, enabling novel applications and combination with other enzymes in complex value chains. MetGen uses advances in genetic engineering and microbiology to adapt enzymes to these harsh industrial conditions and to handle a variety of lignocellulosic substrates. These enzymes permit Wood-to-Chemicals processes, and with that, a source of more sustainable and renewable chemical building blocks for improved products and materials.

MetGen aims to significantly contribute to the economics and sustainability of industry processes, such as pulp & paper, biofuels, and biochemicals: MetGen's mission is, in fact, to empower industries to get more value out of lignocellulosic biomass. The company is pursuing this goal by direct sales of industrial enzymes as well as licensing of technologies.

To this date, MetGen has been awarded a total of € 12.4 M through the EU H2020 grants for 9 ambitious projects. Other recent awards and recognitions include: The John Sime Award for Most Innovative New Technology at the European Forum for Industrial Biotechnology and the Bioeconomy (EFIB) in October 2016, the Millennium Distinction Award from the Technology Academy of Finland for Finnish biotech company, in November 2017, and it was also a Finalist of the 2017 Pulp & Paper International Awards for Innovation in Cellulosic Applications.

Main motivations and drivers to participate to the BBI JU programme

MetGen is interested in the opportunities related to pulp and paper, biorefineries, biomass utilization, circular economy and sidestreams, especially water and biogas. MetGen supplies a wide variety of enzymatic solutions to improve industrial processes efficiency: the development cycles to improve and create customer-tailored enzymatic solutions is short and customer-friendly.

Working in BBI JU projects enabled MetGen to expand its contact network, and find cooperation possibilities in its strategic focus area, lignocellulosic biomass conversion, in multiple segments. MetGen has always believed in the strength of collaboration: open innovation throughout the value chain has proven a powerful tool to impact the industry far beyond what would be possible as an SME working alone. MetGen has chosen to support the development of its novel technologies from lower TRL levels to commercial products and industrially integrated technologies gradually through collaborative projects. BBI JU perfectly fits the strategy.

To work on a demonstration, research or business case, the BBI JU programme provides an ideal platform to proceed to solve a specific challenge at hand, where large-scale operators and small size businesses work side by side. With the frame of reference provided by BBI JU Calls, the project cooperation partners have an easier task identifying each other and seeking mutual ground to work upon. None of the partners could complete the casework by themselves, but cooperation and support allowed them to advance in developing new bio-based economy solutions, with joint forces.

Opportunities and benefits

Through the BBI JU programme, MetGen has been able to move forward in three key areas: aiding the demonstration and deployment of novel technologies to enable new chemicals, building blocks, materials and consumer products to commercial level; developing value chain in linking biomass production through to B2B and B2C in the market; and setting up flagship biorefineries that show that bio-based materials can offer cost, performance, societal and environmental advantages to outperform current fossil-based alternatives.

BBI JU covers the entire value chain from biomass feedstock cultivation and harvesting / mobilisation to manufacturing of new products and their market penetration. The programme has provided an ideal opportunity for MetGen to increase the TRL levels of its products via controlled pilot and industrial level trials. As part of the BBI JU programme, a small company such as MetGen can collaborate with large industry players. As a result, MetGen has great opportunities to prove its place in the new value chain(s).

Contribution to the BBI JU initiative

MetGen's MetZyme® products – such as SUNO™ and PURECO™ – aim to revolutionize the production of bio-based chemicals by improving the productivity and economics of various processing steps in the biorefinery field. Working on BBI JU projects has allowed MetGen to cooperate with large-scale industrial operators, and have successful trials within their facilities.

The company has been able to work for their own objective, sustainable bio-economy, utilizing all the processing streams in projects such as [BIOFOREVER](#) (DEMO) where efforts focused on lignocellulosic feedstocks (especially non-food feedstocks such as spruce, poplar, and wood waste) and new value chains. In [BIOrescue](#) (RIA), MetGen has been able to showcase how hydrolysis enzyme technology customized to substrate and process can significantly reduce the time spent on biomass, increasing productivity and reducing equipment costs due to improved capacity requirements. MetGen is also part of the [SWEETWOODS](#) flagship project, where the consortium partners want to demonstrate profitable production of high purity lignin as well as C5 and C6 carbohydrates on industrial level from hardwood by establishing a biorefinery with throughput capacity 80 bdton/day. Unlike other existing biorefinery concepts, this plant utilizes all the fractions of the biomass feedstock. The successful implementation of the project will alter the concept of biorefineries, and provide a stable and competitive source of bio-based building blocks and materials to the market.

Within the BBI projects, we have participated in forming total of 18 new and complete value chains, with the aim on end-user products such as carbon binders, biobutanol, resin acid, FDCA, PEF, fertilizers, biodegradable nanocarriers, polyurethane products, MDF, fibre-bonding enhancers in paper, elastomer foams for insulation, polymer compounds for injection moulding, as well as platform chemicals, such as xylitol sweetener, lactic acid and lactic acid derivatives. The changeover from fossil-based and first-generation feedstocks to sustainable bio-based chemicals, materials, fuels, and energy improves the environmental impact of society and reduces CO2 footprint.

MIAL GMBH

LOCATION	Bad Zwischenahn (Germany)
FOUNDED	2014
NUMBER OF PROJECTS	1 DEMO (SpiralG)
BBI JU GRANT	0.56 MEUR
SECTOR	Aquaculture
WEBSITE	www.mial.eu



Mial GmbH was founded in 2014 and went into active business in March of 2015. It was financed by a team of business angels that hold more than 60 % of the shares. Mial positions itself both as producer of organic microalgae with a focus on Chlorella and as a nutraceutical product company. The nutraceutical ingredients are partly algae based but also use appropriate plant derived ingredients (e.g. arabinoxylan and glucosinolates). Mial follows an indication-based approach and targets mainly inflammatory events and supplies products that modulate the immune system. Currently Mial is separating the two lines of business into a pure algal company and a pure nutraceutical company. The main indication will be the market of adjuvant/complementary oncology, i.e. by reducing the side effects of chemotherapy.

