



Circular
Bio-based
Europe
Joint Undertaking

Strategic Research and Innovation Agenda



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Table of contents

EXECUTIVE SUMMARY	3
1. Legal and policy context	5
2. Building on the success of BBI JU.....	8
2.1 BBI JU in figures.....	8
2.2 BBI JU main achievements and further challenges.....	8
3. The way forward: CBE JU partnership	11
3.1 Public interests that motivate the EC to join the partnership.....	11
3.2 Private interests that motivate the bio-based industry to join the partnership	12
3.3 Alignment of the public and private interests in the CBE partnership and the strategic approach	13
3.4 Other Stakeholders	14
3.5 Scope of activities.....	15
4. Strategies for the operation of the CBE partnership.....	17
4.1 CBE objective 1: Accelerate the innovation process and development of bio-based innovative solutions.....	21
4.1.1 Specific objective 1.1: Increase the intensity of cross-disciplinary research and innovation activities.....	21
4.1.2 Specific objective 1.2: Increase and integrate the research and innovation capacity of stakeholders across the Union	24
4.1.3 Specific objective 1.3 Increase and integrate the research and innovation capacity for addressing environmental challenges and development of more sustainable bio-based innovations	26
4.2 CBE objective 2: Accelerate market deployment of existing mature and innovative bio-based solutions.....	27
4.2.1 Specific objective 2.1: Reinforce the integration of bio-based research and innovation throughout industrial bio-based systems and increase the involvement of R&I actors including feedstock providers in the bio-based value chains.....	27
4.2.2 Specific objective 2.2: Reduce the risk for research and innovation investments in bio-based companies and projects	32
4.3 CBE objective 3: Ensure a high level of environmental performance of bio-based industrial systems	34
4.3.1 Specific objective 3.1: Ensure the integration of circularity and environmental sustainability requirements, contribution to climate neutrality and zero pollution ambition in the development and implementation of bio-based research and innovation and facilitate societal acceptance.	34
4.4 Strategic Interaction and synergies.....	36
4.4.1 EU research and innovation programmes.....	36

4.4.2	Other EU funding and financial instruments	37
5.	Governance of CBE JU	38
5.1	Roles and responsibilities	38
5.1.1	The Deployment Groups	39
5.2	Programming	40
5.3	Programme monitoring and reporting	40
6.	Financing the CBE partnership	41
6.1	Financial commitments	41
6.2	Mechanism for sufficient participation of BIC members in innovation actions	42
Annex I	General objectives and specific objectives of CBE JU (Council Regulation, Article 46)	44
Annex II.	Intervention logic	45
Annex III	Broader policy context for the Circular Bio-based Europe Joint Undertaking	46
Annex IV	Key Performance Indicators	53
Annex V.	Table V.1: Potential feedstock for the bio-based industry	54
Annex VI.	Action areas under the strategic priorities	55
Annex VII.	Glossary	64

EXECUTIVE SUMMARY

The **Strategic Research and Innovation Agenda** (SRIA) identifies the strategic priorities and the essential research and innovation actions required to achieve the objectives of the **Circular Bio-based Europe Joint Undertaking** (CBE JU), as defined in the Council Regulation (EU) 2021/2085 of 19 November 2021 establishing the Joint Undertakings under Horizon Europe.

The CBE JU is a EUR 2 billion Public-Private Partnership between the European Union, represented by the European Commission (EC), and the Bio-based Industries Consortium (BIC). It is established under Horizon Europe, the EU's research and innovation programme, for the period 2021-2031. The CBE JU is not a direct continuation of the Bio-Based Industries Joint Undertaking, but rather a programme that builds on its achievements and aims at addressing its shortcomings.

The scope of CBE JU is underpinned by the updated EU Bioeconomy Strategy (2018). The CBE JU is in line with the **European Green Deal** objectives – to produce major contributions to the EU climate targets by delivering innovative bio-based solutions and paving the way for Europe to become the first climate neutral continent by 2050; protecting and enhancing biodiversity; combating pollution; reducing fossil resource dependence; and deploying a just transition.

The bio-based solutions and innovations that fall within the scope of CBE should focus on the production of bio-based chemicals, materials, food and feed ingredients and soil nutrients. Biofuels, bioenergy, food and feed, pharmaceuticals and medical devices are not within the remit of the partnership. The activities to be funded by the CBE JU will follow the principles of cascading use of sustainably-sourced biological feedstock (including bio-based waste, residues and side-streams), as well as delivering innovative solutions with improved climate and environmental performance. Supporting industrial activities will also contribute to local and regional economies, while reducing Europe's dependency on imports of biological resources. An integrated approach, between stakeholders across several territorial dimensions, including the mobilisation of national and regional authorities, is expected to create more favourable conditions for market uptake of bio-based solutions and services. This can be of benefit to countries and regions with great potential for bio-based industrial activities, but with insufficient capacity and support to start-up, diversify or extend these activities.

This **Public-Private Partnership** will, in particular, aim at strengthening the European bioeconomy primary sectors of the land and sea and its industries by combining the 'public' interests, pursued by the EC, and the 'private' interests of bio-based industries, such as: increasing the competitiveness of the EU economy; job creation; balanced regional development and economic cohesion; climate and environmental performance; creating better market conditions; removal of barriers; de-risking investment; increasing resource efficient, circular technologies and operations, while engaging all actors in the bio-based systems.

The CBE JU operations are based on the general and specific objectives detailed in the Council Regulation which aim to:

- accelerate the **innovation process and development** of bio-based innovative solutions;
- accelerate **market deployment** of existing mature and innovative bio-based solutions;
- ensure a **high level of environmental performance of bio-based** industrial systems.

For each CBE JU specific objective, a set of **strategic priorities** has been defined by the partners and is presented in Chapter 4. These strategic priorities underpin action areas covered by delivery mechanisms, including grants, as well as other instruments and/or actors.

In line with Horizon Europe, the CBE JU will fund projects following open calls for proposals, as well as supporting other activities deemed necessary to achieve the objectives of the partnership. The main types of actions that will be funded are research and innovation actions (RIAs), innovation actions (IAs), and coordination and support actions (CSAs). Among the projects to be funded by the CBE JU the **flagships** are a specific type of innovation action to support innovations that have already been demonstrated but not yet applied or deployed at industrial and commercial scale in the EU (first-of-a-kind innovation).

All CBE JU actions will apply the ‘open science’ concept as set out in the Horizon Europe regulation and will implement a value chain approach which ensures that all the concerned actors in the bio-based system, including the supply chain, are appropriately involved and represented in the project consortia.

This SRIA will be the basis for the CBE JU annual work programmes that will contain the call for proposals, developed jointly by both partners under the coordination of the Programme Office, and taking into account the recommendations of the advisory bodies. Six calls for proposals are foreseen during the lifetime of the partnership for a total indicative operational budget of EUR 976.5 million.

Progress towards the achievement of the CBE JU objectives will be monitored through a set of Key Performance Indicators (KPIs). The monitoring and reporting of CBE activities, including KPIs, will be undertaken on an annual basis and reflected in the Annual Activity Report (AAR).

1. Legal and policy context

The European Union, with its European Green Deal and the new EU growth strategy, has committed to an ambitious course of becoming climate neutral by 2050, and set this aspiration to an obligation laid down in the European Climate Law, adopted in December 2020. The Climate Law sets ambitious EU targets for reducing net greenhouse gas emissions by at least 55% by 2030 (compared to 1990) and becoming the first climate neutral continent by 2050. The Commission's 'Fit for 55' Package proposes how the legislative amendments will support achieving the targets of 55% by 2030, including the aim to reach climate neutrality in the entire land sector by 2035. The European Climate Law also creates new opportunities for innovation, investment and jobs, and will boost the green economy and protect the environment. The EU climate and environmental challenges are interlinked with and reinforced by unsustainable production and consumption patterns, overexploitation of natural resources, ecosystem degradation, biodiversity loss and dwindling availability of critical biological raw materials. Research and innovation are fundamental drivers that can turn these complex and multi-faceted challenges into economic and environmental opportunities that are also inclusive and just. Innovation deployment can also, eventually, trigger societal transitions and open new market opportunities; while sustainable and circular bio-based solutions simultaneously support also addressing environmental challenges. The overall contribution of Bioeconomy in the European Green Deal can become a catalyst for systemic change, with new ways of producing and consuming resources while respecting our planetary boundaries.

Box 1. SRIA definitions

According to the Council Regulation establishing the Joint Undertakings¹ - institutionalised public-private partnerships in the field of research and innovation - under the Horizon Europe, the '**Strategic Research and Innovation Agenda**' (SRIA) is the document that identifies the strategic priorities and the essential research and innovation actions required to achieve the objectives of the Joint Undertaking. The SRIA shall also describe the Joint Undertaking's targeted impact, foreseen portfolio of activities, and measurable expected outcomes. The SRIA should be established at the beginning of the initiative covering the whole period of Horizon Europe (2021-2027), and also until the end of the Initiative (2030) and can be amended where necessary. Referring to relevant EU policies, the Council Regulation establishes the Joint Undertakings as a key element of the policy approach of Horizon Europe and clarifies that these partnerships are set up to deliver on Union priorities targeted by Horizon Europe and to ensure clear impact for the EU and its people². In particular, the Joint Undertakings should play an important role in achieving the strategic objectives such as accelerating the transitions towards **sustainable development goals** and a **just, green and digital Europe**, and should also contribute to recovery from the **unprecedented COVID-related crisis**.

¹ Council Regulation (EU) 2021/2085 of 19 November 2021 establishing the Joint Undertakings under Horizon Europe and repealing Regulations (EC) No 219/2007, (EU) No 557/2014, (EU) No 558/2014, (EU) No 559/2014, (EU) No 560/2014, (EU) No 561/2014 and (EU) No 642/2014

² Council Regulation Recitals 1-2.

The **European bio-based sector** (including SMEs, regions and primary producers) should contribute significantly to climate neutrality, more circularity and more sustainability, while remaining competitive on the global scale. A strong, resource efficient and competitive bio-based innovation ecosystem can decrease dependency on and accelerate the substitution of fossil raw materials (and mineral) resources. It can develop renewable bio-based products, materials, processes and nutrients from waste and biomass through sustainability and circularity-driven innovation. Such ecosystem can also create value from local feedstock – including waste, residues and side-streams – to deliver jobs, economic growth and development throughout the Union, not only in urban areas but also in rural and coastal territories where biomass is produced, and which are often peripheral regions that rarely benefit from industrial development.

Bioeconomy sectors and industries have strong innovation potential due to increasing demand for their goods and their use of a wide range of sciences and industrial technologies. The sector proposed, in 2019, a vision document entitled **Joint industry Vision for a circular-bio-society in 2050**³. Bioeconomy can offer a unique opportunity to address societal challenges such as food security, natural resource scarcity, fossil resource dependence and climate change while achieving sustainable economic growth.

Box 2: Bioeconomy and bio-based systems definitions

A key EU policy commitment related to the present Partnership is the **EU Bioeconomy Strategy** and its **Action Plan (2012)**, as updated by the European Union in 2018, and implementing the objectives of the **European Green Deal** and related policies.

The broader **Bioeconomy** covers all sectors and systems that rely on biological resources (animals, plants, microorganisms and derived biomass, including organic waste and biogenic CO₂), their functions and principle, encompassing all primary production sectors that use and produce biological resources (agriculture, forestry, fisheries and aquaculture) and all economic and industrial sectors that use biological resources and processes to produce food, feed, bio-based products, energy and services. It includes and interlinks: land and marine ecosystems and the services they provide; all primary production sectors that use and produce biological resources (agriculture, forestry, fisheries and aquaculture); and all economic and industrial sectors that use biological resources and processes to produce food, feed, bio-based products, energy and services⁴. The biorefineries are the core of the bioeconomy, which sustainably transform biomass into value-added products and energy in respect of sustainability considerations. The value-added of the EU bioeconomy is estimated at EUR 614 billion (2017)⁵, out of which ca. 65% is related to agriculture and food sectors, 19% to forestry and wood-based industries and 16.5% to other **bio-based industries** in the EU27.

³<http://biconsortium.eu/sites/biconsortium.eu/files/documents/Vision%20for%20a%20circular%20bio-society%202050.pdf>

⁴ "A sustainable bioeconomy for Europe" <https://op.europa.eu/en/publication-detail/-/publication/edace3e3-e189-11e8-b690-01aa75ed71a1/language-en/format-PDF/source-149755478>. To be noted that health biotechnology is not covered under the EU Bioeconomy Strategy definition.

⁵ JRC EU Bioeconomy Monitoring System (knowledge4policy.ec.europa.eu/bioeconomy/monitoring_en)

The need for establishing the **Circular Bio-based Europe (CBE) partnership** was identified in the **Impact Assessment Report**⁶ that provided an analysis of problems and proposed an intervention approach (see Annex II). Based on this report and following the agreement of the Council of the EU, having consulted the European Parliament on the Commission's proposal, the Council Regulation set the aim⁷ of the Circular Bio-based Europe partnership as, i.e. "to develop and expand the sustainable sourcing and conversion of biomass into bio-based products, applying circular economy approaches". The Council Regulation also specified the partnership's objectives and tasks⁸.

The more detailed coverage of the broader policy context⁹ for the Circular Bio-based Europe Joint Undertaking is outlined in Annex III.

⁶ SWD(2021) 37 final PART 16/19 COMMISSION STAFF WORKING DOCUMENT IMPACT ASSESSMENT REPORT

Accompanying the document Proposal for a Council Regulation establishing the Joint Undertakings under Horizon Europe European Partnership for a Circular Bio-based Europe {COM(2021) 87 final} - {SEC(2021) 100 final} - {SWD(2021) 38 final}

⁷ Council Regulation Introduction

⁸ Council Regulation Articles 46 and 47.

⁹ It should be noted that the policy context is under development and as many initiatives are not adopted yet. As many CBE JU projects are about deployment of innovation, only a clear, predictable and stable policy framework will set the incentives to convert project outcomes beyond pre-commercial levels. Because of their 'newness', bio-based products may encounter legislative barriers in their market uptake. These barriers may refer to the sustainable feedstock used, an applied technology, or the new characteristics/functionalities of the product for the market. Novel bio-based systems should anticipate barriers that may impede market uptake. Similarly, these systems should anticipate adequate regulation needed to support market uptake of the new products. The anticipating of barriers, their monitoring and proposing how to deal with them, and proposing supporting regulation, are particularly relevant for IA at TRLs 7-8 since they bring products close to or on the market.

2. Building on the success of BBI JU

2.1 BBI JU in figures

From 2014 until 2020, the Bio-based Industries Joint Undertaking (BBI JU) implemented the programme as defined by the Bio-based Industries Consortium (BIC) and the EC through seven annual work programmes. It launched eight calls for proposals mobilising more than 10 000 applicants (of whom around 1/3 were unique applicants) and receiving 929 project proposals.

BBI JU grants from 2014 – 2020 calls in a snapshot:

- 142 granted projects of which: 14 Flagship Actions – 39 Demonstration Actions – 71 Research & Innovation Actions – 18 Coordination and Support Actions
- EUR 822 million public funding
- Around 1 000 beneficiaries from 39 Countries of which: 26 Member States, 9 Associated Countries including UK¹⁰ and 4 Other Countries (as defined in H2020 General Annex A¹¹)
- 60% of the beneficiaries are private companies of which more than 40% are SMEs¹², 30% are universities and research centres, 10% are other actors
- BIC full and associate members add to 39% of the beneficiaries (61% of the beneficiaries are not BIC members) and they have received 59% of the overall funding

2.2 BBI JU main achievements and further challenges

BBI JU projects and beneficiaries: boosting competitiveness of European bioeconomy

The two main positive effects of BBI JU have been the **structuring** effect in organising the value chain across sectors and the innovation-driven **mobilising** effect of key stakeholders across sectors and across geographical areas. Both effects have been even stronger since the interim evaluation (2016)¹³.

In 2021, the expected leverage effect of BBI will reach EUR 2.6 billion, above the expected level and is very well on track to achieve the overall target of the programme of EUR 2.8 billion. It is also expected that the amount of In-Kind Additional Activities¹⁴ (IKAA) will continue to grow, pushing the leverage effect even further. On top of this indicator, another important achievement of BBI JU Flagship projects is that the cumulative funding of EUR 250 million provided by BBI JU generated private investments of around EUR 1.5 billion.

As confirmed by the above-mentioned BBI JU interim evaluation report, BBI JU has created a stimulating research and innovation environment in Europe, attracting a satisfactory level of participation of the best European players in the areas of the selected value chains. The development of business models to integrate economic actors along the whole value chain can clearly be considered a remarkable achievement, as it covered the entire range of

¹⁰ [ec_rtd_uk-participation-in-horizon-europe.pdf \(europa.eu\)](#)

¹¹ [h2020-wp1820-annex-ga_en.pdf \(europa.eu\)](#)

¹² [The BBI JU SME landscape: driving impact and innovation, November 2019, Brussels](#)

¹³ [Interim evaluation of the Bio-based Industries Joint Undertaking \(2014-2016\) operating under Horizon 2020](#)

¹⁴ Council Regulation Article 2(10): 'in-kind contributions to additional activities' means contributions by the private members, constituent entities or the affiliated entities of either, and by international organisations, consisting of the costs incurred by them in implementing additional activities less any contribution to those costs from the Union and from the participating states of that joint undertaking

stakeholders, from the supply of biomass to biorefinery operators to customers and consumers of biobased materials, chemicals and other products. This has been also supported by creating new cross-sector interconnections and related cross-industry clusters. In particular, SMEs have shown an increased participation in BBI JU projects, much higher than the 20% participation level for SMEs reached in the full H2020 programme¹⁵.

There is still room for further outreach and mobilisation of SMEs and other stakeholders, especially in the rural, coastal and less advanced regions. For example, primary biomass suppliers from the agriculture sector¹⁶ have already been identified as a special group that needs to play a bigger and more specific role in the bioeconomy and bio-based value chains.

Broadening the feedstock and achieving the circularity

The growing EU bio-based industry relies on bio-based feedstock availability and quality, which depend on geography, climate and soil conditions, seasonality, and may be affected by logistical issues and competing uses of biomass for other applications, such as food/feed and energy production. These elements can lead to uncertainties of the availability and quality of feedstock and potential large price fluctuations, thus increasing the risk for investments and reducing competitiveness of bio-based industry.

BBI JU projects have contributed to broadening the range of bio-based feedstock for industrial uses: while the first AWP's focused on agri- and forestry-based feedstock, topics have increasingly introduced new sources, such as from aquatic origin, from municipal bio-waste, from wastewater and from biogenic CO₂ (from the AWP 2016 onwards) A clear translation in the project portfolio has occurred, including first of its kind flagships biorefineries valorising the organic fraction of municipal solid waste and aquatic-based feedstock in 2020.

Besides the efforts made to expand the feedstock variety, a more efficient use of resources (especially bio-based residues and waste) and more reusable and recyclable bio-based products is necessary for the transition to a fully circular¹⁷ bio-based industry. The CBE JU will, therefore, develop and expand the sustainable sourcing, and achieve higher utilisation of unavoidable bio-based residues and waste and side streams from all sectors.

