

VISION

The circular bio-society in 2050





This Vision is the result of the collective work by the Bio-based Industries Consortium (BIC) and its members, the BBI JU's advisory bodies: the States Representatives Group and Scientific Committee, and the following organisations:

European Bioeconomy Alliance ([EUBA](#)) and its members:
Confederation of European Forest Owners ([CEFE](#));
Confederation of European Paper Industries ([CEPI](#));
European Association for Bioindustries ([EuropaBio](#));
European Association of Sugar Manufacturers ([CEFS](#));
European Bioplastics ([EUBP](#));
European Farmers and European Agri-Cooperatives ([Copa-Cogeca](#));
European Renewable Ethanol Producers Association ([ePURE](#));
European Starch Industry Association ([Starch Europe](#));
European Vegetable Oil and Protein Meal Industry ([FEDIOL](#));
Forest-based Sector Technology Platform ([FTP](#))
and Primary Food Processors ([PFP](#)) &

European Agricultural Machinery Industry ([CEMA](#))
European Chemical Industry Council ([Cefic](#))
European Technology Platform 'Food for Life'
European Technology Platform for Sustainable Chemistry ([SusChem](#))

The Institute for European Environmental Policy ([IEEP](#))
has been consulted in this process.

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By 2050, Europe will have a **sustainable and competitive bio-based industry** providing jobs and growth that contribute to a **circular bio-society**. In this circular bio-society, informed citizens choose a **sustainable way of life**, supporting an economy that couples economic growth with **societal well-being and respect for the environment**.

Executive summary

This Vision will establish a sustainable and competitive bio-based industry in the EU enabling a circular bio-society by 2050. It focuses on four key drivers:

1. Foster food security for a growing world population and meet its demand for sustainable products
2. Contribute to a sustainable planet
3. Create jobs and growth in the circular bioeconomy
4. Achieve a circular bioeconomic society

In this circular bio-society, informed citizens choose more sustainable means

to live and acknowledge and benefit from a bioeconomic societal model. Bio-based products and services are both competitive in price and performance with their fossil-based counterparts. The EU, having proactively invested early in a highly efficient and sustainable biomass production for food, feed and bio-based products, is the global hub for bio-based industrial investment and the international reference point for the circular bioeconomy. More specifically, this Vision describes a scenario in which food, renewable products and energy for our communities are provided in a sustainable manner.

With respect to food, it motivates citizens to accustom to innovative new foods and food sources that have minimal impact on the environment. We will be resource efficient and function in a zero-waste society that harnesses natural resources in harmony with ecosystems and utilises energy efficiently.

A carbon-neutral bio-based industry will play a central role in combatting climate change whilst moving Europe towards a carbon-neutral society. Informed and engaged European citizens will choose

bio-based products and services that not only underpin multi-skilled and secure jobs but enhance the well-being of society and the environment, whilst ultimately improving their own health.

A circular bio-society will be achieved with this mindset, making an active contribution to achieving twelve of the UN's Sustainable Development Goals (SDGs) and reducing society's dependence on fossil resources, to the benefit of the planet, the economy and the citizen.

Background

This Vision unites the collective knowledge of Europe's bio-based organisations and experts. These include the full spectrum of **BIC's membership**, encompassing sectors as diverse as agriculture, food and feed production, forestry and pulp & paper, aquatic and marine, chemicals and materials including bioplastics, technology providers and beyond. They also include a broad selection of stakeholders, large and small, other European associations and industries, the primary sector, brand owners, representatives of Member States, scientists and environmental organisations, representing Europe in all its geographical and natural diversity.

This Vision will also serve as the framework for the development of a Strategic Research and Innovation Agenda – the SIRA – for a public-private partnership on bio-based solutions under Horizon Europe (2021-2027). The SIRA will be an important tool to realise and implement the vision with all involved stakeholders (primary producers, industry, academia, the EU and society at large).



01

Foster food security for a growing world population and meet demand for sustainable products

Through integrated, efficient production of food, feed, bio-based products, services and energy with minimal environmental impact.

in 2050

Integrated and innovative circular operations produce food, feed, bio-based products, services and bioenergy while preserving ecosystems

- integrating food production that meets growing demand with innovative systems to valorise its side and residual streams into products and services for various market sectors; contributing to UN SDG 2 (Zero Hunger);
- operating on principles of circularity, returning the necessary ingredients to the soil to increase soil carbon content and avoid depletion, while furthering the use of compost as a fertiliser;

- enhancing biodiversity, including its social aspects, in the context of EU agricultural and environmental policies.



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Bio-based operations utilise new and available feedstock sustainably and generate value-adding products with minimal environmental impact:



- utilising all fractions of renewable feedstock from multiple sources such as the land, sea, air (including CO₂) and municipal bio-waste streams in a sustainable manner, through smart and efficient use of feedstock with zero-waste objectives;
- producing safe, nutritious and diverse food and feed for humans and animals, and achieving a sustainable consumption of animal and plant-based proteins; contributing to UN SDG 3 (Good Health and Well-being);
- creating value for society and protecting the environment with sustainable high-quality solutions; this includes supporting the switch to renewable energy sources for all transportation modalities; contributing to UN SDG 7 (Affordable and Clean Energy);

- ensuring efficient logistics and a continuous supply of sustainable food, feed and bio-based products and services for European citizens, while providing creative solutions for changing and new market sectors.