Main motivations and drivers to participate to the BBI JU programme

From the very start Mial established a scientific and business network with various French companies to expand market access and product opportunities. There was interest in extending the Chlorella product portfolio with ingredients from Spirulina and immune modulatory carbohydrates from macroalgae. The EU bio-based economy provides both market access and access to new scientific networks. Mial regards networks as extremely important as they expand the knowledge base of our company. It speeds up the process of growing as a small company.

We decided to apply for the BBI JU Call because it could be perfectly integrated into Mial's product development strategy. Beforehand Mial had had contact to several partner within the consortium and was convinced that we could establish a very good working relationship, based on mutual interests and very similar perspectives. Joining the proposal was constant work in progress that was very well coordinated by the Greensea team until the final version was finished. The consortium consists of an ideal group of partners who can equally contribute to the common goal but also can use the network for the improvement of the regular business activities.

Opportunities and benefits

Mial profits from the general networking situation. Spirulina and products derived therefrom are part of the core business of Mial. Mial seeks to expand the product pipeline and get access to premium quality products. In addition the economic work packages that Mial is responsible for will hopefully provide valuable answers on market structure, consumer behaviour and the right approach to set up the bio-

refinery approach of [SpiralG](#) as a viable business entity. Access to additional markets for our products is one important benefit for Mial and at the end it should result in more income and growth for the company. Still more important may be, for a small company like Mial, to exchange ideas, discuss critically within the consortium and find new answers to the challenges of an algal industry that can only compete via product quality and by creating new, innovative products.

The main challenge for a biorefinery project is to create high value products from no or low value products or “waste” materials. An additional challenge will be to maintain trust among the SME partners, in order to openly discuss business aspects.

Contribution to the BBI JU initiative

Mial will provide new solutions to make use of cell wall fractions and carbohydrates of spirulina after the phycocyanin has been extracted. It will thus create a new line of products based on new carbohydrate fractions. An in depth economic analysis will be provided to the consortium addressing markets, consumers and items relevant for a successful business. Mial brings in its commercial network of nutraceutical companies, main distributors for pharmacies and large supermarket chains. Mial is a developer of new consumer products with a very specific market niche. In addition we are developing new formulations and mixtures of ingredients that expand the product range of the [SpiralG](#) (DEMO) approach towards other indications.

Mial is marketing its products as clear/clean label products. We are constantly trying to reduce the energy requirements in our product development and production process. The concept of bio-refinery per se is the concept of using the resources in the most efficient way. As we create new products, we have to create knowledge and new markets where we can introduce our products. This starts with a profound scientific analysis of the new products, mode of action and physiological effects or benefits for the users. New products can also mean replacing similar products from other sources or competitors.

MILIS ENERGY

LOCATION	Milan (Italy)	Milis Energy Società Agricola Srl
FOUNDED	2009	
NUMBER OF PROJECTS	1 DEMO (SpiralG)	
BBI JU GRANT	1.38 MEUR	
SECTOR	Industrial Biotechnology	

Milis Energy Società Agricola (Milis Energy) is an Italian Renewable Energy Company operating a 12 MW Photovoltaic plant on greenhouses located near Oristano, in the Sardinia region. A member of the Cooperativa Produttori Arborea since 2013, the company is active in various agricultural production activities, including mushrooms and microalgae. It is one of the largest producers of mushrooms in Sardinia and among the largest Italian producers of Spirulina. Through its dedicated biotechnologists, Milis Energy studies, cultivates and transforms microalgae in order to obtain the following products, facilities and services: new bio-molecules for the food industry, new bio-molecules for pharmaceutical industry, new bio-molecules for cosmetics, CO₂ bio-fixation plants, bio-fuel like biogas, natural pigments, wastewater treatment plant. Milis Energy plans and realises plants for the cultivation and transformation of microalgae. The main microalgae products of Milis Energy are dried Spirulina microalgae for human nutrition and blue powder of phycocyanin from dried Spirulina microalgae for human nutrition.

Main motivations and drivers to participate to the BBI JU programme

Milis Energy wanted to access the international market of natural pigments for the food industry. This could be achieved by developing a new microalgae product line based on phycocyanin extracted by Spirulina microalgae. To this end, Milis Energy wanted to establish a partner consortium with microalgae producers, phycocyanin extraction companies and biomass valorisation companies. Therefore it participated to the BBI JU Info Day of June 2015 in Brussels, in order to understand how to develop its competitive proposal of phycocyanin extraction from Spirulina microalgae. The info day meeting was useful to get to know companies that could be involved in the project and to understand how to participate to the BBI JU programme. During the application process Milis Energy worked very closely with its partners and the shared efforts of the composed consortium allows to establish a feasible integrated value chain process for phycocyanin extraction and valorisation.

Opportunities and benefits

Milis Energy participation to the BBI JU programme enables to develop an important microalgae chain value. This allows to access international markets by proposing new microalgae product developed by the consortium team. Milis Energy will benefit from sharing know-how with BBI JU programme partners that will allow to acquire new technological skills on the microalgae compound extraction and processing. These competencies enable to upgrade the production process and to achieve stable and standardized quality of the microalgae product. Moreover, the cooperative work with the consortium partners allows

Milis Energy to develop new technology approaches for implementing other researches on different microalgae species.