Climate neutrality targets, zero-pollution ambition and biodiversity emergency

Climate change, pollution and biodiversity loss put pressure on the need to reduce emissions of greenhouse gases and other pollutants from industry and to pay attention to the natural ecosystems. The bio-based industrial systems are intrinsically more carbon efficient compared to their fossil-based counterparts, as the primary feedstock used in such systems are living organisms, which bind carbon from the air or soil, turn it into biomass and does not pollute. The biomass converted into bio-based products, especially long life-cycle and circular products, store the carbon during the extended life-cycle and such carbon may be recycled to compost at the end of life (in case of products which are biodegradable). However, the overall environmental sustainability of the bio-based industry will depend on its performances targeting a variety of environmental objectives: zero pollution ambition, sustainable sourcing

¹⁵ [Horizon dashboard](#)

¹⁶ [Action Plan and Study Primary Sector_publication.pdf \(europa.eu\)](#)

¹⁷ [Categorisation System for Circular Economy, EC Expert Group on Circular Economy Finance \(2020\)](#): Access-to-finance conditions for Investments in Bio-Based Industries and the Blue Economy, the bio-based industry can become circular by: using sustainably sourced renewable biomass as the feedstock, using the biological waste as the feedstock, or by producing materials/products that can be used in circular way

of biological feedstock, mitigation of and adaptation to climate change, biodiversity protection and enhancement, reduction of impacts on ecosystems due to ILUC, reduced resources consumption, reduced use of fertilisers and pesticides, waste generation, etc.

BBI JU projects have striven to contribute to the environmental challenges: 58% of the BBI JU projects indicated their expected contribution to lower GHG emissions compared to fossil-based counterparts, when completed; 64% of the projects reported an expected contribution to waste reduction through reusing, recycling or valorisation of products at their end-of-life; nearly half of the projects reported an expected reduced energy consumption and improved land use; and one third of the projects have reported expected improved water efficiency and a more sustainable use of natural resources. Considering only the BBI JU Flagships, the total CO₂ savings are expected to surpass 800 kt CO₂/year. Moreover, flagships biorefineries produce materials and ingredients from locally sourced biomass and plan to create about 20 000 direct and indirect jobs in rural and coastal areas based on the latest data collected from the BBI JU Flagship Projects in October 2021. These outcomes demonstrate the positive environmental and social impacts that the BBI JU projects have brought.

The new partnership intends to increase the focus on environmental sustainability and circularity of bio-based systems in all life-cycle stages, from sourcing to processing, market applications and consumption.

More balanced distribution of beneficiaries across the EU

The potential of the bio-based industries to contribute to sustainable growth of local communities all over Europe can be undermined by the unequal capacity for research and economic activities of the bio-based industries. The challenge is, therefore, to promote the bio-based sectors also in those parts of the EU where such sectors are under-developed, either due to unsuitable conditions or to an insufficient capacity due to various reasons, such as lack of political engagement, investment decisions, knowledge and capacities, e.g. in Central and Eastern Europe¹⁸. The bio-based sector can be an opportunity to deploy the economic recovery from the crisis caused by the COVID-19 pandemic, as well.

The geographical distribution of beneficiaries in BBI JU projects has already shown a relatively good spread across Europe. For example, among Flagships, five projects are located in North-Western Europe (Ireland, the Netherlands and France), three in Southern Europe (Italy and Spain), four in Central and Eastern Europe (Estonia, Latvia and Romania) and one in Norway.

However, research and innovation in bio-based sectors tends to be concentrated in countries such as Belgium, the Netherlands, Nordic countries and some regions of Germany, France, Italy and Spain, whereas in the other regions, the capacity for R&I has not been sufficiently developed yet, even in those regions where there could be great regional/local potential for bio-based industry due to the availability of biomass, or presence of human skills.

The new partnership will focus on the regions that are currently lagging behind the leading Member States, and also on the regions with the most noticeable gaps in bioeconomy policy development, aiming at a balanced distribution of benefits from bio-based innovation across Member States and regions. Furthermore, it aims at reviving and revitalising the rural, coastal and peripheral regions through development of appropriate technological solutions, and inclusive involvement and empowerment of local bioeconomy actors.

¹⁸ This is the conclusion of the Impact Assessment Report

3. The way forward: CBE JU partnership

The CBE JU is a public-private partnership between the European Commission (EC) and the Bio-based Industries Consortium (BIC). As a partnership of public and private members, CBE JU can only function and succeed if the interests, goals and commitments of the partners are aligned.

3.1 Public interests that motivate the EC to join the partnership

The EC expects that the CBE JU, as it is an institutionalised partnership, will deliver more effectively on the objectives of Horizon Europe and on a number of public interests related to bio-based industrial systems than any other type of initiative in the framework of EU R&I policy¹⁹. These public interests are related to the potential long-term contributions of the EU bio-based industry to the following EU policy objectives framed in the European Green Deal:

- The EU economic growth and creation of jobs for EU citizens, contributing to socially just transition from fossil-based economy. This implies that the investments and industrial activities take place in the EU Member States;
- The competitiveness of the EU economy, by making the EU bio-based industry a global leader in bio-based innovation and its deployment for the benefit of people, economies and the environment;
- The resilience and strategic autonomy of the EU economy by making the bio-based sector technologically independent and self-sufficient in feedstock and other material inputs;
- A balanced economic development and territorial cohesion by bringing development opportunities to regions across the Union, in particular to rural, coastal and marginal regions that typically do not benefit from industrial development but may have a strong potential for bio-based industry;
- The EU climate and environmental policy objectives, in particular reduction of greenhouse gas emissions, biodiversity protection and restoration of ecosystems and reduction of environmental pollution including through a regenerative, circular, and restorative by design EU industry²⁰.

These public interests are realised if the solutions deployed by the private companies are designed and implemented in a specific way and in view of these interests. The European Commission sees the CBE partnership as a tool to create conditions and incentives for the bio-based industry to carry out their industrial activities in a way that delivers on public interests, while making the economic activity feasible and attractive for the private companies. For example, the core actions of the partnerships -- the grants to research and innovation projects - incentivise and mobilise companies to keep their research activities and make investment in first market applications of bio-based innovation in the EU, rather than elsewhere where costs of such activities might be lower. The European Commission is willing to invest public money from Horizon Europe because the returns, in the form of public good produced by actions of the CBE JU, are expected to exceed the amount of public funds invested.

¹⁹ This is the conclusion of the Impact Assessment Report

²⁰ Where processes store more anthropogenic carbon than is emitted, generate more energy than is used and enhance rather than deplete biodiversity. From "Industry 5.0, a transformative vision for Europe" <https://op.europa.eu/en/web/eu-law-and-publications/publication-detail/-/publication/38a2fa08-728e-11ec-9136-01aa75ed71a1>.

3.2 Private interests that motivate the bio-based industry to join the partnership

The Bio-based Industries Consortium (BIC) is committed to engaging in a continued partnership with the European Commission (EC) to meet both the public and private interests.

The bio-based industry's collective interest is to improve market conditions and remove barriers for the development of the bio-based sector in the EU. Joining forces with the EC in the CBE JU partnership will help share the investment risks, and receive support to move bio-based innovation beyond the 'valley of death' and develop it into a competitive and profitable industry and sector. As indicated in its Vision "The circular bio-society in 2050"²¹, the industry expects that this joint work will lead towards a more sustainable, climate-neutral, and circular society, while remaining competitive on the global scale, in line with the Green Deal objectives.

The request for sustainable circular products and operations is becoming increasingly urgent at national, European, and international level. Globalisation, climate change, urbanisation, environmental pollution, and dwindling natural resources make joint public-private action imperative. Sustainability is one of the most pressing topics for the future, which has been a high priority for BIC members for some time and becoming even more important. Frontrunners will be those that use the most resource-efficient, sustainable technologies, apply them to circular and renewable feedstock and bio-based materials, while operating in the planetary boundaries.

The shift to more sustainable chemicals, materials and products, processes and technological solutions is accelerating at high speed. This leads to profound implications on feedstock used in industry and on the processing steps to make these chemicals, materials, and products of our daily life accessible, available and affordable, as well as with high environmental performances. BIC is strongly committed to safe and sustainable-by-design chemicals, materials and products. A big part of this will be achieved through innovation and novel technologies and processes to valorise locally available bio-based feedstock.

While the shift to sustainable and circular bio-based solutions is no doubt a positive development for Europe and industry frontrunners, it also brings challenges. With other regions having less stringent rules, more favourable tax policies, and cheaper access to energy and feedstock, the competition for European companies producing or processing chemicals, materials and products increases. It is therefore of utmost importance to set up a strong partnership between the EC and BIC to jointly create inclusive and competitive bio-based communities in the EU. This partnership will contribute to securing jobs and growth and a quick market-uptake of environment- and climate-friendly circular bio-based solutions, while decoupling economic growth and environmental impact. A stable, predictable, and coherent policy framework will foster the uptake of bio-based products.

The partnership that BIC pursues with EC will facilitate the following:

- Establish a competitive bio-based industry across Europe, with a specific focus on local/regional sustainable circular bio-based systems, in particular in countries and regions in Central and Eastern Europe, including by cooperation with the macro-regional BIOEAST Initiative.

²¹ <https://biosocietyvision.eu/>

- Produce and market sustainable circular products to combat societal challenges caused by globalisation, climate change, urbanisation, environmental pollution, and dwindling natural resources. Aid SMEs to develop and scale up their knowledge and expertise, and deliver benefits to the SMEs, the bio-based sector, and the community.
- Set up industrial operations to be safe, resource- and energy-efficient as well as with high environmental performances: use safe and sustainable-by-design chemicals, materials and products and operate within the planetary boundaries.
- Apply sustainable technologies throughout new and existing sustainable circular bio-based systems: aim at zero pollution and zero-waste production, eco-designed bio-based products that are reusable/ recyclable or compostable/biodegradable under target conditions, develop new bio-based products using diverse functionalities of biomass, apply digital technologies and data science.
- Valorise bio-based feedstock effectively and efficiently:
 - no conflict with food & feed production (but rather improve economics of their operations by adding value to surplus, residual and side streams that today have no/low value);
 - protect and enhance biodiversity;
 - mitigate and adapt to climate change.
- Engage and integrate primary producers (of sources on land, in forest, freshwater and marine areas) in sustainable circular bio-based systems and value chains.
- Engage and integrate owners and providers of side streams, residual streams, wastes, and any other biogenic wastes into sustainable circular bio-based systems.
- Develop high-value circular bio-based products and solutions to meet demand or stimulate demand where these products and solutions can bring benefits for other industries, consumers, and the society at large.
- Engage and integrate brand owners, market actors and consumers in pursuit of sustainable behaviour and consumption.
- Create purposeful jobs, linking rural and urban areas leading to wellness and welfare for people and societies.

3.3 Alignment of the public and private interests in the CBE partnership and the strategic approach

It is clear from the above that the stated public and private interests are aligned and complementary. While the partners may have different perspectives, e.g., more macro-economic level of the EC perspective compared to the more micro-economic level of the BIC perspective, the interest of both partners can be operationalised in an agreed set of conditions for membership, objectives, strategic priorities and actions.

The public and private partners have collaborated on the development of the strategic approach for the realisation of their respective interests through activities of the partnership. The joint analysis of the problems that need to be tackled and the basic intervention logic has been developed in the Impact Assessment Report⁶ (the schematic intervention logic extracted from the Impact Assessment Report are in Annex II, as already mentioned).

The agreed objectives of the CBE JU partnership that will orient the future activities are fixed in the legal act - the Council Regulation -- that established the CBE partnership²². The general and specific objectives and the corresponding tasks of the partnership are enacted in the Council Regulation⁸.

The objectives and tasks in the legal act are still at a rather general level and may not be directly 'actionable'. These objectives are operationalised in this document, in particular in chapter 4. A hierarchy of strategic priorities and action areas has been created that links all actions to one or more objectives of the partnership. These strategic priorities and action areas will guide the partners in setting the Annual Work Plans and in the formulation of topics for calls of proposals for research and innovation grants.

In addition, a set of Key Performance Indicators (KPIs) has been agreed between partners that allow monitoring of the progress towards the agreed objectives (Annex IV).

3.4 Other Stakeholders

The partners of the CBE JU are not able to reach all objectives only by themselves or via the CBE JU. The bio-based industry operates in a complex economic ecosystem and interacts with a number of stakeholders who have significant influence on the feasibility of bio-based industrial activities and their socio-economic and environmental impacts.

The partners are determined to collaborate with all relevant stakeholders and extend the partnership approach to the interaction with them. The basic principle of this approach is a mutual benefit that will motivate the stakeholders to join the effort in creating favourable conditions for the development of a sustainable and competitive industry or in the removal of particular barriers.

The Stakeholder base of the CBE Partnership is broad, and could include:

- **Industrial companies** or their associations;
- **The research community**, including universities, research centres and educational facilities;
- **Policy makers**, such as EU Member States and regional authorities, and macro-regional governmental organisations;
- **Feedstock providers**, including primary sectors (such as forestry, agriculture, aquaculture, fisheries) and bio-waste producers from industrial and urban sources (including processing and managing entities such as municipalities and local authorities);
- **Investors**, such as commercial banks, VCs, investment funds, corporate Ventures, etc.;
- **Consumers** and their organisations.

Stakeholders who play a critical role in the deployment of bio-based innovation will be engaged via specific 'deployment groups' (see Chapter 5 on Governance). These deployment groups will be encouraged to carry out specific actions that are necessary for successful and fast deployment of bio-based innovation.

²² Council Regulation (EU) 2021/2085 of 19 November 2021 establishing the Joint Undertakings under Horizon Europe and repealing Regulations (EC) No 219/2007, (EU) No 557/2014, (EU) No 558/2014, (EU) No 559/2014, (EU) No 560/2014, (EU) No 561/2014 and (EU) No 642/2014

Box 5: An example of the extended partnership approach: increase farmer's involvement

Farmers are able to supply biomass in the form of purpose grown plants or as by-products and waste from agricultural and agro-food production. There is mutual interest in functional bio-based systems as farmers want to valorise their agricultural production and the bio-based industry needs a stable supply and quality and sustainable source of biomass. However, because of their fragmentation, low economic power, or insufficient innovation capacity, small farmers, in particular, can rarely benefit adequately from supplying biomass to the industry.

The partners of the CBE JU, farmers and their associations, European & national/regional policy makers should all work together so that farmers will participate to CBE JU calls for proposals, where appropriate, and that they will be well-integrated in the bio-based value chains with the aim of ensuring high quality and quantity of feedstock, and farmers will be rewarded with a proper share of the profit. A specific “deployment group” – see chapter 5 on Governance – for agriculture primary producers and other feedstock providers could be set up to develop and support this in detail.

3.5 Scope of activities

The industrial sectors that convert bio-based feedstock into materials and products that are used by other industries or by final consumers, cut across many traditional industrial sectors²³. The partnership will include all the economic and industrial sectors of the bioeconomy, therefore those that use biological resources and processes to produce food, feed, bio-based products, energy, and services. However, because the challenges for bio-based innovation in these sectors are quite broad and different, it was agreed by the partners that the scope of the partnership will focus on the production of bio-based chemicals, materials and products other than biofuels and bioenergy, food and feed (food and feed ingredients and soil nutrients are in the scope), pharmaceuticals and medical devices.

The boundary between the industrial activities that fall in or out of this scope is difficult to define in a precise way because of multiple outputs from bio-based operations or multiple use of the same bio-based material or product. For example, the production of food is excluded from the scope but processes producing food may have co-products that fall within the scope and side streams that can be used as feedstock for producing bio-based products within CBE JU scope. Another example is bioethanol, that can be used as biofuel, and then excluded from the scope, or as an input to other chemicals' production, and then included in the scope, and many other examples.

The guiding principles for evaluating if an industrial activity falls in the scope of the partnership will be based on:

- a) assessment of what is the dominant application of the bio-based material produced and if this dominant use falls into the scope;
- b) the principle of cascading use of biological resources aiming to best valorise the sustainable use of feedstock.

In any case, the feedstock should be sourced to contribute to operations respecting local ecological limits and protection and enhancement of biodiversity and ecosystems services and should come from short supply chains as much as possible. Moreover, for Innovation Action projects (including flagships) funded under CBE JU, that foresee industrial operations, in case they are located in EU/EEA/EFTA countries, the bio-based feedstock should come from such countries, and in case of industrial operations located in an Associated Country, the bio-

²³ As categorized by the NACE code system

based feedstock should come from the same country or from neighbouring EU/EEA/EFTA countries.

In line with above, biorefineries for sustainable processing of biomass into an array of added-value products (e.g. bioactive substances, chemicals and materials) will fall under the scope if the focus of the project is on materials; while energy production is a complementary activity that improves the overall resource efficiency of the production process and it takes place in accordance with the cascading principle.

All supported activities must also demonstrate the potential of bio-based solutions in terms of climate and environmental performance, and circularity. Activities that do not meet the agreed requirements of climate and environmental performance will not be supported. In line with the circularity objective, attention will be given to activities that enable the conversion of waste, residues and side-streams into added-value circular bio-based solutions.

Supported industrial activities should contribute to local and regional economies, while reducing the dependency on imports of natural resources.

4. Strategies for the operation of the CBE partnership

This Strategic Research and Innovation Agenda (SRIA) operationalises the objectives of the CBE partnership as agreed by the partners. The partners see the partnership as a platform for coordinating a broad scope of activities by stakeholders whose interest is to establish a sustainable bio-based industry²⁴ in Europe. It is thus more than just implementing the Horizon Europe programme through financial grants to Research & Innovation projects in bio-based industrial systems. It will also include other activities deemed necessary to achieve the objectives of the partnership. The partners herewith comply with the main reasons identified in the Impact Assessment²⁵ for the partnership format for implementing Horizon Europe in this thematic area, rather than any other format.

The structure of chapter 4 represents the three general objectives and the six specific objectives as defined in the Council Regulation. They form a hierarchical system where specific objectives are delivered through strategic priorities. These strategic priorities underpin action areas covered by **delivery mechanisms**, briefly described below, including i) grants to R&I projects, based on calls for proposals and ii) other instruments/actors.

This SRIA is the basis for the **annual work programmes** (AWPs) that contain the implementation actions during the runtime of the partnership.

Delivery mechanisms

i) Grants to R&I projects from CBE JU calls for proposals

The CBE JU calls will be aligned to the Horizon Europe Framework Programme Regulation²⁶ addressing research and innovation actions (**RIAs**), innovation actions (**IAs**), and coordination and support actions (**CSAs**).

The **RIAs** and **IAs** include activities of 'testing', 'demonstrating' and 'piloting'. These activities by RIAs aim to establish new knowledge or to explore the feasibility of a new or improved technology, product, process, service, or solution. These may include basic and applied research, technology development and integration, testing, demonstration, and validation on a small-scale prototype, in a laboratory or simulated environment. On the other hand, IAs will scale up these activities from prototype, in a (near to) operational environment, industrial or otherwise, to large-scale product validation and market replication²⁷.

The projects under CBE JU include **flagships**, an important and specific type of IA which aim to support the first application/deployment in the EU market of an innovation that has

²⁴ Bio-based industrial sectors in the scope of CBE are all those based on biological feedstock and/or biological processes producing bio-based products/materials excluding food/feed/biofuels/bioenergy, from the supply chains to the final product/material

²⁵ https://ec.europa.eu/info/sites/default/files/research_and_innovation/funding/documents/ec_rtd_he-partnerships-circular-biobased-europe.pdf

²⁶ REGULATION (EU) 2021/695

²⁷ Large-scale product validation are activities to validate technical and economic performance at system level, in real life operating conditions provided by the market. Market replication is to support the first application/deployment in the market of an innovation that has already been demonstrated but not yet applied/deployed due to market failures/barriers to uptake. Basically, RIA projects are to deliver solutions that substantially contribute to one or more objectives related to research; while IA projects are to demonstrate economically viable solutions that contribute to one or more objectives related to deployment.

already been demonstrated but not yet applied/deployed in the EU market (first-of-a-kind innovation).

