

# The circular Bio-society in 2050

**DRAFT VISION**

October 2018



This is the vision developed and proposed by the Bio-based Industries Consortium and its members.

This vision will be finalised and agreed upon with other stakeholders and potential private partners of a future PPP once the scope and nature of the instrument has been agreed with the European Commission.

 **Bio-based Industries  
Consortium**



**By 2050, Europe will be a competitive, circular bio-based society with informed citizens choosing a sustainable way of life, thereby supporting an economy that not only provides jobs but enhances the wellbeing of society and the environment.**

**Five key drivers to realising this vision in 2050:**

1. Integrated and efficient production of food, feed, bio-based products and materials, and energy to help foster food security and satisfy materials needs for a growing world population
2. Resource-efficient and sustainable value chains benefit all actors, including primary producers, and create value for society
3. Industrial and economic sectors operate in symbiosis, effectively collaborating across geographical and competency boundaries
4. Carbon-neutral value chains mitigate climate change and contribute to UN Sustainable Development Goals
5. Informed and participating citizens enable a sustainable, circular bioeconomy

# 1

## **Integrated and efficient production of food, feed, bio-based products and materials, and energy to help foster food security and satisfy materials needs for a growing world population**

### **In 2050: Integrated operations produce food, feed, bio-based products and materials, and bio-energy**

- sustainable production and supply of a broad range of biomass (renewable raw materials), combining food and feed production with that of various materials from side and residual streams, complementing, strengthening and improving food production;
- efficient food and feed production and processing aimed at creating a safe, healthy and nutritious diet for humans and animals;
- realising synergy by combining food and feed production with materials and energy production.

### **Fully utilising biomass feedstock**

- through optimally integrated biomass feedstock cultivation and delivery, cascaded production infrastructures for enhanced food, non-food and energy, aiming at zero waste and pursuing maximal process and energy efficiency;
- utilising feedstock from land, sea, and air (such as CO<sub>2</sub>), and bio-waste streams from municipalities;
- using new sources of biomass for food and non-food applications, and the production of novel food ingredients.

### **Preserving soil and enhancing biodiversity**

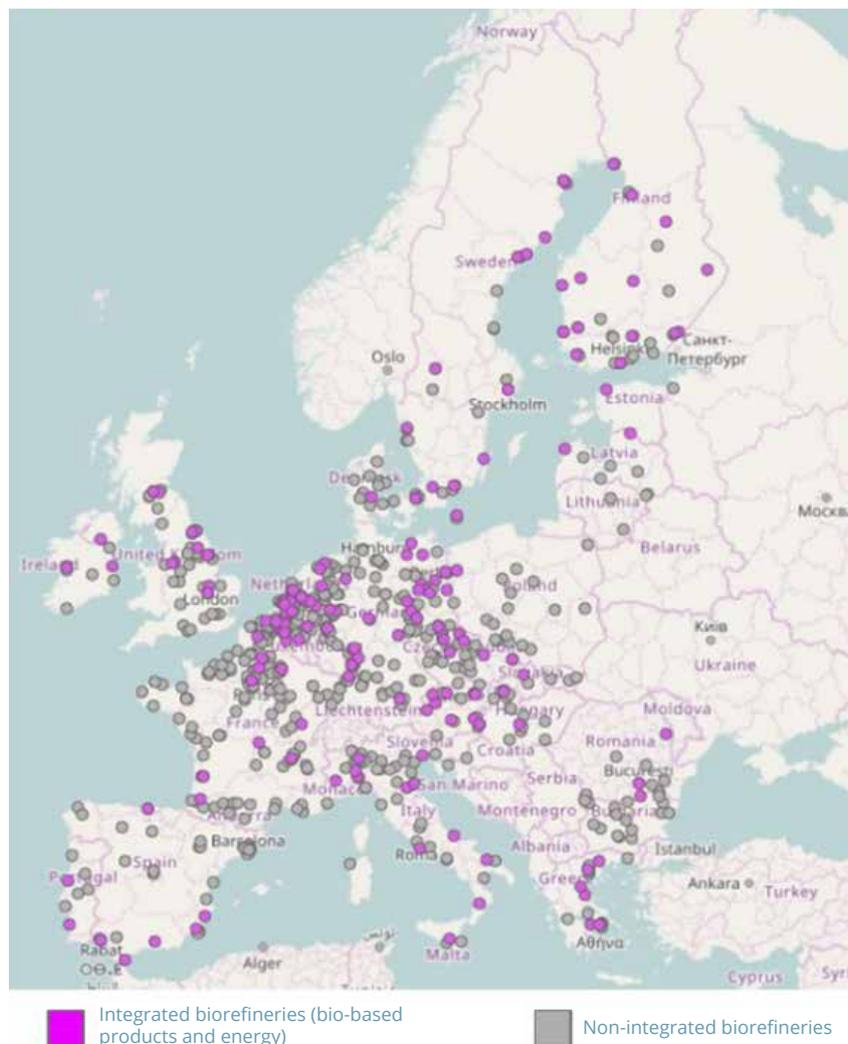
- increasing soil carbon content and returning necessary ingredients to the soil to avoid its depletion;
- enhancing biodiversity, including its social aspects.



