Bio-based Industries Consortium

ANNUAL REPORT
2015

BIO-BASED INDUSTRIES CONSORTIUM (BIC)

Disclaimer

This document reflects the objectives of the members of the Bio-based Industries Consortium (BIC) in January 2016. References to figures, budgets, public and private contributions and statistics are those that were official in December 2015. Changes may have occurred since then.

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01/ MESSAGE FROM THE EXECUTIVE DIRECTOR

This is BIC's first Annual Report and there is plenty for us to talk about. 2015 was a significant year for both BIC and the BBI JU (Bio-based Industries Joint Undertaking). We successfully raised BIC's profile through a range of activities and achieved a series of important milestones, including:

- Funding was approved for the first ten bioeconomy projects, including two demonstration projects and one flagship project. The BBI JU is contributing €50 million and industry is investing an additional €70 million
- The largest ever BBI JU Call for Proposals was launched with a total budget of over €206 million, split into two parts
- In October 2015, the BBI JU became an independent body with its own staff and offices. The BBI JU now manages its own budget and launches its own Calls for Proposals, grants and public procurement
- Survey results from research into investment hurdles in Europe by the European Investment Bank (EIB) and BIC members will be published in early 2016. The research results will feed into a concrete plan of action on how to stimulate further investment in the European bioeconomy

In the following pages, you will discover more detailed information about BIC and the BBI JU and our strategic priorities and achievements.

Dirk Carrez
Executive Director

02/ ABOUT THE BIO-BASED INDUSTRIES CONSORTIUM (BIC)

2.1. Who we are

The Bio-based Industries Consortium (BIC) is a non-profit organisation set up in Brussels in 2013. It represents the private sector in a **public-private partnership (PPP)** with the EU known as the **Bio-based Industries Joint Undertaking (BBI JU)**. The partnership is dedicated to transforming renewable, natural resources into innovative bio-based products.

Of the total €3.7 billion BBI JU budget, almost 75% is being invested by BIC members, in total €2.7 billion from 2014-2020. Their financial contribution will support the **large-scale commercialisation** of high-quality bio-based products, through investment in innovative manufacturing facilities and processes, as well as in biorefining research and demonstration projects.

BIC brings together a unique cross-section of experts and has over 200 members from the following sectors:

- Agriculture and agro-food
- Forestry/pulp and paper
- Chemicals
- Biotechnology and technology providers
- Energy
- Other manufacturing sectors

2.2. Vision

BIC's vision is to accelerate the innovation and market uptake of bio-based products and to position Europe as a world-leading, competitive bioeconomy.

To create a **post-petroleum** society where economic growth is decoupled from resource depletion and dependency on fossil fuels is reduced, BIC and its members are building an economy based on:

- Local sourcing
- Local production
- Job creation
- Rural development
- Sustainability
- Efficient use of resources

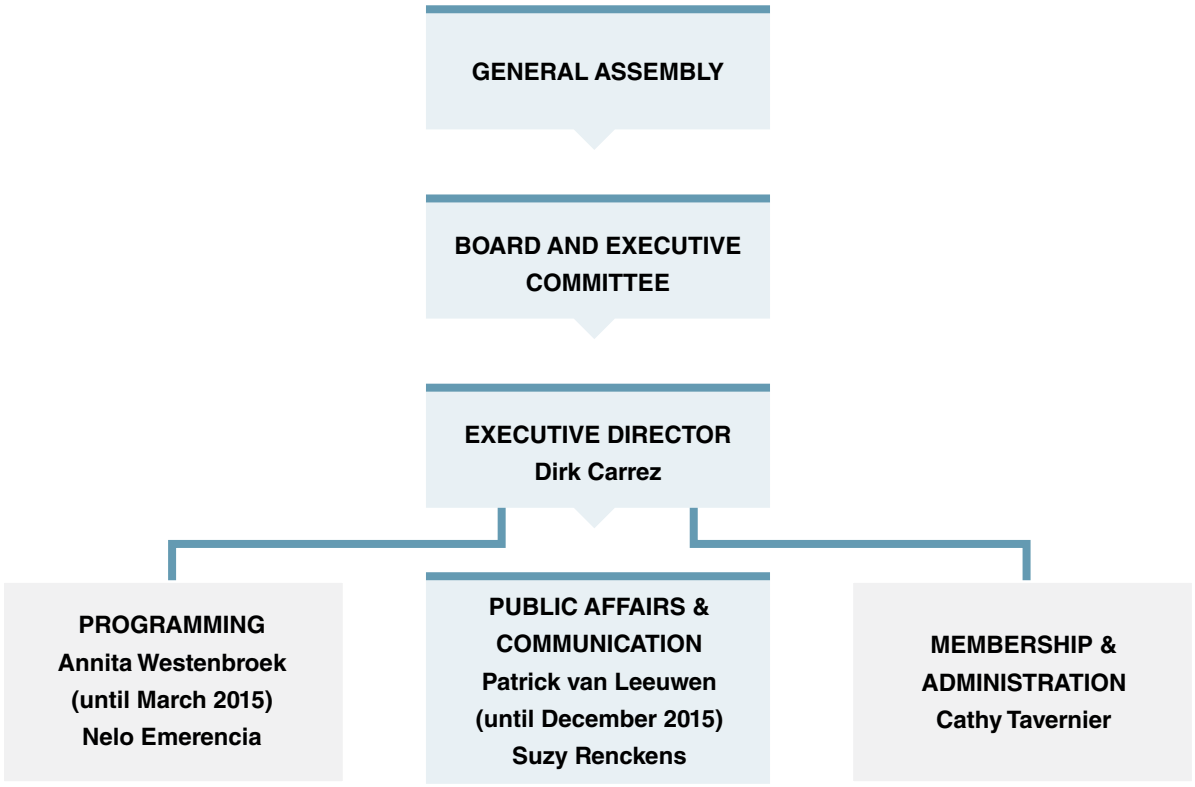
2.3. Mission

BIC's mission is to build **bio-based value chains** by developing new **biorefining** technologies, optimising **feedstock** use and creating a favourable **business and policy** climate to accelerate market acceptance of bio-based products.