CSAs should address needs to i) structure stakeholder communities; ii) support dissemination and exploitation of research or innovation projects; iii) exploit synergies of scale among projects; iv) raise awareness in specific areas; v) support technological visions (e.g. road-mapping, user cases, etc.) and outreach (e.g. events, publications, etc.); vi) promote international cooperation with specific regions and/or technological areas for any of the above-mentioned activities; vii) undertake other activities similar in nature to those above (i.e., this is not an exhaustive list).

Other types of actions, like pre-commercial procurement action (**PCPs**²⁸), may also be considered if relevant to attain the objectives of the CBE JU. In addition, financial support to third parties may be included in specific call topics and funded as part of the received grants from CBE JU via financial support to third parties²⁹. This could be the case for training and mobility of researchers, or prizes.

The technological readiness level (**TRL**) scale defined in the Horizon Europe General Annexes³⁰, is to indicate the appropriate technological context for a project. RIAs are at the level of laboratory or simulated environments and expected to deliver TRL 3-5 at the end of the projects. IAs are demonstration activities in relevant and operational environments and expected to deliver TRL 6-8 at the end of the projects. The end TRL for IA projects will be defined in each call topic and will range from TRL 6 to TRL 8. Flagships need to deliver TRL 8 at the end of the projects.

ii) Other potential instruments/actors

There are other actions by the partnership bodies, partners, or other stakeholders that can contribute to the partnership's objectives. For example, **Tenders** can be part of the CBE JU programme office activities for analysis of specific issues.

The impact assessment³⁰ of the different options for the public-private partnership between the EC and the bio-based industry has highlighted that the optimal implementation of actions requires a new, integrated approach, between stakeholders across several territorial dimensions, e.g. from rural, coastal, urban areas and geographic regions. This approach may include the mobilisation of national and regional authorities that can create more favourable conditions for market uptake of bio-based solutions and services. This can be of benefit to countries and regions with great potential for bio-based industrial activities, but with insufficient capacity and support to start up, diversify or extend these activities. Moreover, the public interest in CBE JU will be served by an effective and transparent communication with policymakers, NGOs, civil society, and consumers to introduce and promote the use of innovative, sustainable bio-based solutions. Public trust is the cornerstone of a sustainable and competitive bio-based industry.

²⁸ PCPs are actions for driving R&I towards commercial applications. Pre-commercial procurement tackles situations when there are no near-to-the-market solutions yet to address a challenge of public interest, and where significant R&I is still needed to ensure that the market can deliver commercially stable solutions with the desired price/quality requirements of the buyers. See also the Glossary.

²⁹ p.13 [wp-13-general-annexes_horizon-2021-2022_en.pdf \(europa.eu\)](#)

³⁰ https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2021-2022/wp-13-general-annexes_horizon-2021-2022_en.pdf

Annual Work Programmes

The Annual Work Programmes (AWPs) are the basis for the calls for grants and all the enabling actions performed by the partnership bodies, partners, or other stakeholders that can contribute to the partnership's objectives. The AWP will contain specific requirements/conditions for different types of actions to meet the relevant CBE JU general and specific objectives and associated strategic priorities for that action. The progress towards the achievement of CBE JU objectives will be monitored through the set of KPIs, reported in Annex IV, which have been built on the CBE JU specific objective and their related strategic priorities presented in this chapter³¹.

Grants will be available for RIA, IA (including flagship), and CSA projects through competitive calls for those actions that contribute financially to the partnership's objectives. The grants therefore serve as an incentive for specific actions and activities. The pursuit of this strategy through the calls is along three dimensions:

- The scopes of topics under each call define the activities that will contribute to the CBE JU partnership's objectives and that can receive a grant.
- The call/topic conditionality: only applicants who meet the condition specified in the call topics are eligible for a grant.
- A coordination between CBE JU calls/topics and other activities/programmes to seek synergy, within the partnership and in other Horizon Europe instruments (HE), resulting in a greater impact.

All CBE JU actions will apply the 'open science' concept as set in the HE regulation. Consequently, scientific, and technological results will be accessible to the community of stakeholders of the bio-based sector. This will increase the impact of CBE JU actions and foster the knowledge sharing within the scientific community in the EU. Where appropriate, beneficiaries of calls should make use of the possibilities offered by the European Open Science Cloud (EOSC) and the European Data Infrastructure.

CBE JU actions will implement a value chain approach which ensures that all the concerned actors in the bio-based system, including the supply chain, i.e. agriculture/forestry/aquaculture primary producers, bio-waste producers and management facilities, etc. are appropriately involved in the selected project proposals and are represented to the largest possible extent in the project consortia. The establishment of an "advisory board of farmers" as part of the management structure of specific projects will be encouraged by providing funding for facilitators via financial support to third parties.

The topics in the AWP will be developed with the objective to achieve synergy and complementarity with other HE initiatives, including work programmes where possible and applicable. These include those developed under Pillar II Cluster 6 'Food, Bioeconomy, Natural Resources, Agriculture and Environment', the Missions, and under other HE components.

The AWP topics for IAs, flagships, and specific RIAs, will include requirements pertaining to the subject at hand and the impacts pursued. When applicable, these could be:

- i) Feedstock should be sourced in order to contribute to operations respecting local ecological limits and protection and enhancement of biodiversity and ecosystems

³¹ The list of KPIs and their targets included in this SRIA will be reviewed by the end of 2024 after the implementation of first CBE JU Calls.

services, and should come from short supply chains as much as possible. Moreover, for an IA (including flagship) funded under CBE JU, that foresees industrial operations, in case they are located in EU/EEA/EFTA countries, the bio-based feedstock should come from such countries. In the case of industrial operations located in an Associated Country, the bio-based feedstock should come from the same country or from neighbouring EU/EEA/EFTA countries. Finally, an IA (including flagship) funded under CBE JU must demonstrate low/zero-ILUC³² effect.

- ii) Deploy practices to protect and enhance biodiversity and to assess the impacts of such practices.
- iii) Meet the performance requirements for environmental sustainability and circularity.
- iv) Implement carbon removal³³ (i.e., CCU and/or CCS) and use in bio-based industrial operations and related nature-based solutions³⁴.

³² Indirect land use change: the displacement effects due to the use of food and feed-crops (DIRECTIVE (EU) 2018/2001).

³³ See the Commission Communication on 'Sustainable Carbon Cycles', and the European Climate Law (Regulation (EU) 2021/1119). The carbon removals described in the Communication include '*recycle carbon from waste streams, from sustainable sources of biomass...to use it in place of fossil carbon in the sectors of the economy that will inevitably remain carbon dependent...promote technological solutions for carbon capture and use (CCU) and the production of sustainable synthetic fuels or other non-fossil based carbon products... upscale carbon removal solutions that capture CO₂ from the atmosphere and store it for the long term, either in ecosystems through nature protection and carbon farming solutions or in other storage forms through industrial solutions*'.

³⁴ Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social, and economic benefits and help build resilience. (https://ec.europa.eu/info/research-and-innovation/research-area/environment/nature-based-solutions_en)

4.1 CBE objective 1: Accelerate the innovation process and development of bio-based innovative solutions

To achieve this objective, actions by the partnership will intensify and accelerate research, testing and upscaling the use of novel technologies for converting bio-based feedstock into useful, innovative, and circular solutions.

To support the acceleration of the innovation and development process, targeted actions under this Objective 1 can range from CSAs to RIAs and IAs (ending TRL 6). Whereas single action areas under the strategic priorities can be included in other CSAs to RIAs and IAs, including flagships, under Objective 2, especially those action areas aiming at increasing and integrating the research and innovation capacity of stakeholders across the Union and addressing environmental challenges. These actions and other activities within the CBE JU will forge robust and competitive EU communities of scientists and innovators.

4.1.1 Specific objective 1.1: Increase the intensity of cross-disciplinary research and innovation activities

4.1.1.1 Strategic priority 1.1.1: Ensure the availability and quality of sustainable bio-based feedstock

This strategic priority is to support technological solutions to increase the availability and quality of sustainable feedstock for industrial, circular bio-based systems. The envisaged systems include the valorisation of any existing bio-based and biodegradable waste and residues and new/novel bio-based feedstock with low/zero-ILUC impacts. The systems should aim at maximally valorising the bio-based feedstocks, and as possible and fitting the specific systems' objectives, maximally retain their intrinsic functionalities.

See Table IV.1 in Annex IV for an overview of potential feedstock for the bio-based industry.

The **major** action areas under this strategic priority are:

A.1	Development and/or optimisation of diversification strategies for different primary production models/sectors with a view to minimise potential sustainability issues.
A.2	Increased utilisation of secondary and novel/untapped bio-based feedstock in the bio-based industry.
A.3	Improvement and extension of the preparation of bio-based feedstock for processing and conversion in the bio-based industry.

See further specified action areas under these major headings in Table VI.1, Annex VI.

4.1.1.2 Strategic priority 1.1.2: Develop innovative production systems in the bio-based industry

This strategic priority should lead to bio-based industrial production processes with improved environmental performances, maximum resource- and energy-efficiency, and optimal cascading³⁵ use of bio-based feedstock.

³⁵ The cascading use of biomass entails maximising the resource-use efficiency by prioritising the processing steps by value creation.

The **major** action areas under this strategic priority are:

D.1	Novel ³⁶ and sustainable technologies ³⁷ to produce bio-based products
D.2	Improvement of existing conversion technologies, currently applied in the bio-based industry.
D.3	Innovative technologies for recycling and upcycling of secondary bio-based feedstock, residues and currently wasted bio-based products ³⁸ , including sorting, separation as well as pre-treatment and upgrading technologies.
D.4	Innovative technologies for valorising by-products and side streams from bio-based processes
D.5	Technologies and logistics to enable small-scale operations, including mobile and modular processing and production options.
D.6	Innovative and sustainable solutions to minimise process flows such as energy, water, additives, etc.
D.7	Digital innovation applications ³⁹ for processes optimisation and monitoring, data management and support of industrial discoveries.

See further specified action areas under these major headings in Table VI.1, Annex VI.

4.1.1.3 Strategic priority 1.1.3: Develop innovative bio-based products

This strategic priority should lead to novel and possibly breakthrough bio-based products through the application of innovative and sustainable technologies, such as those based on biotechnology, nanotechnology, chemistry, etc. Specific goals for the new products are improvement of environmental and production-efficiency performances; higher technical and application performances; and circularity through advanced/new functionalities compared to the state of the art.

The innovative qualities of bio-based products include their capacity to sequester biogenic carbon, replace hazardous materials, aside from improving circularity of bio-based systems and the economy.

The **major** action areas under this strategic priority are:

G.1	New or improved bio-based products with enhanced properties for applications in a wide array of market sectors.
G.2	Innovation in the circular design of bio-based products to allow for reuse, recycling, composting and biodegradation (in specific environments and conditions).

See further specified action areas under these major headings in Table VI.1, Annex VI.

³⁶ Novel technologies are such as new, emerging, so far unused for bio-based feedstock conversion.

³⁷ For example, synthetic and natural biology, bioprospecting, etc.

³⁸ For example, wood/composites from demolition, side streams in pulp & paper processes, textiles waste, etc.

³⁹ For example, bioinformatics, AI, blockchain and data science

Delivery mechanisms for the strategic priorities under Specific objective 1.1:

- Grants to R&I projects from CBE JU calls for proposals
 - RIA.
 - IA (ending TRL 6) for targeted actions.
 - CSA for specific scoping activities.
- Other potential instruments/actors
 - Tenders by the CBE JU Programme Office for specific scoping activities.
 - Mapping the biomass availability (primary, secondary, untapped) and mobilisation of stakeholders. The actor can be a CBE JU deployment group (see chapter 5 on Governance).
 - Insight and advice on waste management challenges (and effluents), including developing a broad discussion on end-of-waste status definition. The actor can be a CBE JU deployment group (see chapter 5 on Governance) and CBE bodies containing representatives of national and regional governments.
 - Dissemination of the outcomes of the R&I projects and the best practices.

4.1.2 Specific objective 1.2: Increase and integrate the research and innovation capacity of stakeholders across the Union

This specific objective should lead to the exploitation of the local circular bioeconomy's potential and a more balanced distribution of socio-economic benefits from bio-based innovations across Member States and their regions.

4.1.2.1 *Strategic priority 1.2.1: Stimulate research activities in countries and regions with underdeveloped R&I capacity for bio-based systems*

Bio-based activities heavily depend on innovation, and hence are relatively low in moderate/modest innovator' countries⁴⁰. This may be the result of insufficient knowledge of the potential or insufficient capacity for bio-based research and innovation of stakeholders in these countries compared to other countries.

The **major** action areas under this strategic priority are:

I.1	Communication, engagement, and exchange of knowledge, best practices, and technology with and among targeted stakeholders.
I.2	Assessment of the needs for novel bio-based innovations and systems in countries and regions with current low bio-based activities.
I.3	Capacity building for researchers including enabling access to research, testing and upscaling infrastructures and services.

See further specified action areas under these major headings in Table VI.1, Annex VI.

4.1.2.2 *Strategic priority 1.2.2: Increase awareness and capacity of national and regional research support agencies for industrial bio-based systems*

This strategic priority will result in accelerated application of research and technological developments in industrial bio-based systems.

The **major** action areas under this strategic priority are:

J.1	Increased awareness of EU R&I funding programmes and of R&I agendas in national strategies to exploit the local bioeconomy potential with focus on low R&I performing Member States and Associated Countries and less represented countries/regions.
J.2	Synergies between research and industry at regional level, with focus on less represented countries/regions.

See further specified action areas under these major headings in Table VI.1, Annex VI.

⁴⁰ <https://ec.europa.eu/info/research-and-innovation/statistics/performance-indicators/european-innovation-scoreboard>

4.1.2.3 Strategic priority 1.2.3: Facilitate the development of expertise in bio-based fields by improving higher education and skills development

One of the expected scientific impacts of CBE JU is the reinforcement of the scientific and innovation capacity that is necessary for exploiting the EU potential for bio-based industrial activities. This can be completed through an optimal coherence of research and innovation efforts between the bio-based industry and research systems.

The **major** action areas under this strategic priority are:

K.1	Development of appropriate university and PhD curricula on the bio-based fields including practical training in companies.
K.2	Exchanging scientific expertise between academia, research centres and bio-based industry (especially innovative SMEs).

See further specified action areas under these major headings in Table VI.1, Annex VI.

Delivery mechanisms for the strategic priorities under Specific objective 1.2:

- Grants to R&I projects from CBE JU calls for proposals
 - CSA for specific scoping activities.
- Other potential instruments/actors
 - A CBE JU deployment group (see chapter 5 on Governance) can be the actor to assist with inclusive engagement of low R&I performing Member States⁴⁰ and Associated Countries and less represented countries/regions in collaboration with existing associations (e.g., BIOEAST) and SRG members to exploit the local bioeconomy potential.
 - Tenders by the CBE JU Programme Office for specific scoping activities.
 - BIC's 'Strategic outreach programme' components on awareness and capacity building.
 - CBE JU programme office dissemination activities and training sessions for Cluster 6 NCPs on proposal preparation.
 - SRG, SC and CBE JU deployment groups (see chapter 5 on Governance) recommendations and advice on actions aiming at fostering higher education and skills development through AWP topics.
 - Dissemination of the outcomes of the R&I projects and the best practices.

4.1.3 Specific objective 1.3 Increase and integrate the research and innovation capacity for addressing environmental challenges and development of more sustainable bio-based innovations

Steps to achieve this objective include those aiming to increase and enhance the environmental performances of existing and new sustainable circular bio-based systems.

4.1.3.1 Strategic priority 1.3.1: Protect and enhance biodiversity and ecosystem services in bio-based feedstock supply systems

This strategic priority focuses on the sustainable provision of bio-based feedstock for the bio-based industry.

The **major** action areas under this strategic priority are:

B.1	Improved knowledge of i) balanced and sustainable management of biotic resources and related ecosystems, while mitigating and adapting to climate change, ii) causes of biodiversity loss and ecosystem degradation, iii) good practices preventing losses of valuable natural ecosystems.
B.2	Optimisation of bio-based systems that enable the restoration of ecosystems ⁴¹ .
B.3	Technical solutions to allow the use of bio-based residues and waste for the production of bio-based products while halting negative impacts on biodiversity.
B.4	Innovative bio-based solutions for monitoring and remediation of impacts on ecosystems due to primary and secondary bio-based feedstock exploitation for industrial use.

See further specified action areas under these major headings in Table VI.1, Annex VI.

4.1.3.2 Strategic priority 1.3.2: Improve environmental performances of bio-based processes

The envisaged sustainable circular bio-based systems have the potential to improve the environmental performance of industrial production. Research and innovation steps focusing on delivering high environmental performance of bio-based processes and products are a necessary step to realise this potential.

The **major** action areas under this strategic priority are:

E.1	Reduced exhaust flows ⁴² from bio-based processes through innovative technologies of recirculation, fractionation, extraction, conversion, etc.
E.2	Bio-based solutions for monitoring systems/devices of environmental conditions, such as air, water, and soil quality.
E.3	Improved bio-based industrial processes where hazardous and toxic substances are replaced with safe bio-based ones ⁴³

⁴¹ Such as the utilisation of paludicrops from rewetted areas for high value applications, or other nature-positive supply chains.

⁴² Including for example hot water, vapour, odours, wastewater, etc.

⁴³ To be coordinated with Processes4Planet

See further specified action areas under these major headings in Table VI.1, Annex VI.

Delivery mechanisms for the strategic priorities under Specific objective 1.3:

- Grants to R&I projects from CBE JU calls for proposals
 - RIA.
 - IA (ending TRL 6) for targeted actions.
- Other potential instruments/actors
 - CBE bodies to ensure sufficient expertise on biodiversity and ecosystem services in the CBE JU governance, notably in the task force of in the SC⁴⁴ ensuring the high-level focus on environmental sustainability aspects and in the relevant CBE JU deployment group (see chapter 5 on Governance).
 - Dissemination of the outcomes of the R&I projects and the best practices.

4.2 CBE objective 2: Accelerate market deployment of existing mature and innovative bio-based solutions

By pursuing this objective, the CBE JU will promote and support actions to scale up innovative bio-based processes, products, and applications starting from at least TRL 5 and ending at TRL 7-8³⁰, including flagships, across Europe. Such actions can include single action areas under the strategic priorities both from Objective 1, especially those aiming at increasing and integrating the research and innovation capacity of stakeholders across the Union and addressing environmental challenges, and Objectives 3. In this process, it is essential to increase the cooperation between relevant actors across all sectors and disciplines, mobilising them to apply bio-based solutions in the market. A key element for success is the engagement of industry and other R&I actors in collective scale-up activities including testing, demonstrating in operation, and proving scalability and replicability. The desired actions will be guided along two specific objectives, each with its strategic priorities and a framework for actions.

4.2.1 Specific objective 2.1: Reinforce the integration of bio-based research and innovation throughout industrial bio-based systems and increase the involvement of R&I actors including feedstock providers in the bio-based value chains

This specific objective for CBE will lead to sustainable circular bio-based systems in the European Union that benefit all actors, the environment, and the society.

4.2.1.1 Strategic priority 2.1.1: Demonstrate the sustainable supply of bio-based feedstock

To build sustainable, circular bio-based systems operating at demonstration and flagship levels, the feedstock for the bio-based industry must be available as needed, sustainable, affordable, and sustainably processed, stored, transported, and delivered for further processing.

The relevant and potentially adequate feedstock for the bio-based industry have different origin or source. See Table V.1 in Annex V.

⁴⁴ The CBE JU Scientific Committee will set up this task force as per the Council Regulation (See Article 55, sub-4).