In terms of main challenges, Milis Energy could have to face the impossibility of maintaining a high phycocyanin concentration in microalgae biomass. In this case Milis Energy will perform studies to make sure that the phycocyanin concentration in microalgae biomass remains stable during the project. If the phycocyanin concentration does not reach the percentage required, Milis Energy will enhance microalgae harvest rate in order to guarantee the required amount of phycocyanin.

Contribution to the BBI JU initiative

Milis Energy targets to guarantee a high quality of *Spirulina* microalgae production in Europe to satisfy partners and clients' needs and demand. The microalgae products will have high content value regarding certain compound (e.g. phycocyanin) and will be characterized by stable quality over time. The aim of Milis Energy is to lower the final microalgae cost by low workforce needs. This goal can be achieved by ensuring a high level of automation that allows enhancing the production process efficiency. Milis Energy contributes to the BBI JU initiative by cooperating with companies from different sectors and by increasing maturity of key technologies for the bio-based industries.

The programme provides the possibility to create a new bio-based value chain for the production and co-valorisation of microalgae-based products through the [SpiralG](#) (DEMO) project. As far as the environmental impacts are concerned, Milis Energy targets to reduce the energy required for microalgae production in comparison with the conventional microalgae way of cultivation and transformation. Milis Energy reduces electrical energy consumption by installing renewable and sustainable energy set-up (photovoltaic panels) on the top of the laboratory roof. Moreover, since Milis Energy wants to perform microalgae cultivation also during winter, the microalgae broth has to be heated. In order to reduce thermal energy costs for microalgae heating, Milis Energy will use heat produced by the anaerobic digestion plant located near the microalgae plant. As far as the microalgae cultivation is concerned, Milis Energy reduces the nutrient consumption required for microalgae cultivation. Milis Energy wants to use similar and cheaper products that can guarantee the required high quality level of microalgae product. These nutrients can be found in regional market in order to enhance local development. By hiring local staff and by organizing info days on plant activity promotion, Milis Energy wants to create and enforce awareness and knowledge of the local bio-based economy.

MI-PLAST

LOCATION **Rijeka, Croatia**

FOUNDED 1980

NUMBER OF EMPLOYEES 20 employees

NUMBER OF PROJECTS 3 RIAs (AFTERLIFE, HyperBioCoat, RefuCoat)
2 DEMOs (FUNGUSCHAIN, PULPACKTION)

BBI JU GRANT 1.65 MEUR

SECTOR Plastic

LOCATION www.mi-plast.eu/en



Mi-Plast was founded in 1980 in Banja Luka (Bosnia and Herzegovina). During the war in former Yugoslavia the company stopped the production in 1990, resuming again in 1993 in Rijeka, Croatia. From the very beginning, Mi-Plast focused as a core business on producing and transforming plastics into semi-final and final products. Recycling plastics and plastic products, obtaining new valuable materials from waste and bringing recycled materials into new products is at the center of Mi-Plast's business model.

Mi-Plast has been a family based company in the last 40 years, oriented towards new bio-based and sustainable plastic materials, products and solutions. The main products are re-granulates (plastic materials ready for transformation), and in particular a set of products entirely obtained from plastic waste, both from post-consumer and post-industrial waste. The products obtained are mainly used in the construction sector, agriculture and in the retail sector: agricultural mulch, shopping and garbage bags, construction film foils and lamination foils, food packaging etc.

Currently Mi-Plast is the most successful Croatian industrial representative in H2020, participating in 8 projects (including 5 BBI JU projects); among all participants it ranks third in Croatia and its representatives are leading expert groups in SC2 and SC5 in the country. Furthermore, Mi-Plast participated in the smart specialization S3 drafting for advanced materials and bioeconomy. Mi-Plast is also a full BIC member since 2014, and the first full member from East and South East Europe with active participation in BIC programming groups.

Main motivations and drivers to participate to the BBI JU programme

Mi-Plast became aware of the BBI JU Program thanks to contacts with BIC members who introduced the company to a potential project consortium. After becoming full member, Mi-Plast created an extensive network with relevant actors in the bio-based industry, including industries RTOs and others. This networking was crucial for the company's success. We decided to apply to the BBI JU calls for several reasons. We wanted to learn, see and establish bioeconomy routes in South East Europe similar to those of Western Europe. Apart from this, we wanted - and still want - to bring new bioplastics solutions which are really sustainable with clean and clear end of life options to replace the currently fossil based and bioplastics solutions. In fact, we see ourselves as a link between bioeconomy and new bioplastics materials obtained from the projects with the real market.

In order to participate in project proposals, you need to have an innovative idea but also find partners who are on the same page and want to move forward in the same direction. BBI JU Info Days and BIC one-to-one meetings helped us a lot to find relevant partners for topics that were relevant for us. Then we calculated and checked every step of the idea and the call, and we gathered around a consortium including partners with special expertise. It was very challenging start for a complete newcomer in H2020 research and innovation projects, but after some first hard steps, everything came to the right place.

Opportunities and benefits

BBI JU represents an industry driven program in which the participation of companies across production chain as end users is key. This enables us to upgrade the production process and shorten the commercialization time of our end product, which should be first and foremost sustainable and reliable, thanks to the cooperation within the consortium and to the understanding of our costumers' and real market needs.

Our company benefitted and will benefit from obtaining Intellectual property through the projects results. We aim to commercialize intellectual property assets and to bring sustainable products to the market. Moreover, competition is huge. When you prove yourself in the demanding European market, you show your value, and currently we have many requests for our products across all Europe.

Mi-Plast saw the possibility of creating new jobs and new opportunities in the long-term, even though the bio-plastic industry is still a niche market. For one SME it is a huge risk to put "all eggs in one basket" and currently across the EU there are 60-70,000 companies operating in the plastics sector, with 1.4 million employees and a huge turnover. The role of the SMEs is crucial: almost 90% of the companies are SMEs, and 80% of them are family based companies with 10-20 employees. Our primary goal is to invest in new production lines via ESIF funding and to prove ourselves as a local bio-economy leader not only within EU funded projects but also in a very competitive market. If we are performing well, then income and profit will come.