BIC activities

- Shaping the BBI's Strategic Innovation and Research Agenda (SIRA)
- Defining the annual BBI Work Plans and Call for Proposals topics
- Mobilising industry (large, SMEs and SME clusters), research organisations, universities and relevant European stakeholders active or interested in the field of bio-based products to support innovation and the development of a long-term EU policy framework that boosts the bioeconomy

2.4. BIC structure and staff



2.5. BIC Board and Executive Committee (2015)

Marcel Wubbolts - CHAIRMAN DSM *Executive Committee member*	**Agnes van Ardenne** Dutch Biorefinery Cluster
Thomas Nagy - VICE CHAIR Novozymes *Executive Committee member*	**Christine Hagstöm-Näsi** FIBIC
Christophe Rupp-Dahlem - VICE CHAIR Roquette *Executive Committee member*	**Christophe Luguel** IAR
Mat Quaedvlieg - VICE CHAIR/TREASURER Sappi *Executive Committee member*	**Niklas Von Weymarn** Metsä Group
Piero Cavigliasso Biochemtex	**Valentín Ruiz Santa Quiteria** Repsol
Gloria Gaupmann Clariant	**Laila Rogestedt** Södra

2.6. Benefits of BIC membership

1 Defining the BBI annual Work Plan

BIC members put forward ideas for research topics, demonstration projects and flagship projects for the annual BBI Work Plans. They also decide how to address non-technical issues affecting the bio-based industries. This input has a direct influence on the development of the EU bioeconomy.

2 Taking part in winning EU grant proposals

From their involvement in developing the BBI annual Work Plan, BIC members receive early insights on which to base project proposals, even before the official publication of the BBI Call for Proposals. This early information gives BIC members an advantage in writing successful project proposals and winning EU grants.

3 Access to European financial instruments

BIC members are better informed about access to funding, loans and grants from EU institutions like the European Investment Bank (EIB). Online reference tools are also available to support members applying for funds.

4 Connecting with potential project partners

BIC private Partnering Events provide a platform for members to network with other key players in the bio-based sector. The online Partnering Platform is another support for members to find potential project partners.

5 Receiving discounts for major events

BIC members receive discounted entrance to bioeconomy events such as the European Forum for Industrial Biotechnology and the Bioeconomy (EFIB) or the BIO World Congress for Industrial Biotechnology.

6 Staying up to date

A regular newsletter keeps members informed on the latest policy developments affecting the bioeconomy, the BBI, relevant events and more.

2.7. BIC members*

FULL MEMBERS

Large industries

- Abengoa Bioenergia
- ARD
- BASF
- BillerudKorsnäs
- Biochemtex
- Borregaard
- Cargill
- CEPSA
- Clariant
- Corbion
- CoSun Biobased Products
- DONG Energy
- DSM
- DuPont Industrial Biosciences
- Ence
- Energochemica Trading
- Ethanol Europe Renewables Ltd.
- Fertiberia
- Fertinagro
- Glanbia Ingredients Ireland
- Holmen Skog
- KLM
- Metsä Group
- Monoghan Mushrooms
- Mondi
- Nordzücker
- Norske Skog
- Novamont
- Novozymes
- Oleon
- Repsol
- Roquette Group
- Sappi
- Smurfit Kappa
- Södra
- Solvay
- Stora Enso
- Südzucker
- Svenska Cellulosa Aktiebolaget (SCA)
- The Coca Cola Company
- Total
- Unilever
- UPM
- Versalis

SMEs

- AlgaEnergy
- Alkol Biotech
- Avantium
- Bio Base Europe Pilot Plant
- Biobased Delta
- BIONET Ingenieria
- Bioprocess Pilot Facility (BPF)
- BioPolis
- BLC3 Association
- BuggyPower
- Centre for Process Innovation Ltd (CPI)
- CLEA Technologies
- De Smet Engineers & Contractors
- GFBiochemicals
- Hygear
- IDENER
- InKemia
- ISOIN
- Metabolic Explorer
- MetGen
- Mi-plast
- Nova Pangaea Technologies
- Plaxica
- Six Fifty Kft

SME clusters

- BE Basic Foundation
- BioEconomy Cluster
- BIOPRO Baden-Württemberg
- BioVale
- CLIB2021
- Dutch Biorefinery Cluster
- FIBIC
- GFPi – German Federation of Private Plant Breeders
- GreenWin
- IAR
- IBB Netzwerk
- IBioIC – The Industrial Biotechnology Innovation Centre
- ISPT – Institute for Sustainable Process Technology