Scaling up sustainable supply of bio-based feedstock from pilot levels (TRL5) to demonstration (ending TRL 7-8) and flagship levels (ending TRL 8), entails the scaling up of all steps and associated logistics from sourcing to conversion of feedstock. The adequate steps include impacts of location, seasonality, and varying composition and quality of various bio-based feedstock. Storing and utilising the feedstock needs to include protection and conservation of natural resources and safe interaction with the ecosystem services:

- Protect, restore, or increase soil fertility.
- Conserve water (by preventing water consumption above sustainable levels for industrial use) and carbon stocks.
- Preserve and enhance biodiversity in terrestrial, fresh water, marine, urban, and coastal ecosystems.
- Reduce nutrient loads in soil and water.
- Support sustainable livestock farming and carbon farming.
- Maintain or improve the resilience and regeneration capacity of multifunctional forests.
- Control and reduce aquatic and soil ecosystems pollutions.
- Ensure the safety controls on waste streams used for bio-based industry.

The **major** action areas under this strategic priority are:

C.1	Innovative, sustainable, and replicable operational business models for the primary biomass producers ⁴⁵ within the bio-based industry.
C.2	Enable new forms of collaborations among key actors of bio-based systems to better involve primary producers, including in new bio-based value chains.
C.3	Sustainable bio-based business models for agricultural, horticultural, forestry, aquaculture, fishery cooperatives.
C.4	Small-scale biorefineries in rural, coastal, and urban areas integrating the primary biomass sectors with bio-based systems that produce bio-based chemicals and materials.
C.5	Innovative, sustainable, and replicable operational business models for the secondary and novel biomass providers to the bio-based industry.
C.6	Demonstration of innovative steps to improve the management of bio-based feedstock for the industrial use.
C.7	Deployment of bio-based systems that enable the restoration of ecosystems to enhance biodiversity

See further specified action areas under these major headings in Table VI.1, Annex VI.

4.2.1.2 Strategic priority 2.1.2: Deploy innovative production technologies

Departing from sustainable bio-based feedstock, innovative processing technologies could selectively retain many of the intrinsic characteristics and functionalities of the feedstock as needed in the products. These technologies could allow relatively milder operating conditions

⁴⁵ Primary biomass producing sectors: agricultural, forestry, marine and aquaculture, and fishery.

and higher selectivity than traditional conversion technologies, resulting in more efficient production systems.

Scaling up innovative production technologies starting from at least TRL 5 to TRL 7-8 entails outcomes such as:

- Sustainable performance of the system prototype in an operational environment, confirmed by validated environmental sustainability and circularity performances, and the economic feasibility of the system.
- Resource-efficient and sustainable conversion/downstream processing technologies.
- Economic viability of the technological and non-technological solutions for the bio-based products industrial processing and manufacturing.
- Applying digital technologies and tools to monitor and optimise production technologies and the use of product information systems for traceability.

The **major** action areas under this strategic priority are:

F.1	Novel methods of feedstock processing in industrial settings for maximising yields and feedstock utilisation through cascading use of biomass in a circular symbiosis of several operators in industrial/urban/rural/coastal areas.
F.2	Innovative technologies for sorting, cleaning, separation, extracting, recycling, and upcycling of biomass of bio-based feedstock from primary and secondary sources, i.e., by-products, side streams and waste from industrial processes and waste streams from other sectors and from retail and end consumers.
F.3	Technical and logistic solutions for producing added-value bio-based products from small to very-small-scale biorefineries (e.g., small-scale (rural and municipal) solutions, mobile installations).
F.4	Demonstration of the development of biorefining concepts that minimise wastes and emissions, resource-efficiency, and climate neutrality (towards zero-waste and zero-pollution operations).
F.5	Demonstration of the development of bio-based processes using safe bio-based substances in substitution of hazardous and toxic ones ⁴⁶ .
F.6	Optimisation and monitoring of bio-based processes by applying digitalisation ⁴⁷ concepts to ensure high standards of resource efficiency and environmental protection.
F.7	Development of tailored, innovative bio-based processes for the manufacturing sectors in the Union.
F.8	Key infrastructures such as pilot plants, demo biorefinery facilities, etc., shared among biomass producers and biorefineries, which provide test rigs and norms.

See further specified action areas under these major headings in Table VI.1, Annex VI.

⁴⁶ To be coordinated with Processes4Planet.

⁴⁷ Digitalisation is the leveraging of digitisation (which is converting information into digital format) to improve business processes. It may include among other AI, block chain, virtual reality, digitisation in general, data science, distributed ledger technologies, PAT, digital twins.

4.2.1.3 Strategic priority 2.1.3: Scale up production and market uptake of innovative bio-based products

Current commercial-level production of bio-based products and their applications in EU market segments are relatively low. But their intrinsic qualities, allowing for a more sustainable use and end of life, offer opportunities for substantial growth.

Bio-based products are new on the market and may be ahead of corresponding legislation to accompany their use and disposal. Industry and academic actors can assist by developing new methodologies for assessing their functional and environmental performances. CBE JU projects (IAs TRL 7-8, including flagships TRL 8) that will deliver new bio-based products and/or processes on the market, should include an analysis of existing legislation, and provide facts and arguments for adjustments or possible new regulations to support market uptake. See also chapter 1 on policies and legislation.

The **major** action areas under this strategic priority are:

H.1	Scaled-up safe and sustainable by design ⁴⁸ bio-based products and solutions.
H.2	Scaled-up circular-by design bio-based products to allow for reuse, recycling, composting and biodegradation (in specific environments and conditions).
H.3	Scaled-up bio-based food ingredients from terrestrial, aquatic, and biogenic CO2 origins integrated in new and/or existing systems to meet sustainability objectives of food systems.
H.4	Scaled-up tailored bio-based products for the manufacturing sectors.

See further specified action areas under these major headings in Table VI.1, Annex VI.

4.2.1.4 Strategic priority 2.1.4: Build policy makers' awareness and acceptance of bio-based solutions

National and regional policy makers are key actors for the deployment of sustainable circular bio-based solutions across Europe, within the framework of local bioeconomy strategies.

The **major** action area under this strategic priority is:

L.1	Enhancement of dialogue with national and regional policy makers to enhance the development of bio-based systems throughout Europe.
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See further specified action areas under these major headings in Table VI.1, Annex VI.

⁴⁸ Looking at the coherence with the safe and sustainable by design criteria being developed within the Sustainable Chemicals Strategy and the feedback on the additional criteria that may be needed in the case of bio-based products.

Delivery mechanisms for the strategic priorities under Specific objective 2.1:

- Grants to R&I projects from CBE JU calls for proposals
 - IAs (ending TRL 7-8) including flagships (ending TRL 8).
 - CSA for specific scoping activities.
- Other potential instruments/actors
 - Tenders by the CBE JU Programme Office for specific scoping activities.
 - Strategic collaboration between BIC and i) primary producers, waste collectors, recyclers, and composters; ii) technology providers; iii) product formulators, converters, brand owners, end-user market actors, and consumers' representatives delivering benefits to all actors.
 - Complementary and synergistic programmes and projects with industry associations active in the bio-based fields⁴⁹.
 - Complementarity and synergy with relevant initiatives under Horizon Europe, such as the Circular Cities and regions Initiative⁵⁹, Hubs4Circularity community of practice, and Processes4Planet partnership⁵⁴.
 - Replication of best practices in operations and of bio-based solutions, guided by the appropriate CBE deployment groups (see chapter 5 on Governance).
 - Guidance from the appropriate CBE deployment groups on the effective mobilisation and integration of primary producers in bio-based value systems.
 - Recommendations from CBE JU advisory bodies regarding sustainable production and sourcing of primary biomass to the industry.
 - Harmonised certification systems, labels, standardisation for bio-based feedstock, supported by EC.
 - Tools/guidance by the appropriate CBE JU deployment groups (see chapter 5 on Governance) in cooperation with the SRG for informed decision-making processes, to foster replication of good practices of efficient bio-based systems, including input from consumers.
 - Strategic direction by relevant CBE JU deployment groups (see chapter 5 on Governance) in cooperation with the CBE JU SRG for local action plans to remove possible hurdles for deployment of bio-based solutions.
 - Dissemination of the outcomes of the R&I projects and the best practices.

⁴⁹ See list of organisations supporting the Vision 'The circular bio-society in 2050':
<https://biconsortium.eu/downloads/joint-industry-vision-circular-biosociety-2050>
<https://biconsortium.eu/downloads/joint-industry-vision-circular-biosociety-2050>

4.2.2 Specific objective 2.2: Reduce the risk for research and innovation investments in bio-based companies and projects

From industry's perspective, companies (including SMEs) and consortia need to develop and present 'bankable' projects and scale up demand-driven products to ensure market uptake and minimise market volatility.

4.2.2.1 Strategic priority 2.2.1: Improve the risk profile of bio-based projects

Investments in the bio-based sector have been increasing over the last few years, but there are still steps to take to accelerate and increase these investments. Industry and academia have promising bio-based technologies and applications that have been proven at lab or pilot plant scale, but industry actors are hesitant to carry all the risks for upscaling to a commercial level. Causes may be uncertainties regarding policies and regulations to remove obstacles in the market, and to support the emerging bio-based industry by creating a level-playing field with competing fossil-based products.

Industry actors need to prepare excellent business cases and plans, recognising and dealing with investment risks, perceived or real. For many this requires a shift from technology-based to a business-based mindset.

The **major** action areas under this strategic priority are:

M.1	Harmonised certification systems, labels, standardisation, Product Category Rules (PCRs) and Extended Producer Responsibility (EPR). To demonstrate the added value and environmental claims by bio-based products and solutions, as well as for transparent communication in B2B and B2C interactions. To improve awareness and trust of stakeholders.
M.2	Capacity building of industrial actors (especially SMEs) to develop, test and present bankable projects with risk profiles that are acceptable for investors.
M.3	Resilience strengthening of bio-based companies.
M.4	Enhanced collaboration between bio-based systems actors with market/industrial actors in various market segments.

See further specified action areas under these major headings in Table VI.1, Annex VI.

4.2.2.2 Strategic priority 2.2.2: Develop investment tools and approaches that mitigate the investment risk in bio-based systems

To mitigate the investment risks perceived by investors, the CBE JU will improve interaction of actors of circular bio-based systems with partners across the (capital) investment sectors, including venture capital funds, and regions across Europe. These interactions will build mutual insight of opportunities, capabilities, and trust, and facilitate collective solutions for investments.

The **major** action areas under this strategic priority are:

N.1	Cooperation of circular bio-based systems with the European regions to connect regional investors with innovators for circular bio-based solutions.
N.2	Connection/interaction of local actors in bio-based fields with the bio-based industry's European network of industrial actors, including SMEs, primary producers, research institutions and academia, to exploit local bio-based resources, opportunities and for the benefit local communities.
N.3	Increased access of bio-based industry to public and private funding instruments, to obtain co-investment in circular bio-based projects.

See further specified action areas under these major headings in Table VI.1, Annex VI.

Delivery mechanisms for the strategic priorities under Specific objective 2.2:

- Grants to R&I projects from CBE JU calls for proposals
 - CSA for specific scoping activities and for activities that could include the option of financial support to third parties to implement projects development assistance (e.g. to SMEs to improve their capacity to develop bankable projects).
- Other potential instruments/actors
 - Tenders by the CBE JU Programme Office for specific scoping activities.
 - Adequate tools and platform to connect industry actors with investors and regions across Europe and to facilitate the discussion on market/financial barriers (involving the European Banking Federation).
 - A CBE JU deployment group (see chapter 5 on Governance) can be the actor to:
 - work on InvestEU, ECBF, EIB, EIC lessons to deliver combination of different tools and actors to increase investments in the bio-based sectors and to make them advance and more balanced in the EU, towards overcoming barriers across countries (e.g., working with national promotional banks).
 - aid in gaining insight of public financial instruments leading to higher investments in bio-based sectors across Europe. Working with national promotional banks could remove barriers between countries.
 - Synergies and complementarities between national and regional financial incentives, such as the Smart Specialization Strategies, with other financial instruments and initiatives available for the bio-based sector identified by SRG and the relevant CBE deployment group (see chapter 5 on Governance).
 - Communication on the funding opportunities from different EU funds (e.g., regional development funds and National Recovery and Resilience funds) by the relevant responsible services under the coordination of the CBE JU programme office.
 - The CBE JU SRG will engage in communication activities within their Member States to align regulations and create stable/level playground for bio-based solutions to compete for market entry.
 - Dissemination of the outcomes of the R&I projects and the best practices.

4.3 CBE objective 3: Ensure a high level of environmental performance of bio-based industrial systems

The zero-pollution ambition, the climate neutrality target, and the restoration of biodiversity are the drivers for this objective. To support this objective, different types of action are needed ranging from CSAs to RIAs up to targeted IAs.

4.3.1 Specific objective 3.1: Ensure the integration of circularity and environmental sustainability requirements, contribution to climate neutrality and zero pollution ambition in the development and implementation of bio-based research and innovation and facilitate societal acceptance.

4.3.1.1 Strategic priority 3.1.1: Set effective and robust environmental sustainability and circularity criteria for bio-based systems

Achieving this strategic priority will contribute to an appropriate framework of assessment methodologies and requirements for the environmental sustainability and circularity for bio-based systems and their carbon removal potential. Environmental sustainability of bio-based solutions includes zero pollution ambition, sustainable sourcing of biological feedstock, mitigation of and adaptation to climate change, biodiversity protection and enhancement, reduction of impacts on ecosystems due to ILUC, reduced resources consumption, reduced use of fertilisers and pesticides, waste generation, etc.

The **major** action areas under this strategic priority are:

O.1	Environmental, sustainability and circularity criteria, requirements, and benchmarks for bio-based systems, including their supply chains.
O.2	Tools for monitoring the environmental sustainability and circularity progress of R&I projects towards pre-set KPIs.
O.3	Assessment of the trade-offs and synergies of the environmental sustainability and circularity of the bio-based industry within the economy of the Union.

See further specified action areas under these major headings in Table VI.1, Annex VI.

4.3.1.2 Strategic priority 3.1.2: Incorporate the environmental sustainability and circularity criteria in bio-based systems

The activities of the CBE JU will promote the implementation of the environmental sustainability and circularity framework developed under the strategic priority 3.1.1.

The **major** action areas under this strategic priority are:

P.1	Dialogue among stakeholders, including policymakers at EU and national levels on the deployment of sustainable and circular bio-based systems.
P.2	Communication systems to share best practices on environmental sustainability and circularity amongst actors throughout the bio-based industry in the EU.
P.3	Assessment of the CBE JU contribution to the zero-pollution ambition, climate change neutrality and biodiversity protection and restoration targets.

See further specified action areas under these major headings in Table VI.1, Annex VI.

4.3.1.3 Strategic priority 3.1.3: Facilitate social acceptance of bio-based applications

Consumers and citizens are the key actors in realising a successful transition towards a circular and sustainable bioeconomy through the cultural and behavioural change. An inclusive interaction is crucial for leading towards circular consumption patterns and more sustainable lifestyles. The bio-based industry will therefore improve actions to help citizens visualise, experience, and feel the bio-based products and their benefits, and provide feedback. Focusing on sustainable products and solutions that consumers need in their daily lives, industry expects to establish their trust and appreciation for these new solutions.

The **major** action areas under this strategic priority are:

P.4 Social acceptance of sustainable and circular bio-based applications.

See further specified action areas under these major headings in Table VI.1, Annex VI.

Delivery mechanisms for the strategic priorities under Specific objective 3.1:

- Grants to R&I projects from CBE JU calls for proposals
 - RIA.
 - IAs for targeted actions.
 - CSA for specific scoping activities.
- Other potential instruments/actors
 - Tenders by the CBE JU Programme Office for specific scoping activities.
 - CBE JU SRG, SC and deployment groups (see chapter 5 on Governance) could potentially become actors for collecting performance benchmarks of bio-based systems, testing the applicability of product information systems allowing for traceability and sustainability assessment and participating in international discussion fora.
 - CBE JU SRG, SC and deployment groups (see chapter 5 on Governance) could potentially assist on the uptake the environmental sustainability and circularity assessment framework and targets.
 - The CBE JU SRG may organise events for dialogue with policy makers to i) validate the applicability of the environmental sustainability and circularity assessment framework; ii) validate targets at territorial level; iii) collect advice on sectors of interests for pre-commercial procurement actions as part of CBE JU projects.
 - EC to engage in disseminating the environmental sustainability and circularity assessment framework and targets to other EU funded R&I programmes. In parallel, EC will keep an open dialogue with experts, including CBE JU SC experts, and enable the cross-fertilisation of the environmental sustainability and circularity assessment framework and targets of CBE JU with new policy initiatives.
 - Dissemination of the outcomes of the R&I projects and the best practices.

4.4 Strategic Interaction and synergies

Research and innovation areas and activities of CBE JU should be developed in complementarity and synergy with other Horizon Europe initiatives and other Union programmes, facilitated by the EC, also through its representatives in the GB of CBE JU.

4.4.1 EU research and innovation programmes

The work programmes developed under Horizon Europe Pillar II show potential complementarities with CBE JU action areas. This is the case of HE Cluster 6 “Food, Bioeconomy, Natural Resources, Agriculture and Environment”⁵⁰ but also, HE Cluster 4 “Digital, Industry and Space”⁵¹ and, to a limited extent, HE Cluster 5 “Climate, Energy and Mobility”⁵² and the associated partnerships: A climate neutral, sustainable and productive Blue Economy⁵³, Processes4Planet⁵⁴, Made in Europe⁵⁵, Safe and Sustainable Food System for People⁵⁶, European Innovation Partnership for Agriculture (EIP-AGRI)⁵⁷. A new component of Horizon Europe Pillar II is the set of Missions⁵⁸ among which “Restore our Ocean, Seas and Waters by 2030” and “Soil Health and Food” may provide outcomes relevant for the assessment of the sustainability framework of our economies, included in bio-based sectors.

A side initiative that may have synergies and complementarities with CBE JU action areas is the Circular Cities and Regions Initiative (CCRI)⁵⁹, which focuses on implementing circular systemic solutions at local and regional level.

The European Institute of Innovation & Technology (EIT)⁶⁰ underpins Knowledge and Innovation Communities (KICs)⁶¹ which are partnerships that bring together businesses, research centres and universities. Their activities, especially KIC Climate⁶², EIT Raw Materials⁶³ and EIT Manufacturing⁶⁴, may inspire the integration of businesses in the bio-based systems which involve SMEs, start-ups, higher education institutions, research organisations and regions addressing similar objectives of CBE JU.

⁵⁰ https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2021-2022/wp-9-food-bioeconomy-natural-resources-agriculture-and-environment_horizon-2021-2022_en.pdf

⁵¹ https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2021-2022/wp-7-digital-industry-and-space_horizon-2021-2022_en.pdf

⁵² https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2021-2022/wp-8-climate-energy-and-mobility_horizon-2021-2022_en.pdf

⁵³ <http://jpi-oceans.eu/climate-neutral-sustainable-and-productive-blue-economy>

⁵⁴ <https://www.aspire2050.eu/content/p4planet-sria-2050>

⁵⁵ https://ec.europa.eu/info/sites/default/files/research_and_innovation/funding/documents/ec_rtd_he_partnership-made-in-europe.pdf

⁵⁶ <https://jpi-oceans.eu/en/safe-and-sustainable-food-systems-people-planet-climate>

⁵⁷ <https://ec.europa.eu/eip/agriculture/en/european-innovation-partnership-agricultural>, and its Operational Groups <https://ec.europa.eu/eip/agriculture/en/about/operational-groups>

⁵⁸ https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2021-2022/wp-12-missions_horizon-2021-2022_en.pdf

⁵⁹ https://ec.europa.eu/info/research-and-innovation/research-area/environment/circular-economy/circular-cities-and-regions-initiative_en

⁶⁰ <https://eit.europa.eu/>

⁶¹ <https://eit.europa.eu/our-communities/eit-innovation-communities>

⁶² <https://www.climate-kic.org/>

⁶³ <https://eitrawmaterials.eu/>

⁶⁴ <https://www.eitmanufacturing.eu/>

As key industry-led communities, European Technology Platforms (ETP) can play a relevant role in CBE JU mobilising stakeholders, outreaching across the EU, and bringing new technologies to the market, especially ETPs such as Forest-based sector Technology Platform (FTP)⁶⁵, Sustainable Chemistry (SusChem)⁶⁶, Fibres Textiles Clothing (FTC)⁶⁷, European Construction, built environment and energy efficient building (ECTP)⁶⁸, Manufuture⁶⁹, Plants for the Future⁷⁰.

