Draft proposal for a European Partnership under Horizon Europe

European Partnership for a Circular bio-based Europe: sustainable innovation for new local value from bio-waste and biomass (CBE)

Version 10 June 2020

About this draft

In autumn 2019 the Commission services asked potential partners to further elaborate proposals for the candidate European Partnerships identified during the strategic planning of Horizon Europe. These proposals have been developed by potential partners based on common guidance and template, taking into account the initial concepts developed by the Commission and feedback received from Member States during early consultation[1]. The Commission Services have guided revisions during drafting to facilitate alignment with the overall EU political ambition and compliance with the criteria for Partnerships.

This document is a stable draft of the partnership proposal, released for the purpose of ensuring transparency of information on the current status of preparation (including on the process for developing the Strategic Research and Innovation Agenda). As such, it aims to contribute to further collaboration, synergies and alignment between partnership candidates, as well as more broadly with related R&I stakeholders in the EU, and beyond where relevant.

This informal document does not reflect the final views of the Commission, nor pre-empt the formal decision-making (comitology or legislative procedure) on the establishment of European Partnerships.

In the next steps of preparations, the Commission Services will further assess these proposals against the selection criteria for European Partnerships. The final decision on launching a Partnership will depend on progress in their preparation (incl. compliance with selection criteria) and the formal decisions on European Partnerships (linked with the adoption of Strategic Plan, work programmes, and legislative procedures, depending on the form). Key precondition is the existence of an agreed Strategic Research and Innovation Agenda / Roadmap. The launch of a Partnership is also conditional to partners signing up to final, commonly agreed objectives and committing the resources and investments needed from their side to achieve them.

The remaining issues will be addressed in the context of the development of the Strategic Research and Innovation Agendas/ Roadmaps, and as part of the overall policy (notably in the respective legal frameworks). In particular, it is important that all Partnerships further develop their framework of objectives. All Partnerships need to have a well-developed logical framework with concrete objectives and targets and with a set of Key Performance Indicators to monitor achievement of objectives and the resources that are invested.

Aspects related to implementation, programme design, monitoring and evaluation system will be streamlined and harmonised at a later stage across initiatives to ensure compliance with the implementation criteria, comparability across initiatives and to simplify the overall landscape.

The private partner has started preparing the Strategic Research and innovation Agenda (SIRA) of the partnership. In this process the Commission`s feedback to draft SIRA has been provided to BIC already on 24 April (by DG AGRI and DG RTD contributing), and the that additional input on the EU recovery package has been sent to BIC immediately as it became available (on 27 May). BIC has also received contribution from the public consultation (91 inputs received, from varied groups of stakeholders). However, until present, no updated draft of SIRA was received from BIC, while this is expected shortly. The document will undergo another round of internal consultation within the European Commission (services involved will include RTD, AGRI, GROW, ENV, JRC, SANTE, CLIMA and MARE). This will

[1] https://www.era-learn.eu/documents/final_report_ms_partnerships.pdf

lead to adoption, expected by mid-2020. It is expected that the document should be of sufficient quality and relevance to not require an update in the first years of the CBE partnership.

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This text shall neither be binding, nor construed as constituting commitment by the European Commission or BIC, nor does it pre-empt any future decisions.

1 Summary

CBE aims to accelerate Europe's transformation into a circular bio-based economy It substitutes non-renewable fossil and mineral resources by waste and biomass for renewable products and nutrients (not bioenergy). This brings up sustainable, resource-efficient and climate-neutral solutions for a healthier planet. Public and industry investment drives sustainable and competitive transitions by supporting R&I, and leverages direct additional investment.

2 Context, objectives, expected impacts

2.1 Context and problem definition

2.1.1 Political context

CBE aims to accelerate the transformation into a circular bio-based economy in the EU. Coordinated research funding under the proposed partnership is needed in a world of limited resources, where global challenges such as climate change, land and ecosystem degradation, and population growth are forcing us to seek new ways to produce and consume that respect the ecological boundaries of our planet.