ASSOCIATE MEMBERS

- 3N Kompetenzzentrum Niedersachsen Netzwerk Nachwachsende Rohstoff
- Aalborg University
- Aarhus University – Danish Centre for Food and Agriculture
- Åbo Akademi University
- ACIB – Austrian Centre of Industrial Biotechnology
- AFBI – Agri-Food & Biosciences Institute
- AICIA – Andalusian Association for Research and Industrial Cooperation
- AIJU – Asociación de Investigación de la Industria del Juguete
- AIMPLAS
- Ainia technology centre
- AITEX – Textile Research Institute
- Aitiip Technology Centre
- ARCMED
- Atlanpole
- Aula Dei Scientific and Technological Park
- Automotive Industry Institute
- Bio Deutschland
- Bio4Energy
- Bioplat
- BDC – Biorenewables Development Centre
- Boku University
- CBB Capbiotek
- CEA
- CEFIC
- CEITC
- CENER – Centro Nacional de Energías Renovables
- CEPF – Confederation of European Forest Owners
- CEPI
- Certech – The Centre of Technological Resources in Chemistry
- Cetenma – Centro Tecnológico de la Energía y el Medio Ambiente
- Chalmers University of Technology
- CIBE – International Confederation of European Beet Growers
- CIEMAT – Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas
- CIRAD – Centre de Coopération Internationale en Recherche Agronomique pour le Développement
- CIRCE – Research Centre for Energy Resources and Consumption
- CNRS – Centre National de la Recherche Scientifique
- CNTA – National Centre for Technology and Food Safety
- CoE BBE – Center of Expertise Biobased Economy
- Condorcet RFS
- COPA Cogeca
- CREAF – Centre for Ecological Research and Forestry Applications
- CT Aqua – Andalusian Aquaculture Technology Centre
- CSIC – Agencia Estatal Consejo Superior de Investigaciones Científicas
- CTFC – Forest Sciences Centre of Catalunya
- CTP – Centre Technique du Papier
- DECHEMA – Society for Chemical Engineering and Biotechnology
- dbA – Centre de Desenvolupaments Biotechnológics i Agroalimentaris
- DTU – Technical University of Denmark Centre for Biosustainability
- DWI – Leibniz Institute for Interactive Materials

- ECN – Energy research Centre of the Netherlands
- ENEA – Italian National Agency for New Technologies, Energy and Sustainable Economic Development
- EPNOE – European Polysaccharide Network of Excellence
- FCBA – Institut Technologique Forêt Cellulose Bois-construction Ameublement
- ePure
- ERRMA
- ESA
- EuropaBio
- European Bioplastics
- FEUGA – Fundación Empresa-Universidad Gallega
- FoodDrinkEurope
- Forschungszentrum JÜLICH
- Fraunhofer
- FTP
- Green Chemistry Institute
- Green Pac Polymer Application Centre
- IFP Energies Nouvelles
- IK4 Research Alliance
- Inbiotic
- INERIS – L'Institut National de l'Environnement Industriel et des Risques
- INIA – National Institute for Agricultural Research and Experimentation
- Innovatum
- Innovhub SSI – Stazioni Sperimentali per l'Industria
- Innventia
- INRA – Institut National de la Recherche Agronomique
- INSTM – National Interuniversity Consortium of Materials Science and Technology
- IRTA – Research and Technology Food and Agriculture
- ISCC – International Sustainability and Carbon Certification
- ITENE – Packaging, Transport and Logistics Research Centre
- ITERG
- IVIA – Instituto Valenciano de Investigaciones Agrarias
- KIT – Karlsruhe Institute of Technology
- KTH Royal Institute of Technology
- Kplus Wood – Kompetenzzentrum Holz
- Laborelec
- Lappeenranta University of Technology
- LCPO – Laboratoire de Chimie de Polymères Organiques
- Leitat
- LGP2 – Laboratoire de Génie des Procédés Papetiers
- LIST – Luxembourg Institute of Science and Technology
- Lund University
- Manchester Institute of Biotechnology
- Masaryk University
- Materia Nova
- National Interuniversity Consortium of Materials – INSTM
- LUKE – Natural Resources Institute Finland
- Norut Narvik – Northern Research Institute Narvik
- nova-Institut
- NUI – National University of Ireland Galway
- PANA – Institute of Agrophysics, Polish Academy of Sciences
- Piteå Science Park
- Plants for the Future
- Pole Eco-industries – Poitou-Charentes
- PTS
- Rabobank
- RE-CORD – Renewable Energy Consortium for Research and Demonstration
- RIVM – National Institute for Public Health and the Environment
- RSB – Roundtable on Sustainable Biomaterials
- SciTech-Service
- SINTEF
- Skogforsk
- STU – Slovak University of Technology
- SP Technical Research Institute of Sweden
- Spring – Sustainable Processes and Resources for Innovation and National Growth
- Starch Europe
- Steinbeis Europa Zentrum SusChem
- Swerea IVF AB
- Swerea SICOMP
- Tecnalia Corporation
- Terra Humana
- The James Hutton Institute
- Thünen Institute
- TNO
- TU Delft – Delft University of Technology
- TU Eindhoven – University Technology
- TU Graz – Graz University of Technology
- TUHH – Hamburg University of Technology
- TU Kaiserslautern – Technische Universität Kaiserslautern
- UA – Universidad de Alicante
- UAB – Universitat Autònoma de Barcelona
- UAH – University of Alcalá
- UAL – University of Almería
- UCA – University of Cádiz
- UCCS
- Università di Bologna
- University of Ghent
- University of Graz
- University of Groningen
- University of Hohenheim
- University of Léon
- UdL – University of Lleida
- Unimore – University of Modena and Reggio Emilia
- University of Naples Federico II
- University of Oulu
- UPV/EHU - Universidad del País Vasco
- Università Catolica del Sacro Cuore
- University Pablo de Olavide, Sevilla
- Universidad Politècnica de Madrid
- UPVLC – Polytechnic University of Valencia
- University of Santiago de Compostela
- University of Utrecht
- University of Valladolid
- University of Vigo
- University of Zaragoza
- URCA – Université de Reims Champagne-Ardenne
- VITO
- VTT Technical Research Centre of Finland
- Wageningen UR