Interconnected bio-based operations exchange intermediate streams and achieve synergies

- incorporating operational efficiency and services, such as precision farming, process intensification, digitalisation, artificial intelligence and data science (including big data management and analysis);
- running large- and small-scale operations and modular processing systems that facilitate an efficient industrial ecosystem and enable SME participation throughout value chains;
- spurring new business models that better integrate primary sectors and market actors and are fully operational across Europe.

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Contribute to a sustainable planet

With carbon-neutral value chains, using natural resources optimally, protecting the environment, adding value to society and the economy.

in 2050

Bio-based operations deliver solutions to mitigate climate change:

- establishing new processes and value chains and improving existing ones for the bioeconomy that are fully sustainable and combat climate change, contributing to UN SDG 13 (Climate Action);
- harnessing bio-based value chains' potential to perform at negative emissions by functioning as a carbon sink, turning carbon and other greenhouse gases captured from the atmosphere into new value-adding products.

A sustainable circular bioeconomy uses water efficiently and responsibly and delivers solutions to increase availability of clean water:

- recycling and reusing water to improve water-use efficiency and reduce fresh water intake;
- treating and sanitising wastewater for safe reuse;
- avoiding pollution and the release of hazardous materials, contributing to UN SDG 6 (Clean Water and Sanitation) and SDG 14 (Life Below Water).



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

- operating at high levels of resource and energy efficiency, utilising renewable raw materials and energy while aiming towards zero-waste production. This contributes to UN SDG 6 (Clean Water and Sanitation), SDG 7 (Affordable and Clean Energy), SDG 12 (Responsible Production and Consumption), SDG 14 (Life Below Water) and SDG 15 (Life on Land);
- stimulating eco-designed bio-based products, which are recyclable, or compostable; preventing pollution and littering of the biosphere; contributing to UN SDG 6 (Clean Water and Sanitation), SDG 14 (Life Below Water) and SDG 15 (Life on Land).

03 Create jobs and growth in the circular bioeconomy

With value chains that mobilise available and potential local feedstock, making products that meet demand and benefit all actors.

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Industry creates jobs in rural, coastal and urban areas, uplifting local economies:

- expanding bio-based activities across Europe, providing new or additional income for actors in the primary sectors¹, creating vibrant sustainable communities in rural, coastal and urban areas;
- assisting municipalities and urban environments in valorising residual streams, avoiding landfill and providing new income for municipalities and actors in 'waste management';
- applying biotechnologies jointly with other disciplines for new and innovative industrial activities;
- creating employment opportunities across the full set of skills and competences needed in a multidisciplinary, diverse and innovative bio-based sector across rural, coastal and urban areas.

¹The primary sectors include agriculture, food and feed production, horticulture, forestry, the blue economy and sustainable aquaculture.

Innovative value chains include actors as strategic partners from primary sectors to markets:

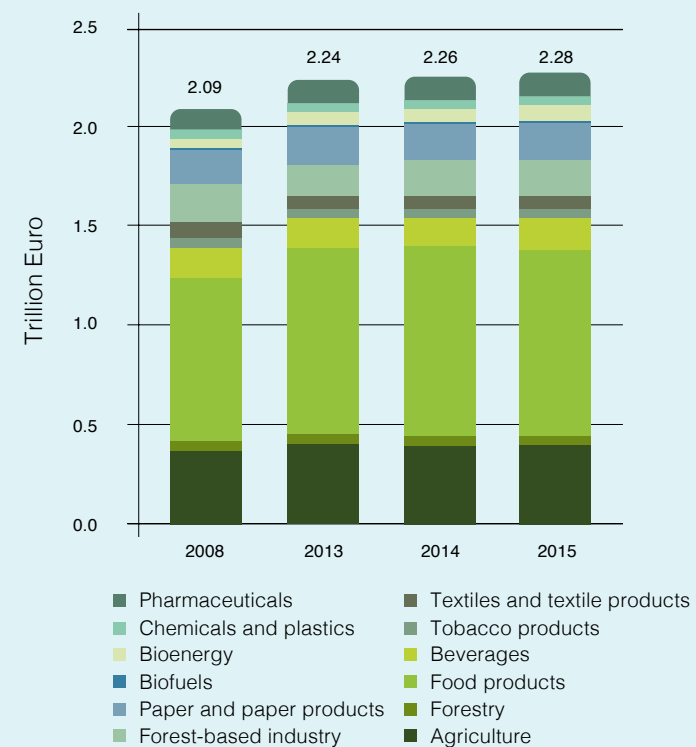
- participating primary sector actors are co-designers of value chains and their outputs, sharing the benefits thereof in rural, coastal and urban areas;
- stimulating additional plant-based production of food, feed and materials;

- enabling brand owners to lead the conversion to bio-based applications by informing citizens and increasing their awareness of sustainable bio-based alternatives;
- creating added-value for consumer products and services that perform better than fossil-based alternatives based on life cycle sustainability assessments², and performance testing results for functionalities;
- sharing value and risks with all participating sectors.