The European Commission has recognised the environmental crisis and has put environment- and climate-related objectives high on the political agenda. One of the six headline ambitions for Europe over the next five years is the **European Green Deal** ([2]), which resets the Commission's commitment to tackling climate- and environmental-related challenges – this generation's defining task. The European Green Deal is a new growth strategy that aims to transform the EU 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. The bioeconomy and the circular economy in general will be important elements for delivering on the Commission's intentions, particularly by contributing to making Europe the world's first climate-neutral continent. This entails contributions to making Europe a global leader in circular economy and clean technologies, to the zero-pollution ambition, to the upcoming biodiversity strategy, and to the upcoming farm-to-fork strategy for a sustainable food system – all of this via a just and inclusive transition that puts people first, in an economy that works for people. The partnership on circular bio-based sectors will support the research and innovation efforts needed to this end, as achieving a climate-neutral and circular economy requires the full mobilisation of industry. The latter is also expressed in the **industrial strategy** ([3]), which stresses in particular the need to set up public private partnerships to this end.

An earlier Commission communication setting the scene for setting up the partnership CBE is the one on the **clean planet** ([4]), which describes a competitive EU industry and the circular economy as key enablers to reduce greenhouse gas emissions, and explicitly refers to the

[2] COM(2019) 640. Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions. The European Green Deal.
[3] COM(2020) 102. Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions. A New Industrial Strategy for Europe.
[4] COM(2018) 773. Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank. A Clean Planet for all – A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy.

increased use of sustainable biomass as a feedstock for producing industrial goods. It also gives sustainable biomass an important role to play in a net-zero greenhouse gas emissions economy.

The legal basis for EU intervention is the proposed **Horizon Europe** programme (based on Article 182 TFEU). In implementing the programme, the EU may set up joint undertakings (in accordance with Article 187 TFEU). The nature and magnitude of the issues are such that action at EU level is needed, rather than the Member States acting alone. Research and innovation on the bioeconomy, the environment, the bio-based and the circular economy is part of one single thematic cluster of Horizon Europe, giving the opportunity to work on actions covering both fields at the same time. Actions under Horizon Europe shall contribute at least 35% of the expenditure to climate objectives (Article 6a (7)), and CBE will deliver heavily on this.

This partnership is intended to build (and expand beyond) on the achievements of the 'Bio-based Industries Joint Technology Initiative' (BBI JTI) established under Horizon 2020, with the last calls due to be launched in 2020.

Updated in 2018, the **bioeconomy** strategy calls for action to

> further engage with stakeholders (Member States, regional authorities, biomass primary producers, the private sector and wider public) to align strategies and visions to further strengthen and upscale the bio-based sectors by supporting innovation and unlocking investments and markets … by exploring the various instruments available, including under the EU Research and Innovation Framework Programme, and also leveraging on private funds. ([5], p. 60)

The EU is a global leader in the bioeconomy, and few sectors match the rise of Europe's bio-based industries. Together these sectors represent 9% of the EU's workforce and are worth EUR 2.2 trillion in turnover. In a global context, maintaining that leadership role is required to keep the EU's industry competitive (in particular vis-à-vis China and the US), to attract investment from outside Europe, and to avoid brain drain to regions outside of Europe. In 2016, the EU bioeconomy employed 18.6 million people in total. Primary biomass production, mainly agriculture, forestry and fishery, generates a lot of employment (55%) but low turnover (20%) ([6]).

The partnership will actively contribute to achieving several actions mentioned in the bioeconomy strategy, both in area 1'Strengthen and scale-up the bio-based sectors, unlock investments and markets', area 2, which is about deploying local bioeconomies rapidly across Europe, and area 3 about understanding the ecological boundaries of the bioeconomy. ([7])

The Reflection Paper towards a Sustainable Europe by 2030 shows that much more **circularity** is needed to meet the sustainable development goals (SDG), especially the one on sustainable production and consumption ([8]). The bioeconomy strategy also states, "to be successful, the European bioeconomy needs to have sustainability and circularity at its heart" ([5], p. 4), and "circularity is a quintessential element of the European Commission's vision for an EU