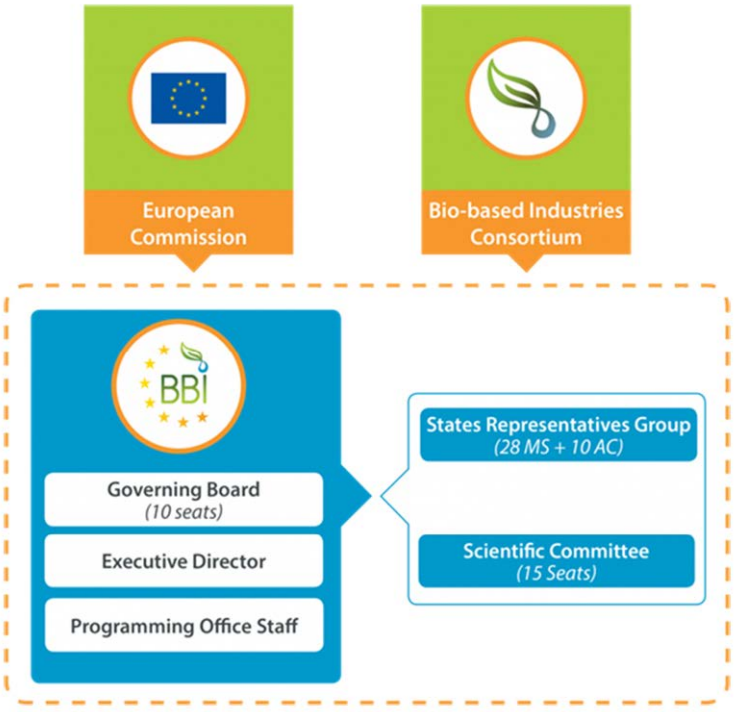
*Status December 2015

03/ THE BIO-BASED INDUSTRIES JOINT UNDERTAKING (BBI JU)

The Bio-based Industries Joint Undertaking (BBI JU) was officially established on 7 June 2014 under EU Council Regulation **No 560/2014**. It is an independent legal entity that manages the public-private partnership (PPP) between the European Commission and the Bio-based Industries Consortium (BIC).

WORTH €3.7 BILLION, THE PARTNERSHIP REDUCES THE INVESTMENT RISK FOR THE PRIVATE SECTOR IN BIO-BASED DEMONSTRATION AND PILOT PROJECTS.

The Governing Board is the main decision-making body of the BBI JU. It is composed of five representatives from the European Commission and five representatives from BIC. The Executive Director, supported by the Programme Office, is responsible for the day-to-day management of the BBI JU, supported by two advisory bodies, the States Representative Group and the Scientific Committee.



3.1. The Strategic Innovation and Research Agenda (SIRA)

The SIRA translates the ambitions of the BBI JU into a set of actions designed to deliver tangible and increasingly ambitious results by 2020 and by 2030.
The SIRA projects are focused on the five following value chains:

Value Chain 1: Mobilise and convert **lignocellulosic feedstock** into advanced biofuels, bio-based chemicals and biomaterials
Value Chain 2: Increase the number of value-added products derived from **forestry biomass**
Value Chain 3: Develop new **agro-based value chains** by improving agricultural production and generating new value-added products and markets
Value Chain 4: Convert currently unused **waste streams** into valuable products
Value Chain 5: Connect biofuel, pulp and chemical biorefineries with sustainable **bioenergy** production

3.2. BBI JU Call for Proposals 2014

Launched on 9 July 2014, the first Call for Proposals resulted in the BBI JU approving funding for ten bioeconomy projects worth a total of €120 million. To fund its share of the projects, the European Commission released €50 million of EU public money, which was combined with an industry contribution of €70 million.

Seven research projects focus on replacing fossil-based materials and products with bio-based solutions:

- **US4GREENCHEM**: Pre-treatment of lignocellulosic feedstock
- **PROVIDES**: New sustainable pulping technologies
- **SmartLi** and **GreenLight**: Producing fibres and polymers from lignin
- **CARBOSURF**: Using fermentation processes to produce biosurfactants and speciality carbohydrates
- **PROMINENT**: Extracting protein products from plant residues
- **NewFert**: Nutrient recovery from waste streams and residues

3.2. BBI JU Call for Proposals 2014

Two grants were awarded for demonstration projects:

- **PULP2VALUE**: A biorefinery system for sugar beet pulp that will extract valuable biochemicals for use in detergents, personal care, oil and gas, paints and composites
- **ValChem**: An economically-viable process to transform wood into chemicals

One flagship demonstration project will develop a first-of-a-kind value chain:

- **FIRST2RUN**: An integrated biorefinery that will convert underutilised oil crops into oleochemicals

3.3. BBI JU Call for Proposals 2015

The 2015 Call for Proposals foresees €206 million in funding from the BBI JU and additional industry investment. It was split into two parts:

I. **Flagship Call**: Launched on 19 May 2015, the €100 million Call focused on three Flagship topics – lignocellulosic feedstock (Value Chain 1), valorisation of cellulose (Value Chain 2) and innovative processes for sugar recovery and conversion from municipal solid waste (Value Chain 4). The deadline for submissions was 15 September 2015.