In the research and innovation project context Mi-Plast tried to direct all of its efforts at achieving full bioeconomy potential and to complement already existing recycling streams with bioindustry and biomaterials in order to achieve full impact of circular economy with clean and clear end of life options. We are part of the European bio-industry that is playing a crucial role in addressing new challenges in packaging and packaging waste requirements (94/62/EC Directive on packaging and packaging waste and its Amendment 720/2015 and new European Plastic Strategy).

Contribution to the BBI JU initiative

Currently, Mi-Plast is covering several key processes to obtain bio-plastic materials and products at various TRL, such as blown extrusion, cast extrusion, mono and co-extrusion, welding/sealing process, compounding, printing, coating, lamination, recycling and re-granulation, evaluation and characterization of obtained materials and final products from those materials etc. Our role in BBI JU projects is to provide the technological processes enabling transformation from monomers/polymers to the final applications

We believe that we are contributing to different KPIs and BBI JU goals through cross sector interconnections, creating something valuable and needed, for example new bio-based value chain for bioplastics. Furthermore, we are contributing to the production of new bio-based building blocks and/or materials or the market uptake of new consumer products based on bio-based chemicals and materials where we are contributing with our 38 years knowledge of plastics.

It is in our strategy to create a positive environmental and socio-economic impact of our products, where we should offer best and reliable solutions. By investing and adapting new equipment to improve resource efficiency of processes and products in general, we contribute to sustainability and to the reduction of environmental impact. Since we are pioneers in this activity in Eastern and South Eastern Europe, we hope that we can inspire and encourage other companies that are not aware of the potential of contributing to the bioeconomy in Eastern Europe.

LOCATION	Nicosia (Cyprus)
FOUNDED	2013
NUMBER OF PROJECTS	1 RIA (VALUEMAG)
BBI JU GRANT	0.4 MEUR
SECTOR	Engineering
WEBSITE	www.nomasico.com

Nomasico Ltd provides products and services in the fields of surface engineering, machinery manufacturing, and production automation. The company has an active research department involved in developing biorefineries and other machinery for publicly and privately funded projects on extraction of valuable products from Greek and Cypriot agricultural stock. Its team of engineers is capable of performing a series of analyses, laboratory experiments and acquisition of data, such as: modelling skills, including materials design by modelling, effective material properties of inhomogeneous materials, phenomenological thermo-mechanical models of materials response, micromechanical and multiscale modelling, damage and fracture, chemo-mechanical processes and transport phenomena.

Main motivations and drivers to participate to the BBI JU programme

Nomasico's long-standing cooperation with the department of Electrical and Computing Engineering of the National Technical University of Athens has resulted in new ideas for the development of biorefineries and for the extraction of valuable products from biomass.

The [VALUEMAG](#) (RIA) project aims to develop an innovative technology to cultivate algae at the lowest possible cost, much lower than the current cost of micro-algae cultivation, and integrate this with other new technologies in a pilot-scale biorefinery. The new integrated production system will have the potential to increase the efficiency and the environmental sustainability of modern biorefineries by lowering the cost of cleaner energy and to sustain food security. We knew that the project could offer value for the EU bio-based industries and therefore we decided to apply for the BBI JU call in collaboration with 10 partners (4 research institutions and 6 SMEs) from all over the EU. The shared effort and collaboration with partners was excellent, as reflected in the almost perfect evaluation given to our proposal. This was the result of a well-coordinated process by the NTUA and a highly responsive team, where every partner contributed with the best of their knowledge to design the project.

Opportunities and benefits

Since BBI JU represents an industry driven program, Nomasico believes that it enables the company to accelerate the development of novel products and services to the market. This is a result of both the support provided by the program, and the collaboration and networking opportunities that originate from interaction with other research and industrial partners.

The project has enabled Nomasico to grow its workforce and invest in the development of novel products that will likely provide a larger market share for the company in the future. Furthermore, the gained knowhow will improve the company's competitiveness and allow applying the acquired knowledge to additional market sectors. The cooperative work with the consortium partners provided the possibility for our company to advance our research and develop a network of partners with whom further collaboration is expected.

Contribution to the BBI JU initiative

[VALUEMAG](#) is a multidisciplinary and synergic project that seeks to develop a revolutionary solution for microalgae cultivation and harvesting in order to produce and purify high-value biomolecules in an affordable and environmentally friendly manner. To achieve this goal, a combination of diverse complementary competences and advanced technology will be put at the service of the project. The project is housed at the company's premises where the pilot biorefinery will be operating. Nomasico's role in the project is to develop the installation and the soft magnetic cone used to cultivate the microalgae.

Nomasico has also contributed to the development of techniques to infuse the microalgae with magnetic nanoparticle, thus ensuring their permanent adherence to the soft magnetic cone's surface. As such this SME contributed in setting new protocols based on electroporation to transform a large variety of microalgae and to optimize growth with limited amounts of water. Nomasico has also helped in the 3D design and simulation of the biorefinery, which was critical to identify and optimize the critical design variables. Finally, the company's experience in 3D design and additive manufacturing allowed to quickly develop and test prototype devices needed for various system components.

OCEAN RAINFOREST

LOCATION	Kaldbak (Faroe Islands)
FOUNDED	2007
NUMBER OF EMPLOYEES	10 employees
NUMBER OF PROJECTS	1 RIA (MACRO CASCADE)
BBI JU GRANT	0.54 MEUR
SECTOR	Aquaculture
WEBSITE	www.oceanrainforest.com



Ocean Rainforest was established in 2007, in the northern coastal region of Europe (Faroe Islands), with a clear vision of becoming a leading supplier of sustainable cultivated seaweed in open ocean environments. Its business model is based on seeding, cultivation, harvesting, processing into a storage stable condition and sales to the business-to-business market.