[5] Updated Bioeconomy Strategy 2018 (https://ec.europa.eu/research/bioeconomy/pdf/ec_bioeconomy_strategy_2018.pdf#view=fit&pagemode=none)
[6] http://news.bio-based.eu/new-figures-reveal-sustained-growth-for-the-european-bioeconomy-2-3-trillion-eur-turnover-and-18-6-million-people-employed-in-2016/
[7] (1.1) Mobilise stakeholders in development and deployment of sustainable bio-based solutions; (1.3) Analyse enablers and bottlenecks for the deployment of bio-based innovations; (1.4) Promote and develop standards, labels and market uptake of bio-based products; (1.5) Facilitate the development of new sustainable biorefineries; (1.6) Develop substitutes to fossil based materials that are bio-based, recyclable and marine biodegradable; (2.1) Launch a strategic deployment agenda for sustainable food and farming systems, forestry and bio-based products; (2.2) Launch pilot actions for the development of bioeconomies in rural, coastal and urban areas; (3.2) Monitoring progress towards a sustainable bioeconomy.
[8] COM(2019)22 of 30 January 2019, https://ec.europa.eu/commission/sites/beta-political/files/rp_sustainable_europe_30-01_en_web.pdf

Bioeconomy" ([5], p. 50-53). In fact, "The cultivation and processing of biomass [for food, feedstock and energy] is now responsible for almost 90 per cent of global water stress and land-use related biodiversity loss", and "biomass extraction and processing also account for more than 30 per cent of greenhouse gas emissions (not including emissions from land use change)" ([9]) – giving a clear call to make the bioeconomy more circular indeed. Also the circular economy action plans of 2015 ([10]) and 2020 ([11]) make this link: "The bioeconomy hence provides alternatives to fossil-based products and energy, and can contribute to the circular economy" (2015) and "… the Commission will enable greater circularity in industry by … supporting the sustainable and circular bio-based sector through the implementation of the Bioeconomy Action Plan" (2020). The potential of the circular approach based on value retention processes such as remanufacturing, refurbishment, repair and direct reuse in complementing recycling is emphasised by the International Resource Panel of the UN Environment Panel ([12]).

The bio-economy is the 'green motor' of the circular economy. It is circular by nature, recycling CO_2 from the atmosphere into biomass via photosynthesis. It uses all fractions of renewable resources and keeping the carbon recycled within the life cycle of products. Whilst the circular economy focuses on "maintaining the value of products, materials and resources in the economy for as long as possible", many of the bioeconomy's elements go beyond this objective, including product functionality (new chemical building blocks, new processing routes, new functionalities and properties of products).

Standard EN 16575 ([13]) defines '**bio-based**' as "derived from biomass" and 'bio-based product' as a "product wholly or partly derived from biomass". This standard focuses on areas other than food, feed and energy applications.

An attempt to describe the differences and similarities of the bioeconomy, the bio-based economy and the circular economy is shown on the last pages of this document.

The bio-based sector is gaining momentum. The first action of the bioeconomy strategy calls to strengthen and scale up the bio-based sector by a "mobilisation of public and private stakeholders, in research, demonstration and deployment of sustainable, inclusive and circular bio-based solutions" ([5], p. 60-62). A coordinated research funding under the proposed partnership CBE is needed in a world of limited resources. Global challenges such as the existential threat posed by climate change ([14]), degradation of land, seas and ecosystems, and population growth are forcing us to seek new ways to produce and consume that respect the ecological boundaries of our planet and allow for including all levels of society. Existing land use practises (agriculture, forestry, bioenergy etc.) belong to the main drivers of soil degradation, biodiversity loss, climate change, nutrient exceedance and water scarcity in parts of the EU. The bio-based economy can devise solutions to redress this.

The European bioeconomy, the bio-based sector and the circular economy approach can contribute to achieving a scenario where bio-based products from sustainable biomass feedstock act as carbon storage and maintain that carbon circular. Sustainable biomass growth

[9] International Resource Panel, Global Resources Outlook 2019. Summary for Policymakers, p. 17, 2019.
[10] COM(2015) 614. Communication from the Commission Closing the loop – An EU action plan for the Circular Economy. pp 17-18.
[11] COM(2020) 98. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. A new Circular Economy Action Plan – For a cleaner and more competitive Europe. https://ec.europa.eu/environment/circular-economy/.
[12] https://www.resourcepanel.org/reports/re-defining-value-manufacturing-revolution
[13] CEN-CENELEC. EN 16575:2014 (Bio-based products – Vocabulary).
[14] https://www.consilium.europa.eu/media/41123/17-18-euco-final-conclusions-en.pdf