II. **Research and Innovation Actions, Demonstration and Support Actions**: Launched on 25 August 2015, the second part of the 2015 Call foresees €106 million in funding and focused on Demonstration Actions and Research and Innovation Actions.

The deadline for submissions was 3 December 2015.

04/ BIC ACHIEVEMENTS IN 2015

In 2015, BIC focused its attention on mainstreaming the bioeconomy concept beyond the research arena and making the initiative a political priority, as well as ensuring broad participation in the BBI JU Call for Proposals. BIC's advocacy, communications and partnership-building activities helped raise awareness and grow BIC's membership.

Green light for Juncker's €315 billion investment plan

At the end of June 2015, the EU adopted the regulation establishing the European Fund for Strategic Investments (EFSI). The EFSI supports investments in transport, energy and digital infrastructure, education and training, health, research and development, information and communications technology and innovation, expansion of renewable energy and resource efficiency, environmental, urban and social projects, as well as support for smaller businesses and midcap companies. EFSI should unlock €315 billion of investment over the next three years.

4.1. European Bioeconomy Alliance (EUBA)

With 11 other bioeconomy stakeholder organisations, BIC founded the European Bioeconomy Alliance (EUBA) on 4 February 2015. The European Bioeconomy Alliance focuses on advocating for a favourable and coherent policy and investment framework to build a competitive, dynamic and sustainable bioeconomy in Europe.

In 2015, EUBA met with the following European Commissioners and senior Commission officials:

- Carlos Moedas, European Commissioner for Research, Science and Innovation
- Jyrki Katainen, Vice-President of the European Commission, European Commissioner for Jobs, Growth, Investment and Competitiveness
- Yvon Slingenberg, Senior Adviser of the Cabinet of Miguel Arias Cañete, European Commissioner for Climate Action and Energy
- Luc Tholoniat, Economic Adviser of the Cabinet of Jean-Claude Juncker, President of the European Commission

The EUBA worked with Members of the European Parliament (MEPs) to set up a Working Group on Bioeconomy in the European Parliament Intergroup on Climate Change, Biodiversity and Sustainable Development.

4.2. Responses to consultations and position papers

In January 2015, BIC submitted comprehensive answers to questions on key regulatory and investment hurdles facing the EU bio-based industries, in response to a European Commission consultation on **Framework Conditions for Sectoral Research and Innovation**.

Ahead of the EU **Circular Economy** Package, which was later adopted on 2 December 2015, BIC submitted a response to the European Commission open consultation on the circular economy in July 2015.

This was followed by the publication of a BIC **Position Paper on the Circular Economy Package**, which was updated in November 2015. The paper called on EU policymakers to take account of a series of recommendations in the formulation of an ambitious circular economy strategy.

Supported by the European Bioeconomy Alliance, the BIC Board also sent a letter to President Juncker and key Commissioners urging them to acknowledge the important role of the bioeconomy in delivering an ambitious European Circular Economy.

4.3. Media coverage and publications

Throughout 2015, BIC's activities were the focus of several articles and interviews. For example, in September 2015, BIC published an article in The European Files, a magazine widely distributed throughout the European institutions and European governments. The article '**Bioeconomy: circular by nature**' was published in a **Special Issue on the Circular Economy in Europe** and emphasised the important role the bioeconomy plays in the circular economy.

In order to help bio-based industry stakeholders access financing outside of the BBI JU, BIC published a **Practical Guide on Combining BBI (H2020) and European Structural Investment Funds (ESIF)**. The guide explains what can be co-financed, how, and who should be involved in the process.

EIB survey on improving access-to-finance for the bio-based industries

BIC members gave input to a European Investment Bank (EIB) survey to identify access-to-finance obstacles and barriers facing the bio-based industries. The full report is expected in Q1 2016 and may recommend more tailored financing tools for the bio-based industries.

4.4. Cooperation with European institutions

From September to November 2015, BIC organised one-on-one meetings with the following European Commissioners and senior Commission officials:

- Jyrki Katainen, Vice-President of the European Commission, European Commissioner for Jobs, Growth, Investment and Competitiveness
- Frans Timmermans, First Vice-President of the European Commission and European Commissioner for the portfolio of Better Regulation, Inter-Institutional Relations, the Rule of Law and the Charter of Fundamental Rights
- Carlos Moedas, European Commissioner for Research, Science and Innovation
- Karmenu Vella, European Commissioner for Environment, Maritime Affairs and Fisheries
- Representatives of the European Commission's Secretariat-General

4.5. Events calendar[1]

4 February 2015

Launch of the European Bioeconomy Alliance (EUBA), Brussels, Belgium
Organised in the European Parliament, the EUBA kick-off meeting helped raise awareness of the BBI and the bioeconomy, particularly among newer MEPs.

10 March 2015

First Meeting of the Bioeconomy Working Group, Strasbourg, France
Chaired by MEP Miapetra Kumpula-Natri (S&D/FIN) and also attended by Jyrki Katainen, Vice-President of the European Commission, European Commissioner for Jobs, Growth, Investment and Competitiveness.

20 March 2015

Boosting Economic Growth and Facilitating Investments Through the Bioeconomy: How to Build Effective Regional Strategies, Brussels, Belgium
Organised at the Committee of the Regions in partnership with the European Regions and Innovation Network (ERRIN) and the European Regions for Innovation in Agriculture, Food and Forestry (ERIAFF), BIC helped develop the event programme and event deliverables.

8 April 2015

Plant Based Summit 2015, Lille, France
BIC attended this European trade fair and conference, a networking platform for stakeholders in the bio-based economy.