4.4.2 Other EU funding and financial instruments

Union funding and financial instruments may operate in synergy with programmes supporting research and innovation to deliver additional gains in terms of quantity, quality, and impact of R&I investment.

The European Circular Bioeconomy Fund (ECBF)⁷¹ and the European Investment Bank (EIB)⁷² have the potential to reduce the risk for research and innovation investment in bio-based companies and projects, whereas those regions that have identified - among their S3 priorities - the bio-based sectors, may support them through the European structural and investment fund (ESIF)⁷³.

Stakeholders of the Rural Development Programmes (RDPs)⁷⁴, the 'second pillar' of the Common Agricultural Policy (CAP), are potential feedstock suppliers of the circular bio-based systems supported by CBE JU.

Finally, the EU Recovery and Resilience Facility⁷⁵ makes available EUR 723.8 billion in loans and grants to support climate neutrality (a minimum of 37% of the budget) which is one of the main goals of CBE JU.

⁶⁵ <https://www.forestplatform.org/#/>

⁶⁶ <http://www.suschem.org/>

⁶⁷ <http://www.textile-platform.eu/>

⁶⁸ <http://www.ectp.org/>

⁶⁹ <http://www.manufuture.org/>

⁷⁰ <https://www.plantetp.eu/>

⁷¹ <https://www.ecbf.vc/>

⁷² <https://www.eib.org/en/about/index.htm>

⁷³ https://ec.europa.eu/info/funding-tenders/funding-opportunities/funding-programmes/overview-funding-programmes/european-structural-and-investment-funds_en

⁷⁴ ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/rural-development_en. The EAFRD contributes to the sustainable development of rural areas through three long-term objectives: fostering the competitiveness of agriculture and forestry, ensuring the sustainable management of natural resources and climate action, and achieving a balanced territorial development of rural economies and communities including the creation and maintenance of employment

⁷⁵ https://ec.europa.eu/info/business-economy-euro/recovery-coronavirus/recovery-and-resilience-facility_en

5. Governance of CBE JU

The CBE partnership will be governed and advised by the bodies established in accordance with the Council Regulation⁷⁶, and those include the Governing Board, the Executive Director, the State Representatives Group, the Scientific Committee and one or more Deployment Groups supported by a Programme Office.

5.1 Roles and responsibilities

The Council Regulation defines the responsibilities and tasks of these bodies with the view to achieve the partnership's objectives. The European Commission represents the European Union in the partnership, while the protection of the financial interest of the Union and of the other members is the responsibility of the Executive Director. In addition to the provision of the Council Regulation, the governance bodies of CBE JU must adopt their rules of procedure, that in any case have to respect the principles established in the Council Regulation. The implementation of CBE JU, and any decision taken by the Governing Board and by the Executive Director have to respect the legal framework of Horizon Europe.

The principle of parity between partners and consensual decision-making will be applied in the proceedings of the main decision-making body – the Governing Board – that consists of representativeness of the public and private partners. The Governing Board is composed of five representatives of the European Commission, on behalf of the Union and five representatives of the members other than the Union, at least one of which should represent SMEs. Representatives of other stakeholders will be involved in deliberations of the Governing Board in an appropriate form, e.g. chairperson of the State Representatives Group shall be invited to Governing Board meetings as an observer. Chairpersons of the Scientific Committee and Deployment Groups may be invited to Governing Board meetings.

On top of its regular meetings, the Governing Board shall hold a strategic meeting at least once a year with the primary objective of identifying challenges and opportunities for sustainable bio-based industry and provide additional strategic orientation for CBE JU. In the strategic meeting, additional chief executive officers or officers with decision-making power of leading European bio-based companies and Commissioners shall be invited. The chairpersons of the States Representatives Group, the Scientific Committee and the Deployment Groups may be invited as observers.

The principle of European Union added value, transparency, openness and impact guide all operations of the partnership. The CBE JU calls for proposals are open, transparent and competitive, except in duly justified cases. In CBE JU calls, as in any other call under Horizon Europe, beneficiaries are selected on the basis of the merits of the proposals assessed by independent experts. The openness principle can only be limited in the situation when it prevents the private partner to fulfil its financial commitments. In duly justified cases, participation of the private partner's constituent or affiliated entities may be required in CBE projects but only to the necessary level and in line with the relevant provisions of the Council Regulation (see chapter 6).

⁷⁶ Council Regulation (EU) 2021/2085 of 19 November 2021

The private partner is committed to applying the openness principle in its membership policy. The membership of BIC is open to any organisation that is willing to respect its rules of membership.

The implementation of the programme by CBE JU is done through a transparent strategic and operational planning of research and innovation activities. In accordance with the Horizon Europe regulation, all the information regarding the funds allocated through the grants signed by CBE JU is immediately available through the dedicated platforms. Furthermore, in accordance with CBE financial rules, accountability is applied to the implementation of the CBE JU budget, and its accounts are audited by the European Court of Auditors, in the context of the discharge procedure from the European Parliament. In application of all applicable legal rules concerning transparency, the CBE partnership will actively publish all relevant information about its activities and, in particular, about spending of EU funds. Concerning Horizon Europe's open science policy, CBE JU applies the legal principles established under the Horizon Europe programme, without derogation, which requires beneficiaries of research and innovation funding to make their publications available in open access and make their data as open as possible.

Furthermore, the avoidance of conflict of interest will be pursued in all CBE operations. A clear division between those who make decisions (e.g. those who develop the work programme and define call topics and conditions) on one side and those who benefit on the other side will be strictly observed. This also applies to consultative bodies such as the Scientific Committee or Deployment Groups.

5.1.1 The Deployment Groups

The structure of the CBE bodies will include a body for active involvement of external stakeholders: the Deployment Groups. The role of the Deployment Groups is to advise the Governing Board on issues critical to market uptake of bio-based innovation and to promote and actively contribute to the deployment of sustainable bio-based solutions. The thematic focus of Deployment Groups will be decided by the CBE JU Governing Board so that each thematic group is a platform for a specific stakeholder group as well as their composition to ensure an appropriate representativeness of the stakeholders.

Without prejudging the future decision of the Governing Board, the partners propose to establish Deployment Groups covering the following groups of stakeholders: primary sector and biological feedstock providers, regional authorities and investors. The thematic focus and structure of Deployment Groups can be modified to achieve the most effective deployment process. The Deployment Groups will be open to well-targeted groups of stakeholders that meet the legal requirements approved by the Governing Board and are willing to take actions to improve conditions for the deployment of bio-based solutions. In particular, each individual member will be able to make commitments corresponding to their own capacity and/or the capacity of their organisation.

The Deployment Groups will be expected to provide their opinion on the basis of a request from the Governing Board, the State Representative Group or the Scientific Committee, but they may also act on their own initiative and provide recommendations to the Governing Board and the Executive Director on various deployment aspects. The Deployment Groups will present their Action Plans to the Governing Board and report on their implementation during their lifetime. The Chairs of the Deployment Groups may be invited to strategic

discussions with the Strategic Formation of the Governing Board and with other bodies of the CBE partnership to ensure most effective coordination.

5.2 Programming

The strategic and programming documents are developed jointly by both partners and the Programme Office will provide their input from the very beginning. Advisory bodies will also be involved and consulted at each key step. A structured co-creation process is applied for the formulation of Annual Work Programmes based on the SRIA and the lessons learned from previous calls, as monitored and reported by the CBE JU Programme Offices.

Based on the strategic and programming documents, the call topics for the Annual Work Plan are selected and co-created by both partners, with the support of the Programme Office, taking into account the recommendations of the advisory bodies, and presented by the Executive Director to the Governing Board for adoption. Once adopted, the Annual Work Programme is published on the CBE JU website.

The CBE JU Executive Director is then responsible for the promotion and implementation of the call for proposal according to the following successive main steps: Call Opening – Independent expert evaluator selection and contract - Call Closing – Eligibility check – Proposal evaluation - Ranking list with proposal proposed for funding to GB – GB approval of the ranking list – Grant Agreement Preparation and signature - Project portfolio management including - Project evaluation.

5.3 Programme monitoring and reporting

In line with the Horizon Europe regulation, the Circular Bio-based Europe Joint undertaking will be monitored at three levels:

- At the level of the Horizon Europe Programme through a set of performance indicators that will trace the contributions of the CBE JU to the Horizon Europe Key Impact Pathways, as set out in the Annexes of the Horizon Europe Regulation. These indicators are based on projects information, their results and expected impact, and will be collected automatically from the corporate IT tools.
- At the level of all HE Partnership with a set of common indicators developed by the European Commission with the help of an Expert Group⁷⁷ to monitor the progress made by the European partnerships and to capture their full value.
- At the level of the specific partnership, with a set of KPIs dedicated to monitor the progress towards the achievement of the CBE JU objectives. The list of CBE JU KPIs and their targets are included in Annex IV³¹.

The monitoring and reporting of the CBE activities, including the above list of KPIs, will be done on an annual basis in the Annual Activity Report.

⁷⁷ [A robust and harmonised framework for reporting and monitoring European Partnerships in Horizon Europe](#)

6. Financing the CBE partnership

6.1 Financial commitments

The European Union is committed to contributing up to EUR 1 billion (in nominal value). The majority of this amount - EUR 976.5 million - will support operational expenditure, mainly grants to research and innovation projects. Up to EUR 23.5 million will contribute to the administrative budget.

The foreseen indicative schedule for the operational expenditure (in million EUR)

	2021	2022	2023	2024	2025	2026	2027	Total	%
Total	0	120	212	210	146	146	141.7	976.5	100%

The BIC (and its constituent and affiliated entities) will make, during the duration of the CBE JU, a total contribution of at least EUR 1 billion, split between in-kind contributions and additional activities. Where **in-kind contribution to operational costs (IKOP)** are eligible costs incurred by the BIC members less the grant from the CBE⁷⁸. An additional activity¹⁴ does not receive financial support from the joint undertaking, but contributes to its objectives and is directly linked to the uptake of results from projects under that joint undertaking or its preceding initiatives or has a significant Union added value.

In particular, the innovation actions (including flagship projects) of the CBE JU are expected to bring additional activities, i.e. extra investment. However, the additional activities (IKAA) are strictly linked to implementation of innovation projects done by BIC members. The implementation of innovation projects takes several years, therefore generation of verifiable, i.e. already executed additional investment, may have a delay of several years after the grant was awarded. Due to this delay, the generation of a significant amount of IKAA is only expected towards later in the period of duration of the CBE partnership.

The foreseen indicative schedule for generation of IKAA (in EUR million).

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Annual IKAA generation	0	0	0	0	0	50	100	150	150	150	150
Cumulative IKAA generation	0	0	0	0	0	50	150	300	450	600	750

⁷⁸ COUNCIL REGULATION Article 2(8): 'in-kind contributions to operational activities' mean contributions by private members, their constituent entities, the affiliated entities of either, by international organisations and by contributing partners, consisting of the eligible costs incurred by them in implementing indirect actions less the contribution of that joint undertaking, the participating states of that joint undertaking and any other Union contribution to those costs.

6.2 Mechanism for sufficient participation of BIC members in innovation actions

The private partner, BIC, can only honour the financial commitment (generation of in kind operational costs) if enough of its members participate in partnership's projects. This is due to the rule that only in-kind contributions of private partner's constituent or affiliated entities count towards the budgetary contribution. The low rate of participation of private partner's entities can result in the inability of the private partner to generate a sufficient in-kind contribution. It is estimated that for the BIC to fulfil its financial commitment, the IKOP generated should amount to at least 15% of the indirect action's eligible costs for demonstration actions and at least 20% of the indirect action's eligible costs for Flagship actions.

The Council Regulation foresees that the Governing Board can adopt measures that will create conditions under which the private partner can fulfil its financial commitment. In duly justified case and in line with the Council Regulation, the Governing Board can *"introduce additional conditions that require the participation of a member of the JU or their constituent or affiliated entities, targeting activities where the industrial partners of the JU can play a key role, such as large-scale demonstrations and flagship projects"*. Without prejudging future decisions of the Governing Board, the partners foresee that calls (in the annual work programmes) for selected innovation actions can include an additional eligibility condition that the participation of at least one member of the Bio-based Industry Consortium is an eligibility criterion for consortia submitting a proposal, and that the in-kind contribution to operational costs must reach certain minimum level.

In the event that the measure above is applied, the BIC will accept all new applications for membership in an expedited manner, ensuring that any grant applicant can become a member of BIC before the call closure.

The participation rate of private partner's entities, and their financial contributions, will be monitored by the Executive Director.

Annex I General objectives and specific objectives of CBE JU (Council Regulation, Article 46)

Article 46

Additional objectives of the Circular Bio-based Europe Joint Undertaking

1.

In addition to the objectives set out in Articles 4 and 5, the Circular Bio-based Europe Joint Undertaking shall have the following general objectives:

- (a) accelerate the innovation process and development of bio-based innovative solutions;
- (b) accelerate market deployment of the existing mature and innovative bio-based solutions;
- (c) ensure a high level of environmental performance of bio-based industrial systems.

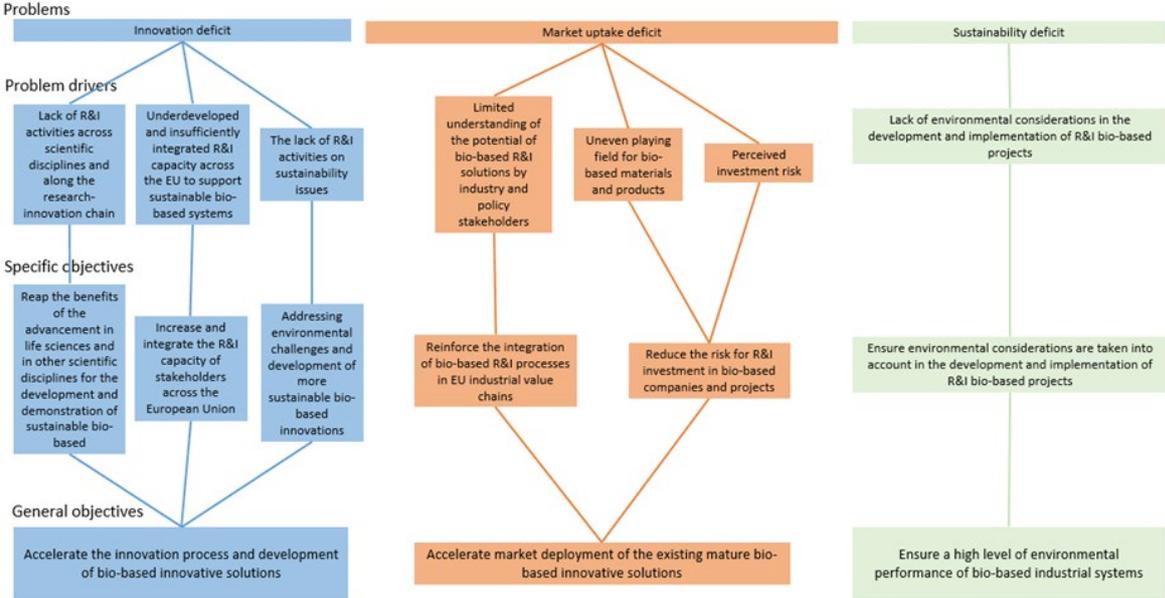
2.

The Circular Bio-based Europe Joint Undertaking shall also have the following specific objectives:

- (a) increase the intensity of cross-disciplinary research and innovation activities to reap the benefits of the advancement in life sciences and in other scientific disciplines for the development and demonstration of sustainable bio-based solutions;
- (b) increase and integrate the research and innovation capacity of stakeholders across the Union to exploit the local bioeconomy potential, including in regions with underdeveloped capacity;
- (c) increase the research and innovation capacity for addressing environmental challenges and development of more sustainable bio-based innovations by ensuring that sustainability issues and environmental performance are integrated throughout the whole innovation chain and in future innovative solutions;
- (d) reinforce the integration of bio-based research and innovation in the Union bio-based industry and increase the involvement of R&I actors including feedstock providers in the bio-based value chains;
- (e) reduce the risk for research and innovation investment in bio-based companies and projects;
- (f) ensure that circularity and environmental considerations, including contributions to climate neutrality and zero pollution objectives, are taken into account in the development and implementation of research and innovation bio-based projects and facilitate societal acceptance.

Annex II. Intervention logic

From the Impact Assessment



Annex III Broader policy context for the Circular Bio-based Europe Joint Undertaking

Policy and reference	Relevance to CBE JU
<p>EU Green Deal⁷⁹ and Fit for 55 package⁸⁰ Launched in 2019, the Green Deal is Europe’s new growth strategy that aims to transform the E.U. into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use.</p> <p>Fit for 55 refers to the EU’s target of reducing net greenhouse gas emissions by at least 55% by 2030. The proposed package aims to bring EU legislation in line with the 2030 goal⁸¹</p>	<p>The Circular Bio-based Europe Partnership has the ambition to provide significant contributions to several key specific EU Green Deal policy objectives, such as objective 1 “Increasing the EU’s climate ambition for 2030 and 2050” and “transform the economy with the aim of climate neutrality”, “Mobilising industry for a clean and circular economy, stimulate the development of lead markets for climate neutral and circular products, in the EU and beyond”, ‘requirements to prevent environmentally harmful products from being placed on the EU market’ ‘tackle intentionally added micro plastics and unintentional releases of plastics’, objective 3 “Reliable, comparable and verifiable information enabling buyers to make more sustainable decisions”, objective 7 Preserving and restoring ecosystems and biodiversity”, by building on the 2030 biodiversity strategy, and on the new EU forest strategy, as well as objective 8 “Towards a zero-pollution ambition for a toxic free environment“ by innovative development of safe and sustainable and competitive bio-based solutions.</p> <p>Several elements of the proposed Fit for 55 package could be relevant to the CBE objectives and specific actions⁸². Amongst other, the revision of RED may have an impact as regards the sustainability criteria for sourcing bio-based feedstock (Art. 29, RED).</p>
<p>International context</p>	<p>At international level and in line with the European Green Deal, the United Nations 2030 Agenda (UN Sustainable Development Goals), the Paris Climate Agreement and the Convention on Biological Diversity remain relevant drivers for the development of sustainable solutions. These are reiterated in European Commission communications, notably “Clean Planet for All”⁸³ and “Towards a Sustainable Europe by 2030”⁸⁴.</p>
<p>EU Bioeconomy Strategy⁸⁵ and its Action Plan</p>	<p>The CBE JU contributes directly to the EU Bioeconomy Strategy Action Plan which includes relevant actions under its action area 1 towards strengthening and scaling up the bio-based sectors, unlocking investments and markets, to mobilise stakeholders in developing and deploying sustainable bio-based solutions.</p>

⁷⁹ COM(2019) 640 final, The European Green Deal.