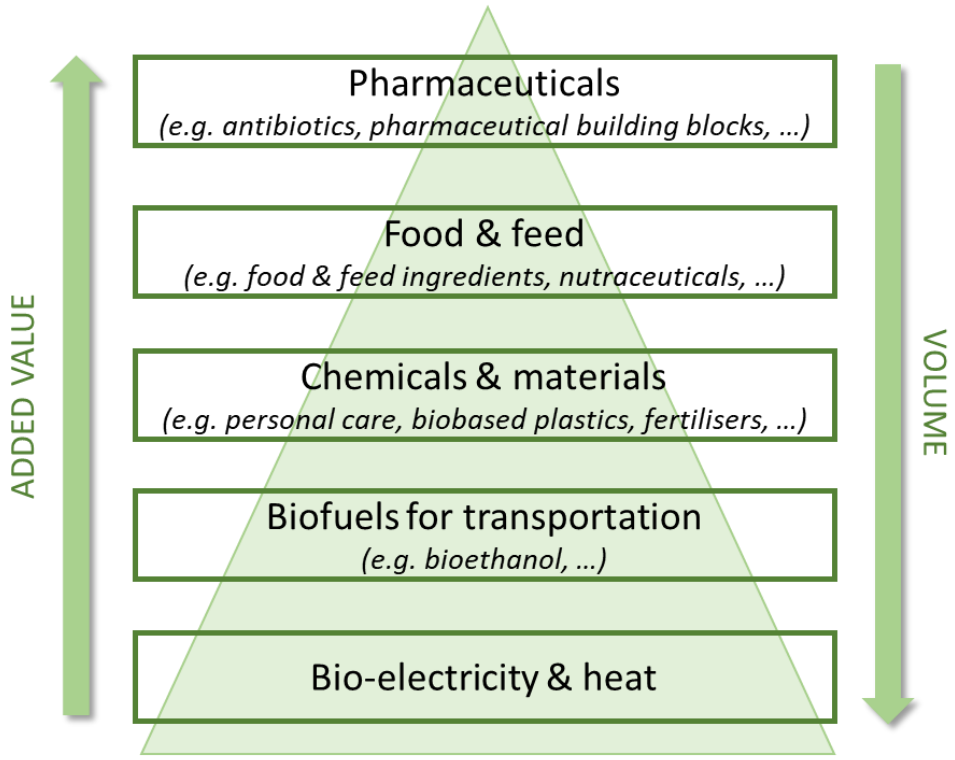
means here: improving yields in agriculture; nutrient recycling; optimal use of water; minimal pesticide use; minimal energy use in production chains ([15]).

In principle, this is also promoting the cascading uses of biomass, ensuring resource efficiency (see *Figure 1*). Moreover, side streams, residues, discards, wastes and waste-water sludge from different sectors of the bioeconomy may be converted into valuable bio-based products, fully implementing the principles of 'industrial symbiosis' (cooperation between industrial sectors, ensuring cost-competitiveness). The significant problem of nutrient losses to the environment impacting on air, water, biodiversity and the greenhouse-gas balance can be addressed through the CBE by developing and deploying techniques to recover and recycle nutrients (nitrogen and phosphorus) from residues and waste throughout the economy such that these organic fertilisers and soil improvers can eventually substitute synthetic fertilisers. This would then have a positive climate impact and reduce losses of nutrients to the environment ([16]). CBE can support the strengthening of primary production and the renewal of the EU's industrial base, and on territorial level synergies with EU regional policy, among others through biorefinery deployment, and help keep sustainable innovation within the EU.

Figure 1: Cascading use of biomass

[15] Kwant K.W., *Biobased Economy in the Netherlands and the regions – Opportunities & Challenges*, Netherlands Enterprise Agency, 2017 (after: van Beeck, N. et al., *An innovative perspective: Transition towards a bio-based economy*, in: Sustainable Energy Solutions in Agriculture, ed. J. Bundschuh and G. Chen, London, 2014).

[16] In the context of the CBE proposal, 'nutrients' means nutrients for agriculture and forestry, but not nutrients for feed or human nutrition.



Optimum use of bio-resources implies 'cascading'

- Cascading in time: expanding the utilisation of harvested biomass by re-using (or even upgrading) waste streams,
- Cascading in value: maximising and optimising the economic benefit of the bio-resource life cycle,
- Cascading in function: benefiting from all potential functions, e.g. through biorefinery?