27-28 May 2015

Building New Biomass Supply Chains for the Bio-based Economy, Sardinia, Italy
BIC was represented at the EIP-AGRI (European Innovation Partnership 'Agricultural Productivity and Sustainability') workshop on biomass supply.

[1]This section provides a selection of 2015 events highlights.

4.5. Events calendar

26 June 2015

BBI Info Day, Brussels, Belgium
The BBI Info Day shared information on the 2015 Bio-based Industries Joint Undertaking new Call for Proposals.

BBI Info Day, 26 June 2015

19-22 July 2015

BIO World Congress on Industrial Biotechnology, Montreal, Canada
BIC attended the leading international industrial biotech event with over 1,300 experts in advanced biofuels, bio-based products and renewable chemicals.

BBI/BIC booth at the 2015 BIO World Congress on Industrial Biotechnology

29 September 2015

The Role of the Bioeconomy in Climate Change Mitigation, Brussels, Belgium
BIC took part in the European Parliament Intergroup meeting hosted by Miapetra Kumpula-Natri, Chair of the Bioeconomy Working Group. Organised ahead of the 21st Conference of the Parties (COP 21) to the United Nations Framework Convention on Climate Change (UNFCCC) in Paris, Kumpula-Natri tabled a Resolution calling on COP 21 to acknowledge the potential benefits and contribution of the bioeconomy towards climate change mitigation and the development of a circular economy.

27-30 October 2015

European Forum for Industrial Biotechnology and the Bioeconomy (EFIB), Brussels, Belgium
BIC hosted a session on 'Access to finance' and exhibited at this leading European bio-based industries event, organised by the industry association EuropaBio.

2-4 November 2015

Ecomondo, Rimini, Italy
BIC had a booth at the technology platform for the Green and Circular Economy in the Euro-Mediterranean area.

9-10 November 2015

European Bioeconomy Investment Summit, Brussels, Belgium
With over 400 participants, BIC discussed how additional investment could bring speed and scale to the European bioeconomy.

6 December 2015

World Climate Summit (WCS), Paris, France
BIC was a supporting partner of the World Climate Summit, an event recognised by the COP 21 secretariat. The WCS is an annual forum for business, finance, and government leaders during the UNFCCC COP.

05/ THE BIOECONOMY IN FIGURES[2,9]

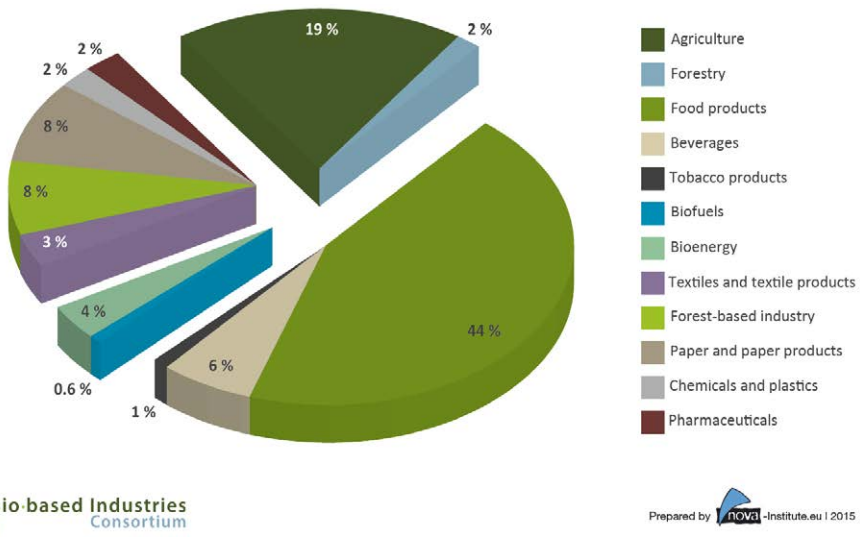
5.1. Turnover

In 2013, the European bioeconomy[3] generated an estimated **turnover of around €2.1 trillion**. Almost half of the turnover came from the food and beverage sectors. The other half was generated by agriculture and forestry (also known as the primary sector) and the bio-based industries (chemicals and plastics, pharmaceuticals, paper and paper products, forest-based industries, textiles and textile products[4], biofuels[5] and bioenergy[6]).

On their own, the bio-based industries generated a turnover of €600 billion. Biofuels and bioenergy accounted for 15% of this, whilst the largest share came from the paper and paper products sector (30%), followed closely by the forest-based industry, which includes wood products and furniture (27%)[7].

Turnover in the EU bioeconomy (EU-28, 2013)
Total: 2.1 trillion Euro

Source: Eurostat, 2013[8]