⁸⁰ ec.europa.eu/commission/presscorner/detail/en/ip_21_3541

⁸¹ ec.europa.eu/clima/eu-action/european-green-deal/delivering-european-green-deal_en

⁸² ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en

⁸³ COM(2018) 773 final, A Clean Planet for all A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy;

⁸⁴ Reflection Paper “Towards a Sustainable Europe by 2030” https://ec.europa.eu/commission/sites/beta-political/files/rp_sustainable_europe_30-01_en_web.pdf;

⁸⁵ COM (2018) 673/2 and SWD (2018)431/2, A Sustainable bioeconomy for Europe: strengthening the connection between the economy, society and environment

	<p>Other relevant actions relate to the enablers and bottlenecks for the deployment of bio-based innovations, promoting and developing standards, facilitating the deployment of new sustainable biorefineries, and developing sustainable and circular substitutes to fossil-based materials and products.</p> <p>Action area 2 supports the rapid deployment of local bioeconomies, across rural, coastal and urban areas in the EU, while also promoting education, training and skills across the bioeconomy.</p> <p>A contribution from CBE JU is expected also on the third action area on understanding the ecological boundaries of the bioeconomy, and specifically by enhancing knowledge on biodiversity and ecosystems, monitoring progress towards a sustainable bioeconomy, promote good practices to operate the bioeconomy within safe ecological limits and enhancing the benefits of biodiversity in primary production. The EU Commission currently (2022) prepares a progress report.</p>
<p>European Biodiversity Strategy 2030⁸⁶</p>	<p>The present initiative is aligned with the EU Biodiversity Strategy for 2030, which introduces measures to enable the necessary transformative change, and highlights unlocking funding for biodiversity, and setting in motion a new, strengthened governance framework to ensure better implementation and track progress, improve knowledge, financing and investments, and better respecting nature in public and business decision-making. There is an increased focus in the present partnership on biodiversity protection and enhancement, while making use of biotic resources for the economy.</p>
<p>Circular Economy Action Plan⁸⁷, Sustainable Product Policy framework and Sustainability framework for bio-based, biodegradable and compostable plastics.</p>	<p>The Circular Economy Action Plan is at the core of the EU Green Deal⁸⁸ and the respective updated Industrial Policy due to its environmental and resource efficiency aspects. Included in this new Action Plan is the drafting of a Sustainable Product Policy Framework. The first act of such framework is the EC Communication COM(2022)140 'On making sustainable products the norm' setting the scene for the proposal for a Regulation on Ecodesign for Sustainable Products and the revision of the Construction Products Regulation, among other actions. CBE could contribute to the objectives of such initiatives, e.g. setting up second and third generation biorefineries for upcycling of residual biomass and capturing CO2 for microbial factories.</p> <p>In addition, the Circular Economy Action Plan includes the action of developing a policy framework for bio-based plastics and biodegradable or compostable plastics. A Communication from the European Commission is expected in 2022. On the same subject, the Directive (EU) 2019/904 calls the Commission to submit a report (by July 2027) which should include an assessment of the scientific and technical progress concerning criteria or a standard for</p>

⁸⁶ https://ec.europa.eu/environment/strategy/biodiversity-strategy-2030_en#:~:text=The 2030 EU Biodiversity Strategy

⁸⁷ European Commission. Questions and Answers: A New Circular Economy Action Plan for a Cleaner and More Competitive Europe. Published 2020. https://ec.europa.eu/commission/presscorner/detail/en/QANDA_20_419

⁸⁸ European Commission. Questions and Answers: A New Circular Economy Action Plan for a Cleaner and More Competitive Europe. Published 2020. https://ec.europa.eu/commission/presscorner/detail/en/QANDA_20_419

	<p>biodegradability in the marine environment applicable to single-use plastic products which ensure full decomposition into carbon dioxide, biomass and water within a timescale short enough for the plastics not to be harmful to marine life and not to lead to an accumulation of plastics in the environment. Although the Directive does not mention bio-based plastics, still biodegradability is a characteristic that some bio-based plastic may have, such as starch-based, PLA, PHA. Then, research actions should be dedicated to develop the biodegradability performances required by the Directive.</p>
Industrial Policy Strategy ⁸⁹	<p>The updated Industrial Policy Strategy, with its 14 industrial ecosystems relating e.g. to food & feed, forest-based industries, textiles and the construction sectors provides an important approach for the intensified deployment and upscaling of the CBE solutions for the green and digital transition towards the sustainability and climate neutrality goals of the Green Deal. These sectors are not only users of the CBE outputs but also the co-developers of breakthrough bio-based solutions due to their long-term acquired knowledge and deep understanding of features of diverse biomass types and their potential for both traditional and also radically new bio-based applications responding to emerging industrial and consumer needs.</p> <p>The contribution of bio-based industry to the economic prosperity and job creation capacity especially by the small and medium size enterprises (SMEs) has been identified also in the EU Industrial Strategy, and confirmed in the bio-based industry context already (BBI JU⁹⁰).</p>
Other relevant industrial sectorial policies	<p>The CBE activities will be very important for the forest-based, chemicals and textiles industries, especially under the upcoming revision of the Construction Products Regulation⁹¹ as well as the Renovation Wave⁹² and the New European Bauhaus (NEB)⁹³. It is notable that the major part of the bio-based construction products refer to woody biomass-based products making use of timber; engineered wood products; circular woody biomass-based insulation materials; adhesives, composites; textiles; etc. The same applies to evolving circular woody biomass-based packaging solutions substituting fossil-based plastics and composites, as well as their respective pollution. The ramping up of second and third generation biorefineries (not using food crops, but residues and algae, respectively), including for lignin-based aromatic chemicals, will require a major R&I input from the CBE both as regards the</p>

89 COM(2021)350 final, Updating the 2020 New Industrial Strategy. Building a stronger Single Market for Europe’s recovery

90 www.bbi.europa.eu/sites/default/files/media/bbiju-sme-landscape.pdf

91 Regulation (EU) No 305/2011 from 9 March 2011 laying down harmonised conditions for the marketing of construction products

92 COM(2020) 662 final; European Commission Communication (14 October 2020) 'A Renovation Wave for Europe - greening our buildings, creating jobs, improving lives'

93 COM(2021) 573 final; European Commission Communication (15 September 2021) "New European Bauhaus Beautiful, Sustainable, Together"

	<p>processing bio- and other technologies and optimising the bio-based feedstock (biomass and CO₂) utilisation⁹⁴. The amended Energy Performance in Buildings Directive (EPBD)⁹⁵ has as one of the objectives to create a clear path towards a decarbonised building stock in the EU by 2050. Also, the Energy Efficiency Directive (EED)⁹⁶ mandates energy efficiency improvements, setting an energy efficiency target for 2030 of at least 32.5%, relative to the 2007 modelling projections for 2030. Effects of the measures may also be relevant for the deployment of bio-based construction materials (e.g. insulation, fibres, adhesives, etc), calling for an evidence-based standardisation and regulation across the EU.</p> <p>Although forests are mainly subject to national policies, the forest-based and related industries fall under the EU industrial policy that provide 19% of the EU Bioeconomy value added⁹⁷. The EU has adopted a sustainable textiles strategy, relevant to bio-based fibres that could be produced in Europe and processed locally in the EU-based biorefineries to replace synthetic fibres (largely imported) and which are one of the leading cause of microplastics' pollution. Such woody biomass-based fibres already serve as starting feedstocks for circular bio-based textiles with less environmental impacts. However, their diversification, deployment and processing technologies needs ramping up to meet the requirements and volumes of the global mass markets. Woody biomass and other bio-based fibres for diverse textile applications, together with bio-based chemicals, dyes and resins will offer an important boost for sustainable, circular and zero pollution textiles from Europe.</p> <p>To ensure that the EU tackles zero pollution from all sources and moves towards a toxic-free environment, a Chemicals Strategy for Sustainability has been adopted by the European Commission. This strategy contains a set of measures, such as related to the development of safe and sustainable-by-design materials and products, including setting criteria but also creating a relevant path for R&I for safer chemicals, materials and products. Bio-based materials and systems innovation could contribute by providing safe[®] and sustainable alternatives, with relevance to a large number of products and value chains.⁹⁸</p>
Waste Framework Directive	As the circularity is at the 'heart' of the CBE JU, the Waste Framework Directive (WFD) has high policy relevance ⁹⁹ , aiming to

⁹⁴ European Commission, Directorate-General for Research and Innovation, Platt, R., Bauen, A., Reumerman, P., et al., EU biorefinery outlook to 2030: studies on support to research and innovation policy in the area of bio-based products and services, Publications Office, 2021, <https://data.europa.eu/doi/10.2777/103465>

⁹⁵ Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency

⁹⁶ Directive (EU) 2018/2002 of the European Parliament and of the Council of 11 December 2018 amending Directive 2012/27/EU on energy efficiency

⁹⁷ JRC EU Bioeconomy Monitoring System (knowledge4policy.ec.europa.eu/bioeconomy/monitoring_en)

⁹⁸ European Commission. Chemicals – strategy for sustainability (toxic-free EU environment). 2020.

<https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12264-Chemicals-strategy-for-sustainability->

⁹⁹ European Commission. Waste Framework Directive 2018/851. Published 2018. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32018L0851>

	<p>ensure that waste management systems of EU Member States would be improved regarding sustainable bio-based materials and products, increase efficiency of resource use and to make sure that unavoidable waste is valued as a resource¹⁰⁰. The WFD also foresees mandatory collection of biowaste which can be used as feedstock in the bio-based sector. The targeted waste reduction could be beneficial for bio-based sectors, as well as for second and third generation biorefineries. The Directive incentivizes the recyclability of products, thus fostering the technological improvements of designing safe and circular bio-based materials. Moreover, for those bio-based packaging products which are biodegradable in industrial composting plants or anaerobic digestion installations, the Directive allows for such packaging to be collected and treated together with bio-waste.</p>
EU Climate/Nature-related policies	<p>The new EU Forest Strategy for 2030, presented together with the Fit for 55 Package, as well as, the New Soil Strategy and the upcoming EU Nature Restoration Law, will further strengthen the EU's natural and man-made carbon sinks, ensuring that they operate in line with the ecological limits protecting biodiversity. The amendment of the Regulation on land use, land use change and forestry (LULUCF) extends the recognition of 'harvested wood products' to a wider 'carbon storage products' while maintaining the role of forests as carbon sinks and proposing an EU land carbon sink target by 2030. Furthermore, the Communication on Sustainable Carbon Cycles supports achieving climate neutrality by proposing a Carbon Farming Initiative and an EU framework for the certification of Carbon Removals. The development and deployment at scale of nature-based and man-made carbon removal zero pollution solutions is indispensable to climate-neutrality and requires significant targeted support in the next decade. Also here, CBE will contribute to this objective with development of circular zero pollution bio-based solutions storing carbon via nature-based or industrial solutions, while developing and assessing the economic viability of the pursued value chains and business cases. The EU strategy to reduce methane emissions focuses on addressing anthropogenic methane emissions. This covers minimising the disposal of biodegradable waste in landfills and its utilisation for, ideally, fully climate-neutral circular bio-based materials and chemicals is critical to avoid the release of methane, whilst providing a substitute for fossil and carbon intensive products. CBE Partnership provides a link for the bio-based approaches and biorefinery pathways capable to convert bio-waste (e.g. manure, sewage sludge) to bio-based chemicals and materials.</p>
The Common Agricultural Policy¹⁰¹ (CAP) is a set of	<p>The Green Deal Communication underlines that all EU policies should contribute to preserving and restoring Europe's natural</p>

¹⁰⁰ Latham & Watkins LLP. The EU Adopts Four Directives to Solidify Europe's Leading Position in Waste Management. Published 2018

¹⁰¹ [The new common agricultural policy: 2023-27 | European Commission \(europa.eu\)](https://ec.europa.eu/commission/presscorner/detail/en/ip21_1867)

On 2 December, 2021, the agreement the common agricultural policy (CAP) post 2020 was formally adopted. The new legislation, which is due to take effect in 2023, paves the way for a fairer, greener and more performance-based CAP. It will seek to ensure a sustainable future for European agriculture sector, provide more targeted support to smaller farms, and

<p>policies, at EU level to ensure the stable supply of affordable food in the EU, safeguard farmers' income, and contribute to climate change mitigation, and support rural development and landscapes.</p>	<p>capital; future Common Agriculture Policy (CAP) National Strategic Plans should be assessed against robust climate and environmental criteria and lead to the use of sustainable practices, such as organic farming, agroecology, and agroforestry. These principles may serve to guide the programming of the CBE JU as well. An expected side benefit for bio-based sectors and biorefineries is that viable opportunities for fair and inclusive participation of the feedstock providers are created as a stable supply of plant biomass also means availability of residues for biorefining, while acknowledging that the amount of such residues should be reduced as much as possible. In addition, the bioeconomy is, for the first time, explicitly included under one of the EU common specific objectives of the Common Agricultural Policy (CAP) post 2020. The new CAP allows Member States to set out interventions adapted to their local realities to promote the development of the bioeconomy in rural areas, providing the possibility to move from individual projects to a more systemic approach and making primary producers active actors of the supply chain.</p>
<p>Farm to Fork Strategy¹⁰²</p>	<p>The Farm to Fork Strategy aims to accelerate our transition to a sustainable food system that should: have a neutral or positive environmental impact; help to mitigate climate change and adapt to its impact; reverse the loss of biodiversity; ensure food security, nutrition and public health; ensure that everyone has access to sufficient, safe, nutritious, sustainable food; preserve affordability of food while generating fairer economic returns; foster competitiveness of the EU supply sector; and promote fair trade. Therefore, while the CBE Partnership is not focused on production of food, there are very clear connections and synergies, such as: improved circularity of biomass valorisation; development of new food/feed ingredients, biologicals such as bio-fertilizers and bio-pesticides relevant for protein supply; etc.</p>
<p>Sustainable Finance</p>	<p>The EU has adopted a Sustainable Finance Taxonomy Regulation¹⁰³ establishing the general framework for determining sustainable investments. It creates a common reference for investors, banks, industry and researchers, and aims at a positive impact on climate and environment. The first Commission Delegated Regulation¹⁰⁴ establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to climate change mitigation or climate change adaptation, included without Do-No-Significant-Harm, included for instance in its scope the manufacturing of bio-based chemicals and of bio-based plastics.</p>

allow greater flexibility for EU countries to adapt measures to local conditions. The new CAP supports agriculture in making a much stronger contribution to the goals of the European Green Deal. Advancing research, knowledge-sharing, and innovation will be essential for securing a smart and sustainable agricultural sector.

¹⁰² COM/2020/381 final

¹⁰³ Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088

¹⁰⁴ [EUR-Lex - C\(2021\)2800 - EN - EUR-Lex \(europa.eu\)](https://eur-lex.europa.eu/eli/reg/2021/2800/oj)

Annex IV Key Performance Indicators

CBE KPIs: Objectives and Units of measurement			2031 targets
1	Strategic participation and integration of feedstock producers and suppliers towards large-scale valorisation of sustainable biomass	1.1 <i>N of primary producers, involved as project beneficiaries and/or engaged in value chains at project level</i>	100
		1.2 <i>N of (bio)waste management actors, involved as project beneficiaries and/or engaged in value chains at project level</i>	20
2	Unlock sustainable and circular bio-based feedstock for the industry	2 <i>N of innovative bio-based value chains created or enabled based on sustainably sourced biomass</i>	120
3	Ensure environmental sustainability of feedstock	3.1 <i>N of projects using feedstock generated with practices that contribute to enhance biodiversity</i>	30
		3.2 <i>N of projects using feedstock generated with practices aiming at zero-pollution (soil, water, air) and/or at reducing water consumption</i>	40
		3.3 <i>N of projects using feedstock generated with practices contributing to climate change mitigation and/or adaptation</i>	60
4	Improve environmental sustainability of bio-based production processes and value chains	4.1 <i>N of projects with innovative & sustainable processes that contribute to GHG emissions reduction</i>	60
		4.2 <i>N of projects developing innovative & sustainable processes that improve on resource efficiency and zero-waste</i>	60
		4.3 <i>N of projects developing innovative & sustainable processes enabling to address zero pollution</i>	60
		4.4 <i>N of projects with innovative & sustainable processes with improved energy efficiency</i>	60
		4.5 <i>N of products with improved life cycle environmental performance</i>	50
5	Expand circularity in bio-based value chains	5.1 <i>N of innovative products that are biodegradable, compostable, recyclable, reused or upcycled (circular by design)</i>	100
		5.2 <i>N projects developing circular production practices (incl. industrial & industrial-urban symbiosis)</i>	40
6	Increase innovative bio-based outputs and products	6.1 <i>N of innovative bio-based dedicated outputs, with novel or significantly improved properties vs relevant alternatives</i>	100
		6.2 <i>N of innovative bio-based drop-in outputs meeting applications requirements</i>	30
7	Improve the market uptake of bio-based products	7 <i>N of brand owners involved as project partners and/or engaged with other mechanisms</i>	50
8	Attract investment on the bio-based sector	8 <i>N of actions implemented at project level to attract investment and/or to create awareness in the investment/funding community</i>	30
9	Increase resilience and capacity in the bio-based sector	9 <i>N of projects contributing to develop the skills and capacity needed by the EU bio-based sector</i>	50
10	Improve participation of regions and countries with high unexploited potential and strategic interest to develop it	10.1 <i>N of participants from the underrepresented EU countries and region</i>	150
		10.2 <i>N of regional hubs established and operated to process bio-based feedstocks and other cooperation aspects</i>	15
		10.3 <i>N of projects with synergies with other funding programmes at EU, national or regional level</i>	60

Annex V. Table V.1: Potential feedstock for the bio-based industry¹⁰⁵

Bio-based feedstock category	Examples of bio-based feedstock
Agri-food feedstock	<ul style="list-style-type: none"> • Side streams and residual streams (or residues) from agriculture and horticulture. • Food and feed waste: bio-waste¹⁰⁶ and side streams from the food and feed production/processing. • Non-edible biomass fractions of food crops. • Perennial grasses, fibre crops or other industrial crops. • Residues of lignocellulosic fraction of industrial crops. • Surplus streams from agricultural biomass processing such as carbohydrates or oils, respecting the “food first” and “cascading use” principles.
Forest-based feedstock	<ul style="list-style-type: none"> • Damaged and/or contaminated wood. • Residues from lignocellulosic biomass and wood from woodlands and the forest-based industry. • Certified lignocellulosic biomass or certified woody biomass harvested from sustainably managed forests.
Aquatic biomass	<ul style="list-style-type: none"> • Aquatic biomass and residual streams (or residues) from aquatic biomass cultivation, processing, and from fisheries. • Industrial biomass grown in open ponds and/or closed systems.
Industrial and municipal bio-based residues and waste (other than food waste)	<ul style="list-style-type: none"> • Bio-waste (other than food waste from production; including post-consumer waste). • Sewage and wastewater sludge. • Used cooking oil. • Residues and by-products from the bio-based industry. • Recycled bio-based products. • Other residues and waste that can be used in bio-based processes.
Biogenic gaseous carbon	<ul style="list-style-type: none"> • Carbon in gaseous emissions from biomass-based industrial ecosystems and biorefineries or any other bio-based operation.
Other / new feedstock	<ul style="list-style-type: none"> • Microbial biomass (including microorganisms). • Insects and fungi. • Residues from nature and landscape management (bio-waste other than food and post-consumer waste). • Products derived from multifunctional forestry practices (other than wood).

¹⁰⁵ This table provides only examples of bio-based feedstock, and it is not meant to be exhaustive and include all the admissible feedstock. Other feedstock than the examples listed in this table may be used, provided they do not interfere with the needs for the food chain, and they meet the requirement to fall within the scope of the partnership.

¹⁰⁶ Bio-waste means: (a) biodegradable garden and park waste, food and kitchen waste from households, offices, restaurants, wholesale, canteens, caterers, and retail premises and (b) comparable waste from food processing plants (WFD).