CBE combines the approaches of the circular and the bio-based economy, following the principle of the 'trias biologica', i.e. (i) decarbonise the economy, thus minimise the carbon need and footprint; (ii) supply the remaining carbon need from sustainably produced bio-resources; (iii) minimise impact and maximise efficiency: use 'cascading' for all carbon resources and avoid all harmful emissions ([15]).

2.1.2 Problems, their drivers and importance

For easier drafting of the following sections (problems, objectives, impacts), text related to R&I issues has been written in blue, related to technical and economic issues in red, and related to societal and environmental issues in green.

In a global and European context, unprecedented interlinked environmental crises occur, which exceed the planetary boundaries. In the EU we are exceeding at least three safe planetary boundaries (climate, biodiversity, biogeochemical flows of nutrients), and water abstraction/ environmental flows have been locally passed in some areas of Europe. In addition, the EU economy is not sufficiently circular and is predominantly fossil-based. The existential threats mentioned as well as toxic pollution are all driven by the dominant global linear economic model and the world's addiction to fossil resources. The rate of the use of natural resources is soaring, currently reaching the carrying capacity of the planet. This is accompanied with persistent social-economic challenges (e.g. income disparities between classes, regions and countries), which shows that this model does not work for all. While the UN SDG process is a

promising response at the global level, with the lack of concreteness and ambition there is a risk of failure.

It is within this context, and responding to these challenges, that CBE must be developed. Not only work on sustainability improvement is needed: there is also a need of well-defined and measurable sustainability criteria for biomass production, to be developed via a systemic approach. They do not exist everywhere in Europe and at regional level and/or have not been integrated yet into most national or regional bioeconomy strategies. Sustainability criteria for many bio-products are lacking as well.

However, major challenges remain that curb the sector's potential to address the environmental problem. The insufficient R&I and cross-sectoral transfer of knowledge on bio-based solutions are driven by an insufficient R&I capacity in the sector in Europe, the attractivity of North America and South-East Asia for investments in biorefineries, the financial gap to scale up technologies, and a low uptake of research results into commercialised products and processes. Although a lot of progress was made via the BBI JU, technological hurdles still exist regarding feedstock, technologies and products. The further development of successful and widely implementable bio-based value chains needs to identify and exploit cross-sectorial synergies ('industrial symbiosis') based on inclusive patterns with all different private and public actors involved (social innovation): from primary producers to end users and brand owners, and from regional and local authorities and enterprises to civil society. Embracing this broad range of stakeholders in R&I will increase trust and awareness and enable the necessary spillover effect for the entire bio-based sector, which will increase the coherence and economic robustness of its value chains.

The bio-based sector shows a lot of systemic bottlenecks and market failures, with quite many challenges still to tackle ([17]).

The supply of biomass in Europe is not always reliable and competitive, and can be seasonal and scattered, especially if compared to fossil and mineral resources, which have a more or less uniform composition and availability. Europe is heavily depending on imports of strategic raw materials like fossil ones, protein, phosphate and potassium. The use of biomass for producing bioenergy is still stimulated by European policies, while other bio-based products are not. Moreover, the prices of fossil- and mineral-based products do not fully include the cost of environmental externalities; therefore bio-based products are often not as affordable and have a smaller market uptake. A level playing field is thus lacking between different uses of biomass ([18]). Producing bioenergy and biofuels from bio-based resources leads a great part of biomass into a chain of smaller added value with no chance of circular use. This is also valid for landfilling and incineration of biomass and biowaste.

In addition, there are large differences in the organisation of the primary sector producing biomass in Europe, with traditions and practices of good organisation of the agricultural sector in western and northern European countries, but less so in central and eastern European countries. Moreover, compared to others, the forestry sector is quite well organised, at least in some countries. Primary producers are often not aware of the opportunities of the bio-based economy, and farmers are not well organised to benefit from the bio-based value chains.