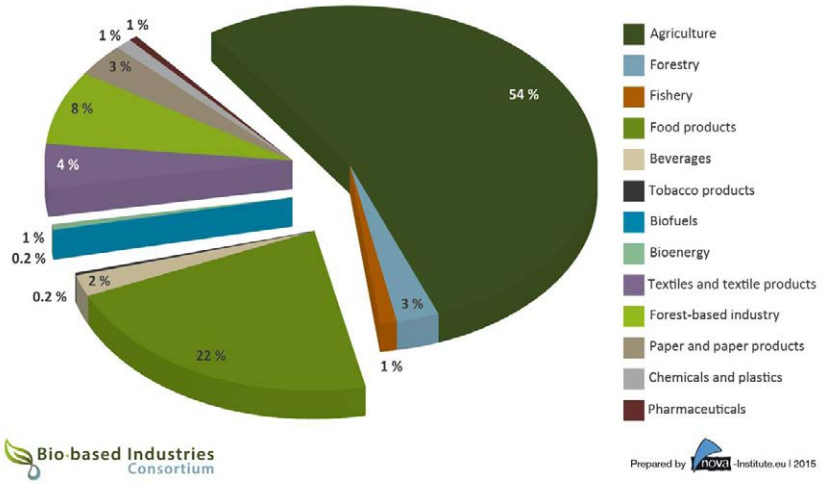


5.2. Employment

In 2013, the European **bioeconomy employed 18.3 million people**. Around 10.6 million people were employed in the primary sector, 4.5 million people in the food, beverages and tobacco sector and 3.2 million in the bio-based industries. Within the bio-based industries, the strongest performing sectors were the forest-based industry, paper and paper products and the textile industry. It is interesting to note that the primary sector, despite accounting for a comparatively high share of the total employment, had a relatively low turnover.

Employment in the EU bioeconomy (EU-28, 2013)
Total: 18.3 million Euro

Source: Eurostat, 2013



[2]A detailed analysis of these figures can be found on BIC's website: www.biconsortium.eu.

[3]The bioeconomy includes the following sectors: primary biomass production (agriculture, forestry and fishery) as well as food and beverage, tobacco and paper and paper products.

[4]The chemicals, plastics and pharmaceuticals sectors include fully bio-based (e.g. natural dyes and pigments, enzymes, fatty acids) and partly bio-based products (chemicals and plastics traditionally petro-based but in recent years also partly bio-based).

[5]Both biodiesel and bioethanol have dedicated product codes within PRODCOM. Therefore, their shares in the total production values of their respective NACE Classes were calculated and then the assumption was made that the same shares apply to employment and turnover.

[6]In the case of bioenergy for heat and power (biogas and solid biomass), a slightly different approach was used. While there are other data sources available for bioenergy and biofuels (mainly the annual reports of Eurobserv'ER, these sources are not compatible with Eurostat since they include both direct and indirect jobs and there is no clear indication how to separate them.

[7]The forest-based industry includes wood products, which are considered to be fully bio-based, but also furniture, which is considered as only partly bio-based (based on wood and/or natural fibres).

[8]The sectors textiles and textile products, forest-based industry, chemicals (including enzymes), plastics and pharmaceuticals only partly contain fully or partly bio-based products. Therefore, the bio-based shares of these sectors are estimates.

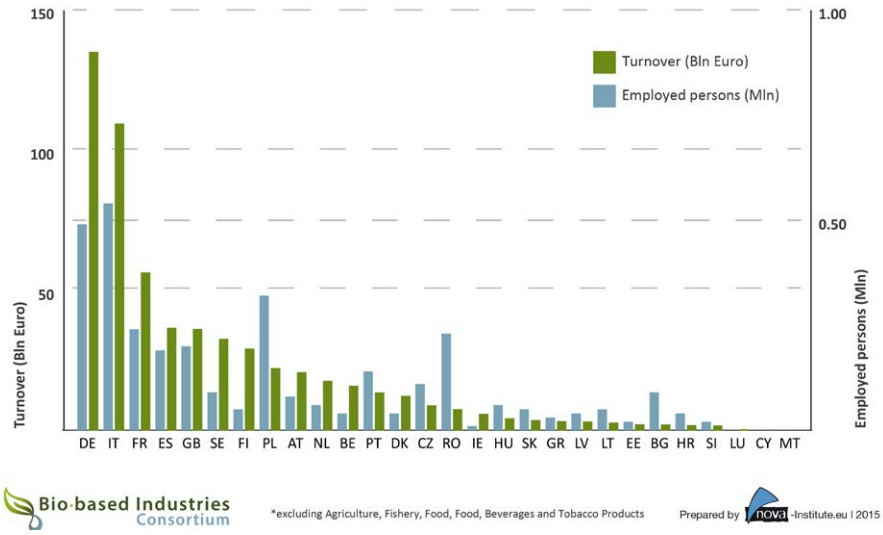
[9]The percentages in the following pie charts do not always add up exactly to 100% due to rounding.

5.3. Turnover and employment across member states

When comparing total turnover and employment across the bio-based economy (excluding agriculture, forestry, fishery, food, beverages and tobacco products), there are marked differences between the European regions. Eastern European countries such as Poland, Romania and Bulgaria play a more active role in sectors of the bio-based economy that generate lower value-added products but have higher employment rates. Western and Northern European countries on the other hand, are active in sectors with a relatively high turnover per person, with the highest turnover per person ratio in Ireland, Finland and Belgium.

Turnover and employment in the EU bio-based economy (EU-28, 2013)

Source: Eurostat, 2013



06/ BIC MEMBER INVESTMENTS

BIC's annual survey from early 2015 shows that members are investing more than €2.1 billion in the bio-based industries (mainly demo and flagship projects).

Most of the short-term investments will take place in the lignocellulosic and forestry-based value chains. Projects include transitioning from first generation to second generation ethanol production, as well as expanding production into chemical building blocks, producing food grade microfibrillar cellulose (MFC) and setting up a production plant for new materials and chemical building blocks from the lignin and cellulose streams of the pulp and paper industry.

In the agro-based value chain, a new industrial scale flagship project to use cardoon to extract oleochemicals for use in bio-based products such as biolubricants, cosmetics and bioplastics has received investment.