²Assessment of the environmental, economic and social impacts of a product, process or service throughout the entire life cycle.

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



Source: nova-Institute (2018)

Sustainable financing and investment to support the bio-based sector:

- building a 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;
- financing green/sustainable investments preferentially, by private and public investors;
- promoting investments that enhance collaboration across the whole research and innovation chain, thereby improving the likelihood of research developing into demonstration projects;
- supporting funding from EU regional development funding instruments.

in 2050

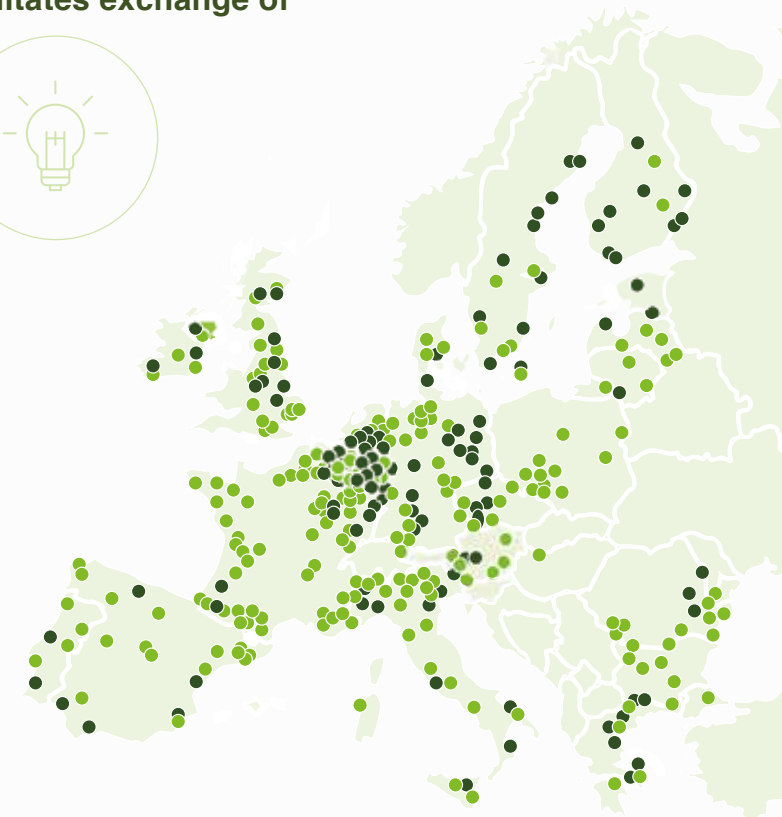
An innovation infrastructure with interlinked R&D centres stimulates open innovation and facilitates exchange of expertise across Europe:

- providing open access to piloting facilities, technical and commercial testing platforms to accelerate commercialisation;
- ensuring low hurdles for SMEs to enter and participate.



Member States and regions support the bioeconomy by taking political action:

- deploying the benefits of the circular bioeconomy through infrastructures and legislative frameworks and promoting the use of local feedstock in bio-based value chains;
- implementing the EU's Bioeconomy Strategy across all major, relevant EU policy initiatives including, among others, the Common Agricultural Policy, the Common Fisheries Policy, the Food Strategy, the Water Framework Directive as well as climate and environment strategies.



Source: EU Joint Research Centre (2018)

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Achieve a circular bioeconomic society

Through effective networks of innovation and knowledge centres, connecting industrial actors, investors and municipalities across boundaries of geography and competence, with informed and participating citizens.



The primary sectors, operational actors, R&I institutions and market actors cooperate with education institutions to meet mutual needs for skills and competences:

- constantly exchanging needs for skills and competences for the bioeconomy across Europe at vocational, applied and fundamental research at university and PhD levels; to align education needs between all actors, society and academia;
- standardising bioeconomic curricula and diplomas across Europe;
- recognising input from all actors in terms of practical and 'real time' examples into curricula, educational programmes and materials;
- encouraging national and European innovation contests to stimulate exemplary performance by students and start-ups;
- institutionalising lifelong learning facilities and trainings that are shared by industry, government and society.



Active citizens consume and put forward proposals for novel bio-based products and services:

- participating in new business models and relationships for design, production, marketing and use of bio-based products and services (quadruple helix);
- achieving societal acceptance and market uptake of innovative circular bioeconomy applications through strategic value chain partnerships;
- through purchasing and consumption patterns that are different from traditional 20th century linear ones:
 - purchasing competitive bio-based products that meet all safety and product standards;
 - consuming safe, nutritious, diverse and appealing food that has a minimal environmental footprint.



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