Although progress has been made in the recent years, European value chains are still fragmented and not sufficiently interlinked, thus not yet fully representing a well-working industrial ecosystem for valorising biomass, side streams and biowaste. Demonstrating and

[17] Bos, H. et al., *Market entry barriers report*, Deliverable 2.1 of the BBI project STAR4BBI – Standards and Regulations for the Bio-based Industry STAR4BBI, 2018; https://www.biobasedeconomy.eu/app/uploads/sites/2/2018/09/Please-click-here-to-access-deliverable-2.1.pdf.
[18] Commission Expert Group on Bio-based Products, *Final Report*, Brussels, 2017; https://ec.europa.eu/growth/content/commission-expert-group-bio-based-products-calls-alignment-bioeconomy-strategy-eu-policy_en

deploying first-of-its-kind biorefineries means high risk and sometimes large capital expenditure ([19]), in particular for SMEs. Therefore the private sector and private investors are reluctant to build the first key facilities without public support. The same applies for the high-risk small-scale capital expenditure for innovations done by small players like farmers. This is all the more relevant when the market requires products with similar or better performance as fossil ones at same cost. With oil and shale gas having low price levels currently, there is also a need for incentives for spending money on developing bio-based alternatives.

The underdeveloped market for sustainable bio-based products presents a risk for the global competitiveness of the European bio-based industry. This is also due to the fragmented policy framework across the EU: The-bio based sector forms part of a wide range of policies at EU, national, regional and urban level (agriculture, fisheries, aquaculture, waste, industry, fertilisers, chemicals, etc.), leading to a complex and sometimes fragmented policy environment.

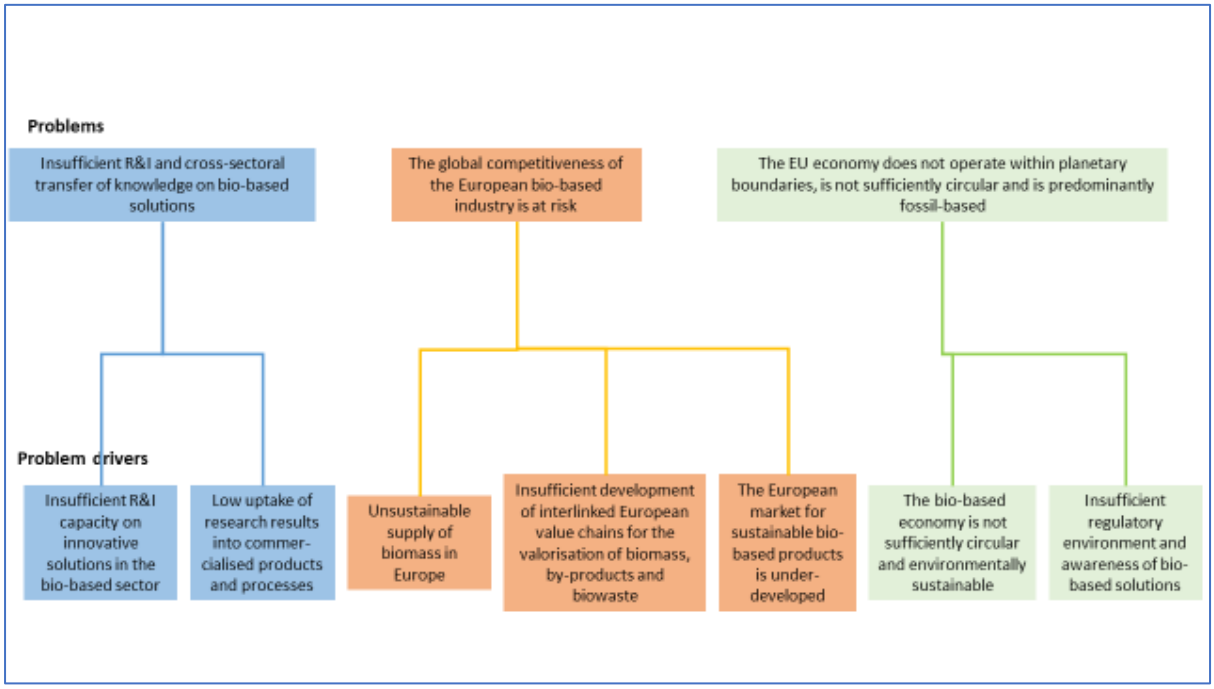
The low social acceptance is another obstacle to investing in R&I in the sector ([20]). This is mainly associated with a lack of awareness and socio-economic barriers experienced or perceived by stakeholders, including consumers, about bio-based products, their cost, accessibility, properties and best use.