07/ CASE STUDIES

7.1. Novamont

Project title: FIRST2RUN - a flagship demonstration of an integrated biorefinery for dry crops

Project aim: Demonstrate that low input and underutilised oil crops like cardoon grown in arid and/or marginal lands (dry) can be exploited by setting up a value chain that integrates the regional agricultural sector with a new biorefinery. A 50/50 joint venture (JV), this project will see the reconversion of the Porto Torres petrochemical site into a biorefinery with an integrated production chain for chemical intermediates. The biorefinery will valorise every fraction (cascading use of biomass) to produce chemicals and animal feed. An agreement between Novamont and Coldiretti (Italian Farmer's Federation) ensures the biorefinery is positioned at the heart of a circular economy model.

Project details:

- Start date: 1 July 2015
- Duration: Four years
- Total cost: €52 million, including €17 million in BBI funding
- Website: first2run.eu

Projected impacts:

- Large-scale cultivation of cardoon (up to 3.5 kha) is achieved through the involvement and support of local farmers and the application of low input, optimised technical/agronomic protocols
- Consumption of thermal and electric energy for chemical processes is reduced by up to 50% and 20% respectively
- Sustainable, cost-effective and innovative catalytic and biocatalytic processes are applied for the production of bio-based building blocks from high oleic oils (such as azelaic acid, pelargonic acid and glycerol)
- Bio-based azelaic and pelargonic acid are manufactured in a plant with a production capacity of up to 10,000 tonnes/year for each acid. Batch production of biodegradable esters of up to 20,000 tonnes/year is demonstrated
- A 35% reduction in greenhouse gas (GHG) emissions is achieved

Applications for FIRST2RUN chemical intermediates:

- Azelaic acid in Novamont's bioplastic
- Plasticisers for PVC
- Biolubricants
- Components for cosmetics
- Oil extenders for rubber
- Bio-herbicides

7.2. Fertiberia

Project title: NewFert - nutrient recovery from bio-based waste for fertiliser production

Project aim: Design and develop different enabling technologies that allow biowaste to be re-used and valorised as a secondary raw material in a new brand of cost-effective, eco-friendly and advanced fertilisers. NewFert targets a combination of specific organic and mineral components for fertilisers.

Project details:

- Start date: 5 November 2015
- Project duration: Four years
- Total cost: €2.4 million including €1.2 million in BBI funding
- Website: newfert.org

Projected impacts:

- Development of a new value chain that uses bioprocesses to recover nitrogen, potassium and phosphorus (NPK) from biowaste
- Europe's economic competitiveness is strengthened and the bio-based economy receives a boost
- Raw material dependency is decreased and resource depletion is prevented, reducing environmental degradation and increasing the sustainability of the fertiliser industry

7.3. UPM-Kymmene/ Metabolic Explorer

Project title: ValChem - value-added chemical building blocks and lignin from wood

Project aim: Demonstrate the techno-economic viability of a wood-based biorefinery for bio-based chemicals.

Project details:

- Start date: 1 January 2017
- Total cost: €18.5 million including €13.1 million in BBI funding
- Duration: Four years

Projected impacts:

- Job creation and increased regional development because future biorefineries based on this platform technology will be located in rural areas, where biomass is readily available
- Valorisation of over 75% of the raw material (wood)
- Production of wood-based chemicals with a value two to six times higher than traditional products
- Improved sustainability of industrial processing and wood production (as more wood with PEFC and FSC certificates will be used)
- The market for bio-based chemicals is expanded, helping to mobilise further investment and accelerate the transition to a more sustainable industrial sector

7.4. Metsä

Project title: New innovative bioproduct mill

Project aim: Metsä Group's €1.2 billion bioproduct mill in Finland is one of the most significant bioeconomy investments in the EU since the start of BBI JU. Construction began in 2015 and the mill will come online in Q3 2017.

Project details:

- Start date: May 2015
- Duration: 3.5 years
- Total cost: €1.2 billion
- Website: bioproductmill.com

Projected impacts:

- When fully operational, 2,500 jobs will have been created throughout the value chain, from forest management to product delivery, including 1,500 entirely new jobs
- Once completed, the bioproduct mill is expected to purchase raw materials and services worth €0.5 billion per year and increase the annual value of Finnish exports by €0.5 billion
- Environmental benefits will include reduced fresh water use per ton of pulp produced, improved energy efficiency, total independence from fossil fuel energy, lower emissions to air and on-site production of key chemicals using mill waste streams, contributing to waste reduction and recycling
- At a later stage, the €1.2 billion mill investment will also create a platform that can be used to introduce new bio-based value chains and products. To date, three such value chains/bio-based products have already been announced.

7.5. GFBiochemicals

Project title: Levulinic acid production

Project aim: Produce levulinic acid at commercial scale directly from biomass. GFBiochemicals has retrofitted an existing plant to produce 10 kta of levulinic acid and 2 kta of formic acid from waste biomass. The GFBiochemicals process is feedstock flexible and allows for a wide range of downstream transformations.

Project details:

- Total investment: €30 million
- Website: gfbiochemicals.com

Projected impacts:

- Demonstration of cost-competitive reactor, recovery and purification technologies with high conversion yields for levulinic acid and formic acid
- By 2017, the project will generate 600 direct and indirect jobs and inject €40 million into the economy
- Bio-based products made with levulinic acid will be used as replacements for petroleum-based products, resulting in greenhouse gas emission reductions (GHG) of 40,000 tons
- Land that is unsuitable for arable farming will be cultivated for energy crops
- The creation of a new value chain centred on levulinic acid, a versatile building block for chemicals and materials derived directly from biomass, will help to reduce dependence on fossil fuels and contribute to the circular economy

For further information or to become a member of BIC, please visit our website **biconsortium.eu** or email **info@biconsortium.eu**