The company has developed a structural system for macroalgae cultivation in open oceans and related onshore processes for bringing the seaweed into a storage stable and sellable condition. The system has obtained international interest, and the company has been invited to conduct a feasibility study to apply the system to U.S. offshore conditions in the Pacific Ocean.

The offshore MacroAlgae Cultivation Rig (MACR) developed by Ocean Rainforest has since 2010 proven to be the state-of-the-art offshore seaweed cultivation system in the world: it presents higher growth rates while producing at lower cost if compared to other known offshore systems for similar seaweed species. The system is scalable, survivable; the growth is predictable and sustainable, and Ocean Rainforest has developed methods to make the production profitable. Since 2014 Ocean Rainforest has provided to the European food and feed market with high quality seaweed product at a limited scale.

We are currently investigating the possibilities to expand its processing capabilities to include also cascading fermentation and biorefinery processes of seaweed. This will enable the company to utilise the scalable potential and at the same time target high volume markets, such as bio-plastics, and high value markets, such as high-performance functional ingredients within the food, feed, cosmetics, and pharma.

The total income for 2018 is projected to be € 0.7 M (90% of this income is already secured). A significant growth is also expected in the years to come, targeting € 3.5 M in 2022. Ocean Rainforest currently employs 4 people of which 3 have MSc. Degrees, and in addition some occasional 4 to 6 workers. Having its quarters in islands, it is an example on a knowledge based and innovative company in a rural/costal region.

Main motivations and drivers to participate to the BBI JU programme

An important strategic activity for Ocean Rainforest is the participation in relevant R&D projects at national, regional and international level. The overall objective pursued through these projects is to

stimulate market demand for cultivated seaweed through further development towards technical and economic viable concepts of innovative food additives, cosmetics, pharmaceutical, marine proteins feed and biofuels.

We heard about the BBI JU Program for the first time at the Blue Economy conference in the Faroe Islands in 2015. That inspired us to submit the BBI JU [MACRO CASCADE](#) proposal, which was awarded a grant agreement in 2016. Since 2013 we have focused on building a network with R&D institutions and innovative industry with an interest in seaweed as a biomass. We utilised this network to build a strong consortium, and since then the collaboration among the partners has increased with new possibilities.

Ocean Rainforest participates in these projects as biomass supplier and pilot scale processor for fresh biomass, contributing with knowledge on large-scale cultivation and seaweed biomass for demonstration projects. For this contribution, Ocean Rainforest is to be awarded with project funding for R&D work and biomass supply in accordance with production cost and market price. In addition, we obtain knowledge about processes from capabilities that are beyond what they have in-house.

Opportunities and benefits

A key element in maintaining a competitive advantage is the focus on how to optimize the value from the cultivated seaweed resource. There is definitely room for improvement in this area, and there seems to be a huge international interest in obtaining this knowledge. However, being a small company, Ocean Rainforest can only afford these activities if the costs are partly or fully funded by national, regional and/or international R&D and Innovation funding programs.

An example of such a project is the BBI JU funded [MACRO CASCADE](#) (RIA), which aims to stimulate market demand for cultivated macroalgae through further development towards technical and economic viable concepts of innovative food additives, cosmetics, pharmaceutical, marine proteins feed and bio-fuels. Ocean Rainforest is very keen to use the output, in terms of increased yield (selective breeding) and energy efficient conditioning methods. In addition, a successful outcome from the R&D work on fermentation processes will increase demand for biomass on the short term (2-4 years), and the output of the biorefinery research and lab-tests will feed into the company on biorefinery strategies in the long term.

Contribution to the BBI JU initiative

The strategy in the short term (1-3 years), is to focus on the markets in Europe and North America, with dried and ensilaged seaweed products for food, feed, cosmetics and pharma, where the scale of production will be less than 100 tons dry weight (DW) per year, with an average price of DKK 143/kg dry weight (DW) – or €19.2/kg DW. The branding effort will strive to manifest Ocean Rainforest as a reliable supplier of high quality seaweed. The sales channels will mainly be business to business. During this period, the strategy also contains significant research and development activities with the objective to understand the concept of bio-refinery of the fresh biomass into a variety of product streams.

In the medium term (4-7 years), the strategy is to expand the annual production of cultivated seaweed up to 500 tons DW per annum. During this period, the concept of biorefinery will be implemented on a commercial scale. In the long term (7-10 years), the scale of production will be up to 5-10,000 tons DW

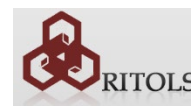
sold at an average price of €3,000-5,000/tons. This will only be possible if the production is based on a fully integrated bio-refinery concept with a combination of high and low value/volume product streams.

Ocean Rainforests does also provide marine ecosystem services with its activities: in order to grow the biomass, we only need light, CO₂ and nutrients already in the oceans. As such we will absorb CO₂ from the atmosphere (and thereby fighting climate change), use excessive supplies of nutrients (nitrogen and phosphorus) from agri- and finfish aquaculture, and provide biodiversity for fish and crustaceans. However, the value of these ecosystem services is still not fully appreciated by the polluting industries and society at large.

A commercial aspect of the R&D activities is also the potential to capitalize on the intellectual property built within Ocean Rainforest through technology transfer project. An example of such an activity is the MacroSystems project funded by the US Department of Energy through the ARPA-E Mariner program. Similar project might become relevant in Australia and Asia.

RITOLS LTD.