[19] https://www.eib.org/en/publications/access-to-finance-conditions-for-financing-the-bioeconomy

[20] For example: FP7 project BIO-TIC – The Industrial Biotech Research and Innovation Platforms Centre: towards Technological Innovation and solid foundations for a growing industrial biotech sector in Europe, Final report summary, 2015; https://cordis.europa.eu/project/id/312121/reporting; Horizon 2020 project BIOWAYS – Bio-based economy: network, innovate, communicate; Deliverable 2.4 *Public perception of bio-based products – societal needs and concerns (updated version)*, 2018; http://www.bioways.eu/multimedia/press-corner/public-results-/; BBI project RoadToBio – *Roadmap for the Chemical Industry in Europe towards a Bioeconomy*, Strategy document, 2019; https://www.roadtobio.eu/index.php?page=publications.

Figure **2** shows the problems and problem drivers of CBE in a more systematic way.

Figure 2: Problems and problem drivers of the initiative on Circular Bio-based Economy



2.1.3 Opportunities

The bio-based sector can contribute strongly to the EU's agenda for greener and more inclusive growth and jobs, particularly in coastal and rural areas, through greater participation of primary producers in local bio-economies and through the high and fast-growing number of start-ups in the biotechnology sector.

The development of bio-based value chains offers substantial opportunities for regional as well as rural, urban and coastal economic development and improved territorial cohesion, with cooperation of all actors, for instance through the deployment of advanced sustainable biorefineries, including small-scale decentralised technological solutions and business models suitable for direct adoption by primary producers, either individually or through cooperative approaches. These technological solutions will empower primary producers and allow them to take up a more active role in the generation of value from biomass and in reducing unwanted impacts from primary production. It would also change the role of primary producers from simple providers of biomass into beneficiaries of the bio-based value chain approach.

In rural areas, a new coordinated approach to manage nutrients within safe boundaries will be operationalised. It couples research, innovation, policy and implementation actions addressing the life cycle of nutrients to halt their harmful emissions into air, water and sensitive habitats ([21]), and the bio-based industry and its biomass suppliers have an important opportunity to grasp here. Expressed as dry matter, agriculture constitutes about 63 % of the total biomass supply in the EU, forestry 36 % and fisheries less than 1% ([22]). Feed and food is the most important category in terms of biomass use, adding up to over 60% of the biomass, whereas

[21] Nitrous oxide emissions from agricultural soils are linked with the biogeochemical cycle of nitrogen, which has been greatly impacted by anthropogenic effects that include the application of synthetic fertilisers. See SWD(2020) 100, Commission Staff Working Document – Leading the way to a global circular economy: state of play and outlook, p.8.

[22] Gurría, P. et al., *Biomass flows in the European Union. The Sankey biomass diagram – towards a cross-set integration of biomass*, JRC Technical Reports, Luxembourg, 2017.

bioenergy and biomaterials account for circa 19% each of the total biomass in the EU-28 ([23]). Wood-based materials, polymers, textiles and fibres / polymers in composite materials are the four main types of biomaterial used in the EU. Around 113 million tonnes of biowaste are generated annually in the EU, out of which 60 million tonnes is food waste ([24]) and 88 million tonnes of the biowaste is municipal waste ([25]). About 25% of the biowaste is collected and recycled.

The bio-based sector can also help build a climate-neutral future, in line with the climate objectives set in the Paris Agreement, by offering opportunities for 'negative emissions' (carbon sinks). CBE will contribute to the SDG target of achieving land degradation neutrality by 2030, and the specific target of this ambition will be defined in the KPIs.

Marine and freshwater realms will be crucial to meet the demand of alternative food, drugs and chemicals, which is caused by a rapidly growing population. Bio-based innovation on aquatic resources can deliver jobs in coastal areas and make an invaluable contribution to a cleaner and healthier environment. However, the biodiversity of aquatic ecosystems is the target that is most missed under the existing biodiversity strategy, which makes specific attention to sustainable exploration of aquatic environments key.

For urban environments, the bioeconomy strategy underlines that "cities should become major circular bioeconomy hubs. Circular urban development plans could translate into very significant economic and environmental gains [for example] by innovating the way cities add value to their significant share of bio-waste" ([5], p. 6 and 9). However, all this also depends on the development of robust sustainable approaches taken on by the bio-based industry and mainstreamed into regional development agendas

The fossil-fuel-based industry might collapse in future, as photovoltaic and wind-based electricity has become cheaper than nuclear or coal, and the cost of electricity storage is going down dramatically. This will not be for now, because the electrification and overall infrastructure setup will take time. While about 50% of the fossil resources are burned to produce energy, only around 10% are used for products and materials. These ten percent generate around half of the margin of the sector in the EU. Thus, if the oil-based infrastructure is not justified anymore, the availability and price of oil for the petrochemical industry will evolve. Applications where carbon is absolutely needed have thus to get become more in the focus: fibre, materials and products. Liquid biofuel is for the transition only.