Annex VI. Action areas under the strategic priorities

FEEDSTOCK	Strategic priority 1.1.1 - Ensure the availability and quality of sustainable bio-based feedstock¹⁰⁷	
	A.1	Development and/or optimisation of diversification strategies for different primary production models/sectors with a view to minimise potential sustainability issues.
	A.1.1	<i>Innovative, sustainable mobilisation of biomass suitable for bio-based industrial applications.</i>
	A.1.2	<i>Innovative concepts for the co-production of non-food/non-feed products for high-value applications in symbiosis with food/feed products (e.g., through intercropping systems)</i>
	A.2	Increased utilisation of secondary and novel/untapped bio-based feedstock in the bio-based industry.
	A.2.1	<i>Innovative mobilisation of bio-based feedstock from secondary sources and exploration and mobilisation of untapped natural resources¹⁰⁸, while fully applying the sustainability principles and the protection of biodiversity.</i>
	A.2.2	<i>Innovative, sustainable mobilisation of novel bio-based feedstock suitable for bio-based industrial applications.</i>
	A.2.3	<i>Innovative and sustainable capture and preparation of biogenic carbon (as part of carbon removal) for subsequent conversion into bio-based products.</i>
	A.3	Improvement and extension of the preparation of bio-based feedstock for processing and conversion in the bio-based industry.
	A.3.1	<i>Improved and novel technologies¹⁰⁹ for fractionation, separation, and purification of feedstock fractions.</i>
	Strategic priority 1.3.1 - Protect and enhance biodiversity and ecosystem services in bio-based feedstock supply systems	
	B.1	Improved knowledge of i) balanced and sustainable management of biotic resources and related ecosystems, while mitigating and adapting to climate change, ii) causes of biodiversity loss and ecosystem degradation, iii) good practices preventing losses of valuable natural ecosystems.
	B.1.1	<i>Metrics, science-based methodologies and tools to assess the ecosystem functions and impacts on biodiversity from bio-based systems based on different types of feedstock.</i>
B.1.2	<i>Integrated advisory services and best or innovative practices, which protect and enhance biodiversity in primary and secondary biomass cultivation/collection in rural, coastal and urban settings.</i>	

¹⁰⁷ See the table in the Annex and JRC 2020 report.

<https://publications.jrc.ec.europa.eu/repository/bitstream/JRC120324/how-big-is-the-economy.pdf>

¹⁰⁸ For example, 'debris' in navigable inland waters, tree felling, contaminated biomass from phytoremediation actions of post-industrial sites.

¹⁰⁹ These technologies may include mechanical, chemical, physical, biotechnological technologies, or a combination thereof.

B.2	Optimisation of bio-based systems that enable the restoration of ecosystems ¹¹⁰ .
B.3	Technical solutions to allow the use of bio-based residues and waste for the production of bio-based products while halting negative impacts on biodiversity.
B.4	Innovative bio-based solutions for monitoring and remediation of impacts on ecosystems due to primary and secondary bio-based feedstock exploitation for industrial use.
Strategic priority 2.1.1 - Demonstrate the sustainable supply of bio-based feedstock	
C.1	Innovative, sustainable, and replicable operational business models for the primary biomass producers ¹¹¹ within the bio-based industry.
C.1.1	<i>Advanced and innovative farms, horticulture systems, forestry systems, fisheries, and aquacultures as replication models, living labs, and as a lighthouse for co-creation in open innovation practices.</i>
C.2	Enable new forms of collaborations among key actors of bio-based systems to better involve primary producers, including in new bio-based value chains
C.3	Sustainable bio-based business models for agricultural, horticultural, forestry, aquaculture, fishery cooperatives.
C.4	Small-scale biorefineries in rural, coastal, and urban areas integrating the primary biomass sectors with bio-based systems that produce bio-based chemicals and materials.
C.5	Innovative, sustainable, and replicable operational business models for the secondary and novel biomass providers to the bio-based industry.
C.5.1	<i>Effective and sustainable valorisation of unavoidable bio-waste from all relevant sectors and processing steps, including from wastewater treatment plants and municipalities.</i>
C.5.2	<i>Optimal mobilisation and integration of novel, untapped, under-used bio-based feedstock into existing and new bio-based feedstock systems for the bio-based industry.</i>
C.6	Demonstration of innovative steps to improve the management of bio-based feedstock for the industrial use.
C.6.1	<i>Enhancement of chain of custody, certification, and traceability concepts in the bio-based feedstock supply systems.</i>
C.6.2	<i>Integration of resource-efficient and sustainable pre-treatment and logistical schemes, and optimal pre-processing units, including small-size or modular systems.</i>
C.6.3	<i>Application of digital technologies and tools to monitor and manage bio-based feedstock availability and supply, as well as to adapt/enhance pre-treatment and (pre-)processing steps.</i>
C.7	Deployment of bio-based systems that enable the restoration of ecosystems to enhance biodiversity

¹¹⁰ Such as the utilisation of paludicrops from rewetted areas for high value applications, or other nature-positive supply chains.

¹¹¹ Primary biomass producing sectors: agricultural, forestry, marine and aquaculture, and fishery.

PROCESSING	Strategic priority 1.1.2 - Develop innovative production systems in the bio-based industry	
	D.1	Novel ¹¹² and sustainable technologies ¹¹³ to produce bio-based products
	D.1.1	<i>Application of novel and sustainable technologies on existing and/or on currently unused (being developed; unlocked; etc.) bio-based feedstock.</i>
	D.2	Improvement of existing conversion technologies, currently applied in the bio-based industry.
	D.2.1	<i>New/innovative microorganisms, enzymes, microbial metabolites via bio-discovery routes.</i>
	D.2.2	<i>Innovative processing and conversion of biogenic carbon (as part of carbon removal) into valuable products.</i>
	D.2.3	<i>Added-value use of the inorganic compounds¹¹⁴ of bio-based feedstock.</i>
	D.3	Innovative technologies for recycling and upcycling of secondary bio-based feedstock, residues and currently wasted bio-based products ¹¹⁵ , including sorting, separation as well as pre-treatment and upgrading technologies.
	D.4	Innovative technologies for valorising by-products and side streams from bio-based processes
	D.5	Technologies and logistics to enable small-scale operations, including mobile and modular processing and production options.
	D.6	Innovative and sustainable solutions to minimise process flows such as energy, water, additives, etc.
	D.7	Digital innovation applications ¹¹⁶ for processes optimisation and monitoring, data management and support of industrial discoveries.
	Strategic priority 1.3.2 - Improve environmental performances of bio-based processes	
	E.1	Reduced exhaust flows ¹¹⁷ from bio-based processes through innovative technologies of recirculation, fractionation, extraction, conversion, etc.
	E.2	Bio-based solutions for monitoring systems/devices of environmental conditions, such as air, water, and soil quality.
	E.3	Improved bio-based industrial processes where hazardous and toxic substances are replaced with safe bio-based ones ¹¹⁸
	Strategic priority 2.1.2 - Deploy innovative production technologies	
	F.1	Novel methods of feedstock processing in industrial settings for maximising yields and feedstock utilisation through cascading use of biomass in a circular symbiosis of several operators in industrial/urban/rural/coastal areas.
	F.1.1	<i>Innovative downstream processing, including separation and purification technologies.</i>

¹¹² Novel technologies are such as new, emerging, so far unused for bio-based feedstock conversion.

¹¹³ For example, synthetic and natural biology, bioprospecting, etc.

¹¹⁴ For example, silicate, oxides, hydroxides, phosphates, minerals, metals, etc.

¹¹⁵ For example, wood/composites from demolition, side streams in pulp & paper processes, textiles waste, etc.

¹¹⁶ For example, bioinformatics, AI, blockchain and data science

¹¹⁷ Including hot water, vapour, odours, wastewater, etc. which are not part of EU regulation.

¹¹⁸ To be coordinated with Processes4Planet

F.1.2	<i>Industrial/urban/rural symbiosis of different actors/operators to use products, side streams, residual streams, and utilities between themselves in bio-based industrial ecosystems.</i>
F.1.3	<i>Advanced processing and conversion of biogenic carbon (as part of the carbon removal) into valuable products.</i>
F.1.4	<i>Innovative production technologies retaining the intrinsic characteristics and functionalities of the bio-based feedstock.</i>
F.2	Innovative technologies for sorting, cleaning, separation, extracting, recycling, and upcycling of biomass of bio-based feedstock from primary and secondary sources, i.e., by-products, side streams and waste from industrial processes and waste streams from other sectors and from retail and end consumers.
F.3	Technical and logistic solutions for producing added-value bio-based products from small to very-small-scale biorefineries (e.g., small-scale (rural and municipal) solutions, mobile installations).
F.4	Demonstration of the development of biorefining concepts that minimise wastes and emissions, resource-efficiency, and climate neutrality (towards zero-waste and zero-pollution operations).
F.5	Demonstration of the development of bio-based processes using safe bio-based substances in substitution of hazardous and toxic ones ¹¹⁹ .
F.6	Optimisation and monitoring of bio-based processes by applying digitalisation ¹²⁰ concepts to ensure high standards of resource efficiency and environmental protection.
F.6.1	<i>Data sharing platforms for the management of supply and value chains.</i>
F.6.2	<i>Traceability systems covering the entire value chain from raw materials to bio-based products.</i>
F.7	Development of tailored, innovative bio-based processes for the manufacturing sectors in the Union.
F.8	Key infrastructures such as pilot plants, demo biorefinery facilities, etc., shared among biomass producers and biorefineries, which provide test rigs and norms.

¹¹⁹ To be coordinated with Processes4Planet.

¹²⁰ Digitalisation is the leveraging of digitisation (which is converting information into digital format) to improve business processes. It may include among other AI, block chain, virtual reality, digitisation in general, data science, distributed ledger technologies, PAT, digital twins.

PRODUCTS	Strategic priority 1.1.3 - Develop innovative bio-based products	
	G.1	New or improved bio-based products with enhanced properties for applications in a wide array of market sectors.
	G.2	Innovation in the circular design of bio-based products to allow for reuse, recycling, composting and biodegradation (in specific environments and conditions).
	G.2.1	<i>Circular-by design bio-based products for specific new applications</i>
	G.2.2	<i>Circular-by design bio-based products substituting non-circular, fossil-based, energy-intensive, or carbon-intensive products, prioritising sectors where achievable positive impact is highest.</i>
	Strategic priority 2.1.3 - Scale up production and market uptake of innovative bio-based products	
	H.1	Scaled-up safe and sustainable by design ¹²¹ bio-based products and solutions.
	H.1.1	<i>Safe and sustainable by design bio-based products and solutions for specific new applications</i>
	H.1.2	<i>Safe and sustainable by design bio-based products and solutions with carbon storage capacity and/or low carbon footprint to substitute non-circular, fossil-based, energy-intensive or carbon-intensive products.</i>
	H.1.3	<i>Safe and sustainable by design bio-based products and solutions replacing toxic and hazardous substances in industrial processes and in final products.</i>
	H.2	Scaled-up circular-by design bio-based products to allow for reuse, recycling, composting and biodegradation (in specific environments and conditions).
	H.3	Scaled-up bio-based food ingredients from terrestrial, aquatic, and biogenic CO ₂ origins integrated in new and/or existing systems to meet sustainability objectives of food systems.
	H.4	Scaled-up tailored bio-based products for the manufacturing sectors.

¹²¹ Looking at the coherence with the safe and sustainable by design criteria being developed within the Sustainable Chemicals Strategy and the feedback on the additional criteria that may be needed in the case of bio-based products.

CROSS-CUTTING (Communication)	Strategic priority 1.2.1 - Stimulate research activities in countries and regions with underdeveloped R&I capacity for bio-based systems	
	I.1	Communication, engagement, and exchange of knowledge, best practices, and technology with and among targeted stakeholders.
	I.2	Assessment of the needs for novel bio-based innovations and systems in countries and regions with current low bio-based activities.
	I.2.1	<i>Information sharing about EU R&I funding programmes and steps to access, especially for actors in countries and regions with current low bio-based activities.</i>
	I.3	Capacity building for researchers including enabling access to research, testing and upscaling infrastructures and services.
	Strategic priority 1.2.2 – Increase the awareness and capacity of national and regional research support agencies for industrial bio-based systems	
	J.1	Increased awareness of EU R&I funding programmes and of R&I agendas in national strategies to exploit the local bioeconomy potential with focus on low R&I performing Member States and Associated Countries and less represented countries/regions.
	J.2	Synergies between research and industry at regional level, with focus on less represented countries/regions.
	Strategic priority 1.2.3 - Facilitate the development of expertise in bio-based fields by improving higher education and skills development	
	K.1	Development of appropriate university and PhD curricula on the bio-based fields including practical training in companies.
	K.1.1	<i>Interaction with (graduating) students in different disciplines to progress and sustain the bio-based sectors at vocational schools, universities of applied science, basic research, and relevant social disciplines.</i>
	K.2	Exchanging scientific expertise between academia, research centres and bio-based industry (especially innovative SMEs).
	K.2.1	<i>Fostering academic research (spin-offs from universities/research organisations) in collaboration with other HE initiatives such as the EIC grants to generate knowledge and technological development of bio-based products and services and to optimize coherence of research and innovation.</i>
	Strategic priority 2.1.4 - Build policy makers' awareness and acceptance of bio-based solutions	
	L.1	Enhancement of dialogue with national and regional policy makers to enhance the development of bio-based systems throughout Europe.
	L.1.1	<i>Increased the awareness of national and regional policy makers and their support to the industrial capacity in the process of deploying sustainable circular bio-based solutions across Europe.</i>
	L.1.2	<i>Inclusion of territorial aspects of circular bioeconomy, bio-based feedstock, sectors, challenges, and opportunities in deploying resilient bio-based industrial activities across Europe.</i>
	L.1.3	<i>Assistance in developing regional actions for deploying circular bio-based solutions and activities at national/regional level.</i>

	L.1.4	<i>Facilitate the harmonisation of national legislations and technical regulations¹²².</i>
CROSS-CUTTING (Finance)	Strategic priority 2.2.1 – Improve the risk profile of bio-based projects	
	M.1	Harmonised certification systems, labels, standardisation, Product Category Rules (PCRs) and Extended Producer Responsibility (EPR). To demonstrate the added value and environmental claims by bio-based products and solutions, as well as for transparent communication in B2B and B2C interactions. To improve awareness and trust of stakeholders.
	M.1.1	<i>Demonstrated added value and environmental claims by bio-based products and solutions, as well as for transparent communication in B2B and B2C interactions.</i>
	M1.2	<i>Higher awareness and trust of stakeholders.</i>
	M.2	Capacity building of industrial actors (especially SMEs) to develop, test and present bankable projects with risk profiles that are acceptable for investors.
	M.2.1	<i>European data platform for business cases, linked to the European network of digital innovation hubs¹²³ where relevant and align with the Commission’s proposed Digital Europe Programme¹²⁴.</i>
	M.3	Resilience strengthening of bio-based companies.
	M3.1	<i>Development of voluntary corporate responsibility schemes.</i>
	M3.2	<i>Exchange of best practices in innovation and to uptake innovative bio-based processes/materials in their value systems.</i>
	M3.3	<i>‘Educate and train’ programs of actors along the bio-based systems to expand the use of digitalisation.</i>
	M.4	Enhanced collaboration between bio-based systems actors with market/industrial actors in various market segments.
	M4.1	<i>Identified demand for circular sustainable bio-based solutions and commitment from market/industrial actors to uptake these solutions when production is scaled up.</i>
	M4.2	<i>Assistance in prioritising actions for circular bio-based systems to achieve maximum impacts both in high volumes sectors and more specialized ones.</i>
	Strategic priority 2.2.2 - Develop investment tools and approaches that mitigate the investment risk in bio-based systems	
	N.1	Cooperation of circular bio-based systems with the European regions to connect regional investors with innovators for circular bio-based solutions.
	N.1.1	<i>Promotion of opportunities for investment, clustering of isolated activities, and networking, to connect local actors and activate/engage public actors and authorities.</i>

¹²² See definition in Article 1(1)f of Directive (EU) 2015/1535. See also the Glossary.

¹²³ <https://ec.europa.eu/digital-single-market/en/digital-innovation-hubs>

¹²⁴ <https://ec.europa.eu/digital-single-market/en/news/digital-europe-programme-proposed-eu92-billion-funding-2021-2027>

	N.2	Connection/interaction of local actors in bio-based fields with the bio-based industry's European network of industrial actors, including SMEs, primary producers, research institutions and academia, to exploit local bio-based resources, opportunities and for the benefit local communities.
	N.2.1	<i>Dissemination of best practices across the Union to assist (macro)regions lagging in industrial bio-based investments and fragile sectors (including SMEs).</i>
	N.2.2	<i>Focus on countries with current low bio-based activities (e.g., Southern and Eastern Europe, including BIOEAST countries).</i>
	N.3	Increased access of bio-based industry to public and private funding instruments, to obtain co-investment in circular bio-based projects.
	N.3.1	<i>Increased awareness of industry actors and how-to-use knowledge of public and private funding instruments.</i>
	N.3.2	<i>Cooperation with relevant European and national financial institutions to create specific financial instruments, to improve access to finance, possibly blending public and private funding, for circular bio-based projects and companies.</i>
CROSS-CUTTING (Environmental sustainability framework)	Strategic priority 3.1.1 - Set effective and robust environmental sustainability and circularity criteria for bio-based systems	
	O.1	Environmental, sustainability and circularity criteria, requirements, and benchmarks for bio-based systems, including their supply chains.
	O.1.1	<i>Methodologies for the environmental sustainability and circularity assessment of bio-based systems including their supply chains¹²⁵.</i>
	O.1.2	<i>Metrics for the cascading use of biomass including its life-cycle assessment.</i>
	O.1.3	<i>Criteria to define environmental performance benchmarks, based on best available technologies for environmental sustainability and circularity.</i>
	O.1.4	<i>Criteria to demonstrate low/zero-ILUC operations.</i>
	O.1.5	<i>Criteria and metrics to assess the carbon removal potential of bio-based solutions</i>
	O.1.6	<i>Sustainability criteria on economic and social objectives.</i>
	O.1.7	<i>Environmental sustainability criteria for technologies and for integrating impacts from non-biogenic systems which work within the bio-based systems.</i>
	O.2	Tools for monitoring the environmental sustainability and circularity progress of R&I projects towards pre-set KPIs.
	O.3	Assessment of the trade-offs and synergies of the environmental sustainability and circularity of the bio-based industry within the economy of the Union.
	O.3.1	<i>Methodologies to assess trade-offs and synergies with competing bioeconomy sectors such as food/feed, bioenergy/biofuels, recreation/cultural services.</i>

¹²⁵ Consistent with existing methodology, e.g., RED II, Taxonomy.