LOCATION	Riga (Latvia)
FOUNDED	1991
NUMBER OF EMPLOYEES	25 employees
NUMBER OF PROJECTS	1 DEMO (ReInvent)
BBI JU GRANT	221,000 EUR
SECTOR	Materials
WEBSITE	www.ritols.lv



Ritols Ltd. was founded as a spin-off company of the Latvian State Institute of Wood Chemistry polymer laboratory. Researchers of the polymer laboratory were well recognised experts of rigid polyurethane (PU) foam across the Soviet Union. After Latvia regained independence, they put their effort in creating and developing knowledge-based business in civil engineering and building renovation sectors.

The core business of Ritols Ltd. is delivering high efficiency thermal insulation materials, namely rigid PU foams for Latvia's construction industry. Furthermore, Ritols Ltd. has broad experience in renovation of different floors surfaces by applying high performance coating materials, like epoxy, PU and acrylic resins. Ritols Ltd. has not forgot its scientific roots and continues to cooperate with several R&D projects funded by the European Union as well as the Latvian government. Ritols Ltd. has previous experience in FP7 EU projects in the development of rigid PU foams from different renewable and recycled feedstock (tall oil, recycled PET, castor oil). Ritols Ltd. aims to become leading producer and applicator of high efficiency thermal insulation material based on sustainable feedstock: bio-based rigid PU foam in the Baltic region.

Main motivations and drivers to participate to the BBI JU programme

Ritols Ltd. was invited to the consortium by partners from a previous FP7 project. Project partners from the previous EU project offered to become partners of the project for the BBI JU Call. We decided to take part in this project because we saw its potential: it has a very strong and experienced consortium, very ambitious goals that will be challenging to fulfil. Nevertheless, the achievement of these goals would improve the competitiveness of the company by providing technology to produce and apply rigid PU foam thermal insulation which is derived from sustainable feedstock. High effectiveness of the proposed materials will allow to compete with state of art thermal insulation such as mineral wool and polystyrene foam. During the application process, Ritols Ltd. worked very closely with the other project partners and the coordinator, a very helpful process for all participants

Opportunities and benefits

The main opportunities that Ritols Ltd. got from joining the BBI JU Program are to work together with industry leaders from Western Europe, and the possibility to enable the development of high quality product in a shorter time, thanks to the cooperation with the project partners. Taking part in the BBI JU

project remarkably opens access to international markets and the creation of new green technologies for the construction industry.

The materials developed within the project allow to reach new market sectors, especially as more and more customers are willing to use green materials in buildings. The entrance in new markets supports the turnover growth and increases the revenues of the company, while enlarging the number of jobs in the production and site application departments of the company. The main challenge is to develop high quality polyurethane thermal insulation from renewable resources while maintaining competitive prices in comparison with similar petrochemical products. This will be demanding mainly because currently green technologies are more expensive than petrochemical products.

Contribution to the BBI JU initiative

Ritols Ltd. is driven by the goal of producing high-quality rigid PU foams from renewable resources and introduce this product into the construction industry. Our task in the project is to produce and test high efficiency thermal insulation material developed by other project partners, using Ritols' own industrial scale spray foaming equipment to up-scale developed formulations and to test this material feasibility.

The project [ReInvent](#) (DEMO) serves to demonstrate that renewable raw materials are economically feasible alternative to petrochemical feedstock and that the performance of produced thermal insulation is equal if not greater. The demand for high efficiency insulation materials is growing from the construction industry, due to the increasing cost of energy. Developed rigid PU foams will allow Ritols Ltd. to penetrate new markets by offering high performance materials, based on renewable raw materials.

Thermal conductivity value of rigid PU foam thermal insulation is one of the lowest among other common thermal insulation materials, like EPS, XPS foams, mineral or glass wool in construction industry. Low thermal conductivity allows to reach high energy efficiency levels of built or refurbished building (super insulated buildings) without significantly increasing the thickness of the insulation envelope. Polyurethane rigid foam insulation is, as such, most suitable for passive house industry, which is an emerging market in the EU. Use and application of developed bio-based thermal insulation material will allow to reduce CO₂ emissions not only due to replacement of petrochemical carbon, but also during the lifetime of insulated buildings due to lower energy demand.

ANNEX I – QUESTIONNAIRE TO SMEs

1. SME OVERVIEW

Please provide an answer by addressing the following questions:

1. When was the SME founded? / For how long has it been operating?
2. In which sector is it specialized? / What is the core business / value proposition?
3. Please provide the main figures/characteristics about the SME: location, size of the company, relevant certifications or awards obtained, revenue/value of the company (based on public information available).

Answer (10-15 lines)

Example of an answer:

For over 10 years, BIOSME has produced and distributed special enzyme solutions to its customers, enabling the bioeconomy for sustainable, bio-based products. Located in Finland, BIOSME is an innovative biochemical engineering company, specialized in the sector of enzymes production. Founded by the XY family, it witnessed a large success, having 35 people employed and committed to its values. BIOSME wants to develop an enzymatic technology treating renewable biomass to provide bio-based chemicals and materials industries with more environmentally friendly choices. The high quality enzymes created, contributed to the European-wide success of the company. Since 2015, BIOSME obtained also the European “Eco-technology” award, which certifies its contribution to bio-based products development.

2. MAIN MOTIVATIONS AND DRIVERS TO PARTICIPATE TO THE BBI JU PROGRAMME

Please provide an answer by addressing the following questions:

1. How did you hear about BBI JU before becoming a beneficiary?
2. What were the main drivers and motivations for participating to the programme?
3. Please describe the process to participate in the proposal and find relevant partners.

Answer (10-15 lines)

Example of an answer:

“Our team quickly saw the potential of the EU bio-based economy and decided to create a network of industries, receptive of this development”.

“We decided to apply for the BBI JU call because we knew we could come up with a competitive proposal, since through the project we are addressing a pivotal problem for the bio-based economy, such as the generation of a new integrated value chain”.