## Valorising renewable raw materials to products that create benefits for citizens, markets and the environment

- with sustainable circular solutions, significantly reducing the environmental footprint by designing and manufacturing products that are recyclable, degradable or compostable (eco-design);
- for existing applications or creating new applications;
- minimising movement of raw materials by substituting imports and increasing Europe's autonomy in providing sustainable food, feed and bio-based products and materials for its citizens;
- providing new and creative solutions for changing and growing market sectors (industries such as textiles, automotive, packaging, personal care and hygiene, medical, etc.).

Map of biorefineries producing bio-based chemicals, liquid biofuels and composites and fibres in the EU



JRC (2018)

## 2

### Resource-efficient and sustainable value chains benefit all actors, including primary producers, and create value for society

#### In 2050: The primary and sequential sectors are strategic partners in the bio-based value chains

- agriculture, horticulture, food processing, beverages; forestry, paper and pulp; fisheries and fish processing; municipalities, all sectors that may have excess primary products, side and residual streams containing organic (carbon) compounds, or produce dedicated crops on available but unused land, co-design value chains and their outputs;
- bio-based value chains that valorise side and residual streams from primary sectors are essential elements of a circular sustainable bioeconomy, including the blue bioeconomy;
- stimulating the conversion to more plant-based production and reducing meat production—with its impact on climate change and its vulnerability to high feed costs, low product prices and potential extreme climate conditions—thus increasing food security.

#### Brand owners are integrated partners and beneficiaries in bio-based value chains

- brand owners are leading actors in implementing bio-based value chains and helping to create sustainable demand and solutions as part of societal challenges;
- creating added value for consumers through better performing products and services, and sharing value with the primary sector.

#### Create new rural, coastal and urban jobs, uplifting local economies

- Expand bio-based activities across Europe, fully utilising available local renewable feedstock, providing new or additional income for actors in the primary sectors, creating vibrant sustainable communities;
- Re-use idle industrial facilities by applying biotechnologies for new and innovative industrial activities.

**Employment in the bioeconomy in the EU-28, 2008-2015**





## 3

### **Industrial and economic sectors operate in symbiosis, effectively collaborating across geographical and competency boundaries**

#### **In 2050: Connected industrial bio-based operations sites exchange intermediate streams and achieve synergies**

- applying concepts of resource efficiency and cascading use of biomass feedstock;
- incorporating operational efficiency/excellence technologies and services in circular bioeconomy operations, such as process intensification, digitisation, artificial intelligence; and science data technologies such as big data analysis for improving feedstock quality and availability, processing efficiency, and product performance;
- in large and small-scale operations, and modular processing systems, at local and regional levels across Europe, enabling participation of SMEs throughout the value chains;
- new business models that better integrate primary sectors will be fully operational across Europe (including central and Eastern Europe).

#### **Interlinked R&D centres across Europe facilitate optimal use of equipment and exchange of expertise**

- open access to piloting facilities, and technical and commercial testing platforms to enable open innovation and accelerate commercialisation;
- low hurdle for SMEs to enter and participate.

#### **Education institutions deliver graduates with skills and competences that meet industry's needs**

- through constant exchange of needs by industry and capabilities of education institutions;
- meeting skills and competences' needs at vocational levels, university level of applied science, and fundamental research and PhD programmes across Europe;
- with standardised 'bio-based' curricula and diplomas across Europe;
- with industry's input into curricula and education programmes and materials;
- with industry's support for national and European innovation contests to stimulate top performance by students and start-ups;
- with funding assistance from regional funding instruments, supplemented by member states;
- with institutionalised 'lifelong learning' facilities and training shared by industry, government, and society.



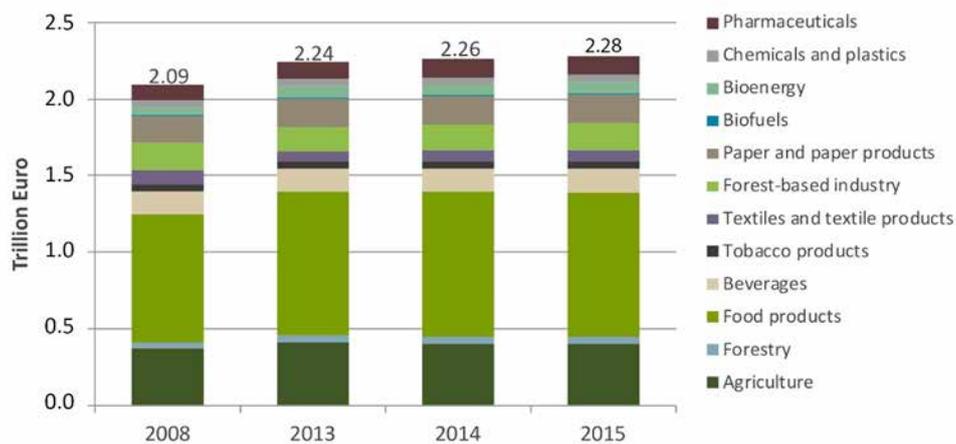
### Attract investors to the emerging bio-based sector

- through a staged framework that communicates the level of risk versus success (risk/reward ratios) for investors facilitating their entry at different stages in the development process of new bio-based value chains;
- private and public investors give preferential financing to green/sustainable investments, thus establishing a circular bioeconomy.