O.3.2	<i>Methodologies to assess trade-offs and synergies with competing non-bioeconomy sectors such as urbanization, fossil-based economy.</i>
Strategic priority 3.1.2 - Incorporate the environmental sustainability and circularity criteria in bio-based systems	
P.1	Dialogue among stakeholders, including policymakers at EU and national levels on the deployment of sustainable and circular bio-based systems.
P.2	Communication systems to share best practices on environmental sustainability and circularity amongst actors throughout the bio-based industry in the EU.
P.2.1	<i>Systems to share best practices among the top performers on environmental sustainability and circularity in the bio-based sector, and in other EU R&I programmes and policy initiatives.</i>
P.2.2	<i>Higher engagement of relevant programmes and initiatives outside CBE JU in deploying the environmental sustainability and circularity criteria,</i>
P.3	Assessment of the CBE JU contribution to the zero-pollution ambition, climate change neutrality and biodiversity protection and restoration targets.
Strategic priority 3.1.3 – Facilitate social acceptance of bio-based applications	
P.4	Social acceptance of sustainable and circular bio-based applications.
P.4.1	<i>Measures to promote a more environmentally friendly consumption of bio-based products of consumers.</i>
P.4.2	<i>Exchange best practices of social involvement across the Union.</i>
P.4.3	<i>Higher awareness of the benefits of being part of bio-based systems.</i>
P.4.4	<i>Labelling and traceable systems for the bio-based products (e.g., circular bio-based food packaging) which are consistent, meaningful, and truthful.</i>
P.4.5	<i>Digital solutions for product information, to allow for traceability, sustainability assessment and better communication of product information (such as digital passports, labels, tags and watermarks, distributed ledger technologies, data sharing platforms).</i>
P.4.6	<i>Development of tailored feedback systems (e.g., smartphone apps or social media) for citizens/consumers to provide input, feedback, and suggestions for improvements or for new solutions to increase the beneficial impacts of circular bio-based solutions and help prioritising actions for industrial bio-based systems to achieve maximum impacts in the society.</i>

Annex VII. Glossary

Added-value product = a product with a significantly increased value from a technical, economic and/or environmental perspective compared with the starting material or feedstock from which the product is obtained.

B2B product = a product destined to be sold by one business entity to another business entity.

B2C product = a product destined to be sold by one business entity directly to the end consumers.

(Bio)active or functional ingredient = any compound with a proven effect on a living organism, tissue, cell, microbiota, or microbiome. Such compounds may include different types of molecules, such as: polyphenols, carotenoids, fatty acids, flavonoids, glycolipids, specialty carbohydrates, peptides, and proteins.

Benchmark = a standard product/process/service representative of a specific technological field or market application, used as reference with which features of another product, process or service developed are compared. Depending on the bio-based product developed the benchmark can be fossil- and/or bio-based.

Bio-based = 'derived from biomass¹²⁶'.

Biodiversity = *'From the world's great rainforests to small parks and gardens, from the blue whale to microscopic fungi, biodiversity is the extraordinary variety of life on Earth'* (Biodiversity strategy). Biological diversity, or biodiversity, is the scientific term for the variety of life on Earth. It refers not just to species but also to ecosystems and differences in genes within a single species. Everywhere on the planet, species live together and depend on one another. Every living thing, including man, is involved in these complex networks of interdependent relationships, which are called ecosystems. Healthy ecosystems clean our water, purify our air, maintain our soil, regulate the climate, recycle nutrients and provide us with food. They provide raw materials and resources for medicines and other purposes. They are at the foundation of all civilisation and sustain our economies. It's that simple: we could not live without these "ecosystem services". They are what we call our natural capital. Biodiversity is the key indicator of the health of an ecosystem (EU Biodiversity strategy)

Biodiversity enhancement (coming on top of biodiversity protection) = refers to reporting practices, methodologies and tool improvements about the integration and improvement of biodiversity aspects related to bio-based systems. Note that the European Commission will put forward a proposal for legally binding EU nature restoration targets as a key element of the [EU Biodiversity Strategy for 2030](#). Restoring EU's ecosystems will help to increase biodiversity, mitigate and adapt to climate change, and prevent and reduce the impacts of natural disasters.

Biodiversity protection (see also biodiversity and biodiversity enhancement) = is expected to be a starting condition for all CBE projects (100 % of projects should comply). Several drivers for biodiversity protection should be accounted for: climate change mitigation, LULUCF, sea/freshwater pollution, soil pollution, invasive alien species, direct exploitation of endangered plants, animals, other organisms, and their habitats, and respective ecosystems services.

¹²⁶ ftp://ftp.cen.eu/CEN/Sectors/List/bio_basedproducts/DefinitionsEN16575.pdf.

Bioeconomy = ‘the production of renewable biological resources and the conversion of these resources and waste streams into value added products, such as food, feed, bio-based products and bioenergy.’¹²⁷

Biogenic = derived from biomass. Such as ‘biogenic carbon cycle’: the natural carbon cycle.

Biomass = ‘material of biological origin excluding material embedded in geological formations and/or fossilised’¹²⁸.

Bio-based dedicated chemicals = bio-based chemicals that are produced via a dedicated pathway and do not have an identical fossil-based counterpart. As such, they can be used to produce products that cannot be obtained through traditional chemical reactions and products that may offer unique and superior properties that are unattainable with fossil-based alternatives (Road2Bio project¹²⁹).

Bio-based drop-in chemicals = bio-based versions of existing petrochemicals which have established markets. They are chemically identical to existing fossil-based chemicals (BIO-TIC 2014)¹³⁰.

Bio-based product = ‘a product wholly or partly bio-based’¹³¹.

Bio-based smart drop-in chemicals = a special sub-group of drop-in chemicals. They are also chemically identical to existing chemicals based on fossil hydrocarbons, but their bio-based pathways provide advantages compared to the conventional pathways (RoadtoBio project¹³²).

Biodegradation = complete breakdown of an organic chemical compound by microorganisms in the presence of oxygen to carbon dioxide, water, and mineral salts of any other elements present (mineralisation) and new biomass, or in the absence of oxygen to carbon dioxide, methane, mineral salts, and new biomass.

Biodegradable = a material or product is biodegradable if it can, under specific environmental conditions and with the help of microorganisms, break down into natural elements (e.g., water, carbon dioxide and biomass).

Bio-based polymer = a polymer comprised, at least in part, of building blocks called monomers, produced from renewable feedstocks. Bio-based polymers can lead to a number of products like bio-based plastics.

Bio-waste = defined as biodegradable garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises, and comparable waste from food processing plants. It does not include forestry or agricultural residues, manure, sewage sludge, or other biodegradable waste such as natural textiles, paper or processed wood. It also excludes those by-products of food production that never become waste (Waste Framework Directive).

¹²⁷ European Commission. European Bioeconomy Strategy (2012, updated version in 2018).

https://ec.europa.eu/research/bioeconomy/pdf/ec_bioeconomy_strategy_2018.pdf.

¹²⁸ ftp://ftp.cen.eu/CEN/Sectors/List/bio_basedproducts/DefinitionsEN16575.pdf.

¹²⁹ https://www.roadtobio.eu/uploads/news/2017_October/RoadToBio_Drop-in_paper.pdf.

¹³⁰ https://www.roadtobio.eu/uploads/news/2017_October/RoadToBio_Drop-in_paper.pdf.

¹³¹ ftp://ftp.cen.eu/CEN/Sectors/List/bio_basedproducts/DefinitionsEN16575.pdf.

¹³² https://www.roadtobio.eu/uploads/news/2017_October/RoadToBio_Drop-in_paper.pdf.

Brand owners = refer to industrial stakeholders selling commodities under a registered brand. They may be existing or new stakeholders of bio-based value chains, contributing thus to the market uptake of bio-based products.

Building block = 'a molecule which can be converted to various secondary chemicals and intermediates, and, in turn, into a broad range of different downstream uses. The largest markets for bio-based chemical building blocks are in the production of bio-based polymers, fibres, lubricants and solvents¹³³'.

Carbon removal = the carbon removals described in the Commission Communication include '*recycle carbon from waste streams, from sustainable sources of biomass...to use it in place of fossil carbon in the sectors of the economy that will inevitably remain carbon dependent...promote technological solutions for carbon capture and use (CCU) and the production of sustainable synthetic fuels or other non-fossil based carbon products... upscale carbon removal solutions that capture CO₂ from the atmosphere and store it for the long term, either in ecosystems through nature protection and carbon farming solutions or in other storage forms through industrial solutions*'.

Circular bioeconomy = the interlink between circular economy concepts and the bioeconomy.

Circular bio-based system = a full operational system, from feedstock intake through market application of resultant bio-based products, and their end-of-life handling to close the circle (cradle-to-cradle).

Circular-by-design = including circular economy considerations at the design stage of a product and/or business model considering their lifecycle. It aims to minimise resource consumption intensity, waste generation, extend the lifetime of products and optimise production and logistics.

Circular economy = a business concept aiming to create a close-loop system and maintain the value of products, materials, and resources for as long as possible by returning them into the product cycle at the end of their use, while minimising the generation of wastes¹³⁴. In this economic system, a 'waste' can become a feedstock source for another process or value chain.

Climate change adaptation = is the process of adjusting to current or expected effects of climate change. It is one of the ways to respond to climate change, along with mitigation. For humans, adaptation aims to moderate or avoid harm, and exploit opportunities; for natural systems, humans may intervene to help adjustment.

Climate change mitigation = consists of actions to limit global warming and its related effects. This involves reductions in human emissions of greenhouse gasses (GHGs) as well as activities that reduce their concentration in the atmosphere. It is one of the ways to respond to climate change, along with adaptation.

Compostable = compostable materials or products are biodegradable but not all biodegradable ones are compostable. A compostable material or product can disintegrate under specific conditions (industrial and/or home composting).

¹³³ <http://www.industrialbiotech-europe.eu/new/wp-content/uploads/2014/08/Summary-of-the-findings-related-to-chemical-building-blocks.pdf>.

¹³⁴ <https://ec.europa.eu/eurostat/web/circular-economy>.

Compound = in chemistry, a substance formed by two or more elements chemically bonded together. The term 'compound' can refer both to 'intermediate' (i.e., substance to be further converted into the final targeted product) and to 'product'.

Consumer products = 'items intended for consumers or likely to be used by consumers, even if not intended for them'¹³⁵. Such products are ordinarily used and bought by individuals or households for private purposes.

CSA= 'coordination and support action'; means an action contributing to the objectives of the Programme, excluding R&I activities, except when undertaken under the component 'widening participation and spreading excellence' of the part 'Widening participation and strengthening the ERA'; and bottom-up coordination without co-funding of research activities from the Union that allows for cooperation between legal entities from Member States and associated countries in order to strengthen the ERA. (Regulation (EU) 2021/695).

Delivery mechanism = the different instruments that are made available under the CBE JU to deliver on the objectives of the initiative.

Ecosystem services = 'the benefits that people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services, such as nutrient cycling, that maintain the conditions for life on Earth' (Millennium Ecosystem Assessment¹³⁶). An ecosystem service could also include practices that prevent or cut down pollution. People describe e.g., the green biorefinery to have an ecosystem service function by cutting down the run-off of nutrients that could otherwise have polluted the surrounding waters.

Energy efficiency = reduced energy input while maintaining an equivalent level of an activity (e.g. bio-based processes) and provide products and services. Improved energy efficiency addresses technoeconomic feasibility but also environmental sustainability aspects. (*see also GHG emissions*)

Extended producer responsibility (EPR) = 'an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle' (OECD).

Feedstock = any unprocessed/raw material fed into a manufacturing/conversion process.

Flagship = innovation action project ending at TRL 8 that includes all sections of a sustainable circular bio-based system: from feedstock through to market application and end of life. First-of-a-kind.

Fossil-based = made from fossil sources.

¹³⁵ <https://www.cen.eu/work/areas/consumerproducts/Pages/default.aspx>.

The European Standards developed by various Technical Committees of CEN in consumer products can be classified into five distinct categories:

- child safety
- household goods, sports, and leather
- cosmetics
- textile products
- safety of other consumer products

¹³⁶ <https://www.millenniumassessment.org/documents/document.300.aspx.pdf>.

GHG emissions = GHGs comprise carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄) and fluorinated gases. There are direct and indirect emissions that need to be monitored and addressed, respectively scope 1, scope 2 and scope 3 emissions.

High-end applications = final applications of targeted compounds derived from a starting bio-based stream which exceed, in terms of value, alternative applications for energetic purposes (based on the calorific value of the starting stream itself).

IA= 'innovation action'; means an action primarily consisting of activities directly aiming to make plans and arrangements or designs for new, altered, or improved products, processes, or services, possibly including prototyping, testing, demonstrating, piloting, large-scale product validation and market replication. (Regulation (EU) 2021/695).

Indirect land use change (ILUC) = displacement of agricultural production into non-croplands (e.g., grasslands and forests) due to the destination of croplands previously used for food agricultural production having been shifted to the production of non-food bio-based products (e.g., biofuels). Indirect land use change risks causing an increase in greenhouse gas emissions because non-croplands such as grasslands and forests typically absorb high levels of CO₂. By converting these land types to cropland, negative environmental effects may occur, including increase of atmospheric CO₂ levels¹³⁷, and biodiversity loss¹³⁸.

Industrial symbiosis/ Industrial-urban symbiosis = the concept affects both material and energy flows. It refers, partly, to a process by which waste or by-products of an (industry) or an (industrial) process become the raw material for another. Application of this concept allows for materials to be used in a more sustainable way and can contribute to circular (bio)economy. Industrial symbiosis creates an interconnected network that strives to mimic the functioning of ecological systems within which energy and materials cycles operate in a continuous mode, without waste products. Deploying industrial and/or industrial-urban symbiosis solutions for energy, water and waste and other by-products can also contribute to the regional development of circular bio-based systems.

Intermediate product = a substance requiring further processing or conversion steps to obtain the final product.

Life cycle assessment (LCA) = assessment of the environmental impacts of a product, process, or service throughout the entire life cycle. The main references for LCA methodologies are the international standards ISO 14040 and ISO 14044. **Environmental LCA** is complemented by **life cycle costing assessment (LCCA)**, which aims to assess the economic impacts of a product/process/service, and by **social life cycle assessment (S-LCA)**, which aims to evaluate social implications of a product/process/service.

In the context of SRIA2030 and AWP, depending on the type of impacts to be assessed, **LCA methodologies** can refer to:

- Life cycle assessment (LCA) to evaluate environmental impacts.
- Life cycle costing (LCC) to evaluate economic impacts.
- Social life cycle assessment (S-LCA) to evaluate social impacts.

Life cycle sustainability assessment (LCSA) = assessment of the environmental, economic, and social impacts of a product, process, or service throughout the entire life cycle.

¹³⁷ <https://ec.europa.eu/energy/en/topics/renewable-energy/biofuels/land-use-change>.

¹³⁸ http://ec.europa.eu/environment/nature/conservation/species/pollinators/index_en.htm.

Lignocellulose = a complex matrix made up of lignin, cellulose and hemicellulose mainly constituting the cell walls of woody plants.

Material = a substance or a mixture of substances also resulting from a manufacturing process, constituting one of the components which more complex products are made by.

Nature-based solutions = solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions.

New = refers to a product or a process that entails clearly described innovative and/or advanced properties or enhancements compared to existing benchmarks (for example a 'new material' does not mean that such types of material currently does not exist on the market, but it means that the material has properties that are unmatched by existing benchmark products available on the market).

Novel = novel technologies are such as new, emerging, so far unused for bio-based feedstock conversion; novel bio-based feedstock.

Open Science = 'open science'; means an approach to the scientific process based on open cooperative work, tools, and diffusing knowledge, and includes the elements listed in Article 14 of Horizon Europe Regulation.

Outputs = referring to the following product categories: i) Chemicals (platform chemicals, additives, solvents, surfactants...), ii) Materials, 3) other products related with end use. Use established classification for reporting, for example the one in: EU Biorefinery outlook 2030.

PCP = 'pre-commercial procurement action'; means an action the primary aim of which is to realise the pre-commercial procurement implemented by beneficiaries that are contracting authorities or contracting entities. 'pre-commercial procurement' means the procurement of research and development services involving risk-benefit sharing under market conditions, and competitive development in phases, where there is a clear separation of the research and development services procured from the deployment of commercial volumes of end-products.

Support to pre-commercial procurement through dedicated PCPs should be used when challenges require a demand-pull from procurers to encourage industry and academia to invest in new R&I for solutions for public service needs. (Regulation (EU) 2021/695).

Plastic = any synthetic or semisynthetic organic polymer entailing the property of plasticity, i.e., the ability to deform without breaking. Thermoplastics and thermosetting polymers are the two types of plastic¹³⁹.

Platform chemical = intermediate molecules which can be converted to a wide range of chemicals or materials.

Primary biomass producers = biomass feedstock suppliers (primary and/or secondary), including the following sectors: agriculture, forestry, fisheries, and aquaculture/marine.

¹³⁹ <https://www.thoughtco.com/plastic-chemical-composition-608930>.

Process intensification = ‘a chemical and process design approach that leads to substantially smaller, cleaner, safer and more energy-efficient process technology. It improves process flexibility, product quality, speed to market and inherent safety, with a reduced environmental footprint¹⁴⁰.

Regional bio-based hubs = large-scale infrastructures such as biorefineries, established to implement industrial cooperation and economy of scale, at regional level

Research and Innovation Actions (RIA) = 'research and innovation action'; means an action primarily consisting of activities aiming to establish new knowledge or to explore the feasibility of a new or improved technology, product, process, service, or solution. This may include basic and applied research, technology development and integration, testing, demonstration, and validation on a small-scale prototype in a laboratory or simulated environment. (Regulation (EU) 2021/695).

Resource efficiency = means using the Earth's limited resources in a sustainable manner while minimising impacts on the environment. It allows us to create more with less and to deliver greater value with less input. Improved energy efficiency addresses technoeconomic feasibility but also environmental sustainability aspects. Resource efficiency aspects addressed in bio-based processes covers biomass feedstock valorisation efficiency but also encompasses the other resources such as water, solvents, (bio)catalysts and other auxiliaries etc.

Secondary bio-based feedstock = waste that can be recycled in a circular economy and is injected back into the economy as secondary raw materials. In this context, secondary bio-based feedstock is any waste that can be used in bio-based processes (See Table IV.1 in Annex IV).

State of the art = the most updated developments of a product/process/service entailing the newest achievements and improvements in the related (application or technological) field.

Sustainable = this refers to a product/process/system that enhances and creates benefits for the environment, economy, and society. In a broad sense, sustainability has four dimensions: environmental sustainability, productivity, fairness, and macroeconomic stability (European Commission, ‘Annual Sustainable Growth Strategy 2020’, COM(2019) 650 final, 17 December 2019).

Sustainability Certification = sustainability certifications are voluntary certifications issued by an independent, second-, or third-party organization to a company, product, or service. To be certified, the company needs to demonstrate that their business practices and products meet specific criteria to demonstrate that they’re committed to good environmental, social and ethical practice.

Technical regulation = covers, on the one hand technical specifications, other requirements or rules on Information Society services which are laid down by the Member States, the observance of which is compulsory, de jure or de facto, for the marketing or use of a product, for the provision of a service or the establishment of a service operator, and on the other hand regulations or administrative provisions prohibiting the manufacture, importation, marketing or use of a product or prohibiting the provision or use of a service, or establishment as a service provider. (Article 1(1)f of Directive (EU) 2015/1535).

Under-represented EU country/region = refers to the below-average geographical (national and regional) participation pattern in CBE JU calls, as compared with the such patterns observed either in

¹⁴⁰ Reay, D., Ramshaw, C., Harvey, A. Process Intensification - Engineering for Efficiency, Sustainability and Flexibility (2nd Edition), Butterworth-Heinemann, 2013.

the calls of the preceding Joint Undertaking (BBI JU), or in the previous calls of CBE JU, whatever data is available first.

Zero-pollution ambition (see also biodiversity protection) = on 12 May 2021, the European Commission adopted the EU Action Plan: "Towards a Zero Pollution for Air, Water and Soil" (and annexes)- a key deliverable of the European Green Deal. The action plan aims to strengthen the EU green, digital and economic leadership, whilst creating a healthier, socially fairer Europe and planet. It provides a compass to mainstream pollution prevention in all relevant EU policies, to step up implementation of the relevant EU legislation and to identify possible gaps.

Zero waste = preserving the natural resources and significantly reducing/eliminating waste during production but also across the value chain. (*see also resource efficiency*)