“During the application process, we worked very closely with our biomass feedstock suppliers, who were very willing to assist in all our requests. The shared effort of the consortium was helpful throughout the process and continues to be supportive. It was advantageous to work with all partners of the consortium to meet the criteria compliance”.

3. OPPORTUNITIES AND BENEFITS

Please provide an answer by addressing the following questions:

1. What are the main opportunities that your participation to the BBI JU programme has provided to your company?
2. Please comment on, for example: access to international markets, cross border collaboration, job creation, market share, sector diversification, income.
3. What are the main challenges you are addressing in the context of the project?

Answer (10-15 lines)

Example of an answer:

"BBI JU represents an industry driven programme in which the participation of companies as end users is key. This enables us to upgrade the production process and shorten the commercialization time of our end product, thanks to the cooperation with and understanding of our costumers' needs."

"Our company benefitted from sharing know-how with suppliers and clients. Moreover, acquiring new technological competencies provided BIOSME with the possibility to expand the market share, outreaching diversified chemicals and materials industries, resulting in a steady growth for our company in terms of profit and jobs."

"The cooperative work with the consortium partners provided the possibility for our company to advance our research and develop a technology that significantly decreases costs in the next step of the production chain for industries, resulting in costs cuts and higher profit for our clients and consequently distribute a more affordable end product."

4. CONTRIBUTION TO THE BBI JU INITIATIVE

Please provide an answer by addressing the following questions:

1. What are your main achievements/successes in the context of your project in BBI?
2. What type of contribution are you bringing to BBI initiative in terms of, for example:
 - cooperation with companies of a different sectors;
 - the creation of new bio-based value chains;
 - the production of new bio-based building blocks and/or materials;
 - the commercialization of new consumer products based on bio-based chemicals and materials;
 - the increase in maturity of key technologies for the bio-based industries?
3. What are your contributions to a positive environmental, or socio-economic impact, for example in terms of:
 - creation of bio-based products with lower GHG emissions;
 - improved resource efficiency in the production process;
 - regional or local development;
 - bio-based economy awareness raising;
 - the creation of knowledge or new markets?

Answer (20 lines)

Example of an answer:

"The aim of BIOSME is to expand research and development to provide tailor made enzymatic solutions that can adapt to partners and clients' needs and requests. Our job is to unlock high-value opportunities, facilitating the success of bioeconomy by delivering a

useful product to partner industries. The patented tailor made enzyme solution is assembled from completely new bio-based building blocks, which our company puts together thanks to our research and development laboratory and the experience of our team.”

“BIOSME enzymes operate at extremely low temperatures, allowing to preserve all the chemical components of the feedstock biomass. They unleash the possibility for industries to create brand new end products from different kinds of bio-based feedstock, exploiting the potentialities of the chemical components preserved by our enzymatic solutions. For example, in the project XXXX, we produced a totally new enzyme, the YYYY, that turned out to be very useful to preserve the chemical component BBBB as a side product of the pulp processing, allowing our client industry to produce, from a side stream, a highly resistant and flexible kind of bio-based plastics for packaging.”

“Through the participation in the project XXXX, BIOSME contributes to the creation of knowledge, since our laboratory focuses a lot on the research and development to deliver appropriate and tailor-made enzymatic solutions. At the same time, we contribute to resource efficiency: our enzymes exploit biomass feedstock and preserve chemical components, reducing the necessity to resort to fossil based products to extract the same chemical components.”

ANNEX II – ADDITIONAL GRAPHS

Fig. 1. Coordination role of SMEs, Calls 2014-2017 (absolute values)