### Member states/regions provide political and legal support to the bioeconomy

- Member states have implemented infrastructures and legislative frameworks to deploy the benefits of circular bioeconomy;
- A European bioeconomy strategy is in action, implemented by all member states;
- Regions support the development of value chains using local feedstock.

## Turnover in the bioeconomy in the EU-28, 2008-2015



## 4

### Carbon-neutral value chains mitigate climate change and contribute to UN Sustainable Development Goals

#### In 2050: Bio-based operations deliver solutions to mitigate climate change

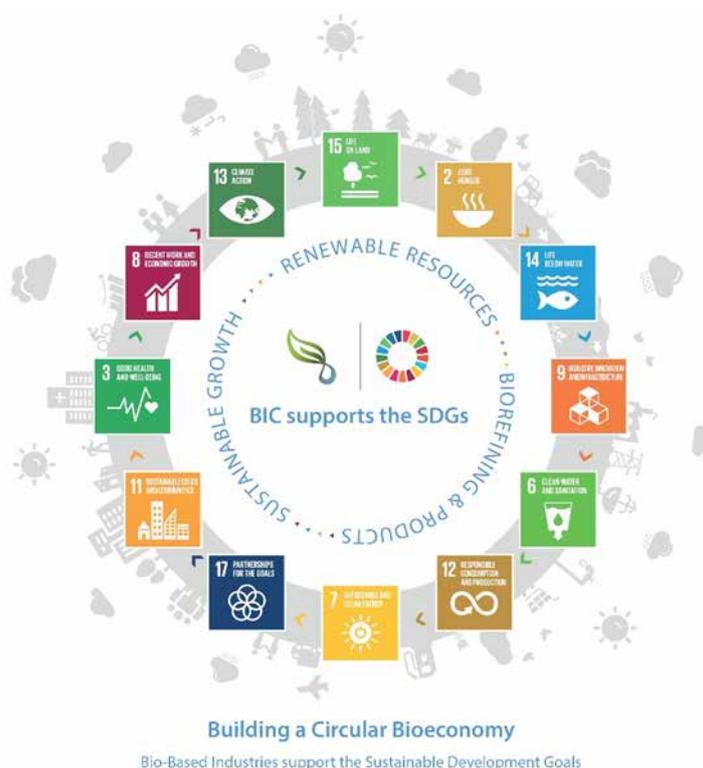
- new processes and value chains in the bioeconomy are fully sustainable and contribute to combating climate change, and contributing to SDG 13: climate action;
- a majority of bio-based value chains act as 'carbon sink', reducing greenhouse gases in the atmosphere.

#### A vibrant European circular bioeconomy demonstrates contributions to more UN SDGs

- bio-based value chains co-produce food, feed, bio-based products and materials, valorising residual streams ('waste'), lowering energy consumption in production processes, etc.), and contribute to: zero hunger (SDG 2), good health and well-being (SDG 3), clean water (SDG 6), clean energy (SDG 7), decent work and economic growth (SDG 8), industry, innovation and infrastructure (SDG 9), sustainable cities and communities (SDG 11), responsible production and consumption (SDG 12), life below water (SDG 14), and life on land (SDG 15);
- the contribution of the circular bioeconomy to these SDGs is acknowledged and has been demonstrating positive impact on the environment, economy, society's welfare and wellbeing.

#### A circular bioeconomy uses natural resources responsibly and eliminates pollution of the biosphere

- bio-based value chains operating at high levels of resource and energy efficiency, utilising renewable energy, and aiming at producing zero waste;
- bio-based products, based on an eco-design principle, have a sustainable 'end of life' as they are recyclable, degradable or compostable, preventing polluting and littering the biosphere.



## 5

### Informed and participating citizens enable a sustainable, circular bioeconomy

#### In 2050: Citizens submit proposals for product improvement and new innovative societal developments through participative governance

- through new business models and relationships for design, production, marketing and use of bio-based products and services:
  - incorporated industry, education and research, policymakers, and society (quadruple helix);
  - with a structured process to maintain citizens' participation and, hence, societal acceptance of innovative circular bioeconomy applications;
- with strategic partners in the value chains representing the markets and consumers to facilitate market uptake of the most sustainable solutions.

#### Citizens opt for a sustainable way of life by purchasing and consuming competitive bio-based materials and services

- through purchasing and consumption patterns that are different than traditional patterns throughout most of the 20th century:
  - purchasing competitive bio-based products that meet all safety and product standards;
  - willingness to pay a premium for better performance during use in 'end of life';
  - consuming healthy and nutritious foods that have a smaller environmental footprint in production.





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