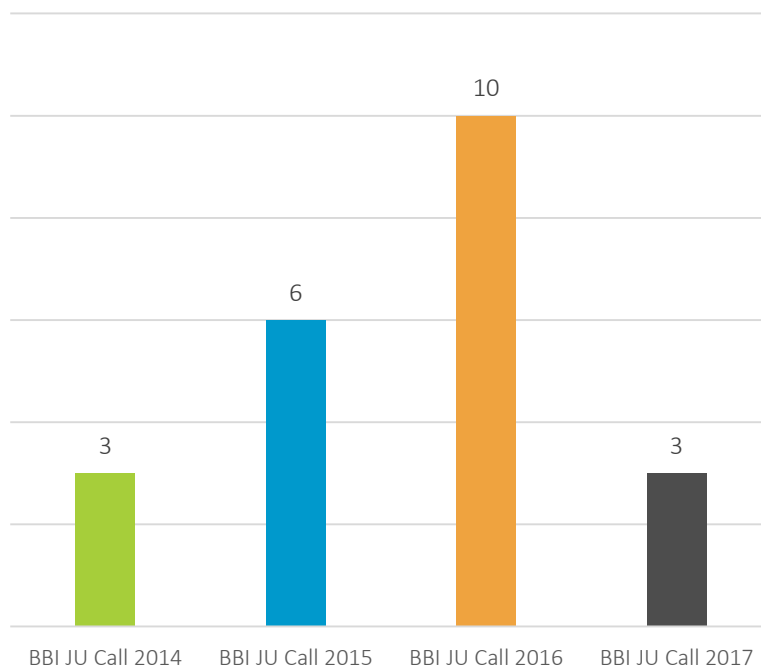


Fig. 2. BIC members among BBI JU's SME unique beneficiaries

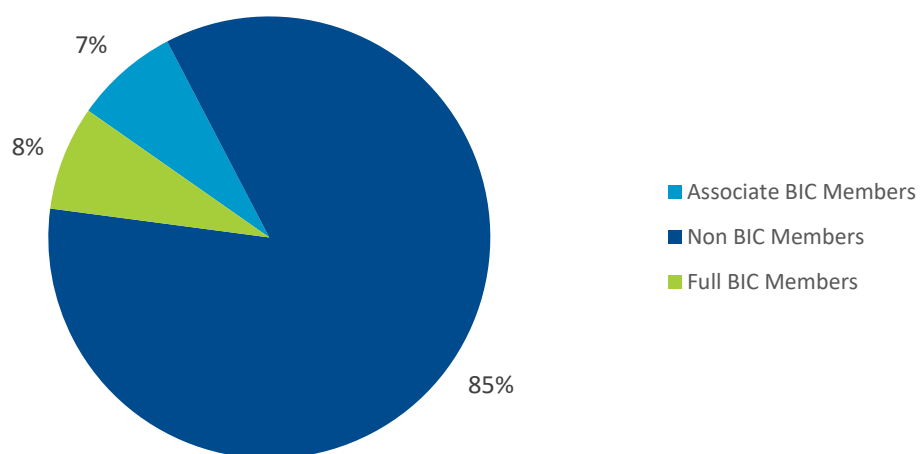
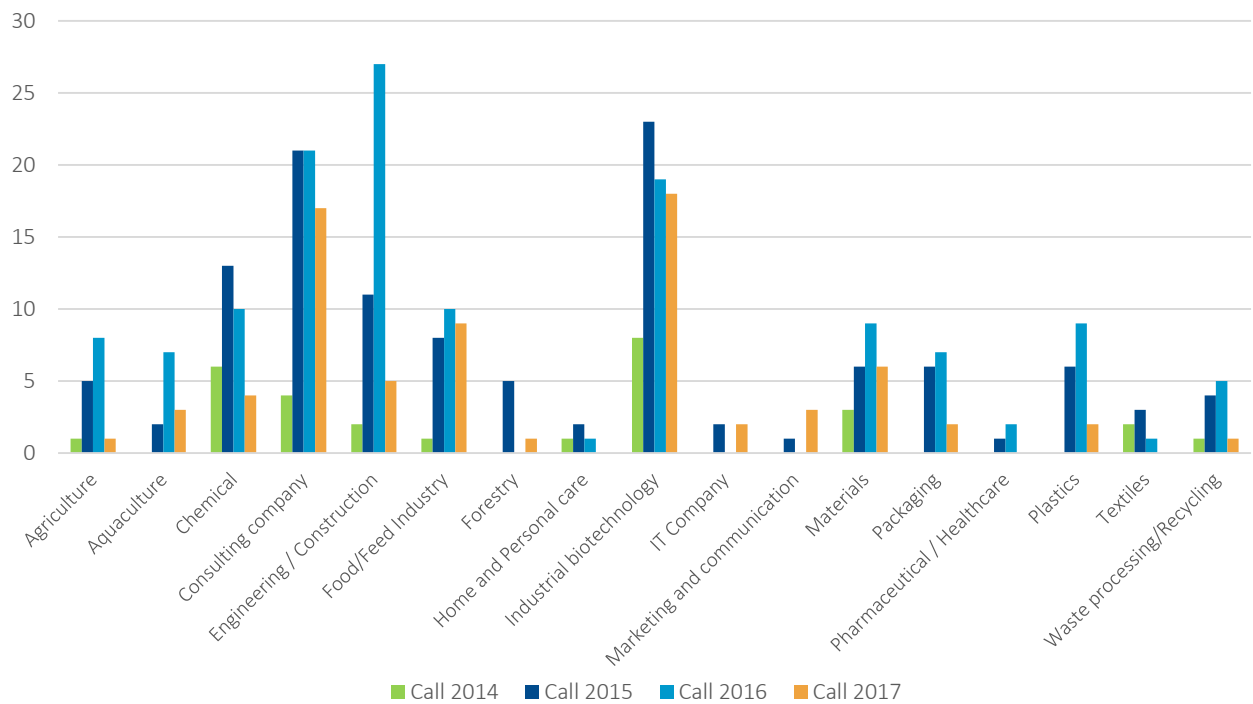


Fig. 3. Sector coverage of SMEs, Calls 2014-2017 (absolute values)



LIST OF ACRONYMS

BBI JU	Bio-Based Industries Joint Undertaking
BIC	Bio-based Industries Consortium
CEO	Chief Executive Officer
CO₂	Carbon dioxide
CSA	Coordination and Support Action
DEMO	Demonstration project (part of the Innovation Actions)
DG GROW	Directorate-General Internal Markets, Industry, Entrepreneurship and SMEs
EC	European Commission
EFIB	European Forum for Industrial Biotechnology and the Bioeconomy
E-CORDA	External Common Research Data Warehouse
EU	European Union
EU13	Member States that joined the EU between 2004 and 2013
EU15	Member States that joined the EU before 2004
GERD	Gross domestic Expenditure on R&D
GHG	Greenhouse Gas
H2020	Horizon 2020
IA s	Innovation Actions
ICT	Information and communication technology
IT	Information Technology
JU	Joint Undertaking
KPI	Key Performance Indicator
LCA	Life Cycle Assessment
LEIT	Leadership in Enabling and Industrial Technologies
MEUR	Million Euros
MFC	Micro-fibrillated cellulose
MSc	Master of Science
MSW	Municipal Solid Waste
OFMSW	Organic Fraction of Municipal Solid Waste
PDM	Participants Data Management
PPP	Public-Private Partnership
R&D	Research and Development
RIAs	Research and Innovation Actions
RTO	Research and Technology Organization
SC2	Societal Challenge 2 (Horizon 2020)
SIRA	Strategic Innovation and Research Agenda
SME	Small and Medium-Sized Enterprise
SPIRE	Sustainable Process Industry through Resource and Energy Efficiency
TRL	Technology Readiness Level

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