Opportunities of a future partnership CBE are:

- Bioeconomy and bio-based products to act as a greenhouse-gas sink;
- Ability to establish new value chains and markets;
- Bringing circularity to the forefront by creating value through the valorisation of biomass waste and side streams from industry, rural areas, cities, food industry and forestry;
- Regional development and rural renaissance;
- Industrial competitiveness;
- Job creation in the bio-based sector;
- Just and fair transition into a circular bio-based economy for all in Europe;
- Bridging the gap from research to the marketplace and accelerating market introduction;
- De-risking investment in innovative biorefineries;
- Building new industrial collaborations and value chains
- Digitalisation.

[23] However, due to large data gaps in terms of biomaterial and bioenergy uses of agricultural biomass, those two categories of uses are clearly under-estimated in the report quoted just above ([22]).
[24] Draft report by Zero Waste Europe commissioned by BIC and to be published before the summer.
[25] COM (2010) 235. Communication from the Commission to the Council and the European Parliament on future steps in bio-waste management in the European Union.

2.1.4 Learning from the previous R&I Partnership

The establishment of the Bio-based Industries Joint Undertaking (BBI JU) was deemed essential for structuring and mobilising a sector that was extremely fragmented across geographies and industrial applications. The Union's and the industry's long-term commitment has triggered additional investment by the industry in Europe, benefitting all citizens involved throughout the value chains. Moreover, the need to support high-risk projects enabling a faster uptake of biobased products was key for choosing this implementation instrument. BBI JU has proven to be very effective in de-risking investments, as it deals with sectors still under development, where traditional funding or financing instruments (loans) are not effective. For example, capital-intensive demonstration and flagship projects aiming at scaling up technology remain highly risky and would not have been realised in Europe if the direct financial support, in the form of grants, had not been provided. Establishing BBI JU also allowed the setting of ambitious objectives with respect to the expected socio-economic and environmental impact, in the context of the Union's bioeconomy strategy.

The BBI JU has been established in 2014 by Council Regulation No 560/2014, as amended by Council Regulation (EU) 2018/121 of 23 January 2018, with an original Union contribution of up to EUR 975 million and contributions of the member other than the Union (BIC) of at least EUR 2 730 million between 2014 and 2024. According to the Council Regulation, the Union contribution should consist of: (i) contributions to the administrative costs of up to EUR 29.25 million; and (ii) in-kind contributions to operational activities of up to EUR 945.75 million. BIC's contributions should consist of: (i) contributions to the administrative costs of up to EUR 29.25 million; (ii) financial contributions to operational activities of at least EUR 182 million; (ii) in-kind contributions to operational activities (amount not laid down); and (ii) in-kind contributions to additional activities of at least EUR 1 755 million.

According to the assessment of the BBI Annual Activity Report 2018 (AAR) ([26]) by the Governing Board, by the end of 2018, the commitments or payments are more or less in line with the expectations, with one exception: BIC has not met its cash contribution obligations. While BIC had indeed committed to deliver at least EUR 182.5 million of cash contribution at operational level, its contribution is almost non-existent to date (EUR 3.25 million; thus less than 2%). By virtue of Article 4(5) of the Council Regulation, the Commission therefore reduced the planned Union contribution to BBI JU operational costs in 2020 by an amount of EUR 140 million, which is indeed less than the total gap in BIC's cash contribution of EUR 180 million. No other figures are expected to be given in the BBI AAR2019, which will be published in July 2020. The main lesson to be learnt from this is that well-suited commitments and transparent procedures understood by all partners in the same way should be established a priori.

One of the unique features of the BBI JU initiative has been to foster the closer collaboration between the scientific community and Industry, ascending the scale of Technology Readiness Level (TRL) and thus enabling a swifter move towards innovation. The scientific community mobilisation is evidenced by the 28.4% participation level of universities and research centres in the BBI JU projects. It is further confirmed by the annual survey: according to the projects' reports, 80% of them contribute to knowledge creation, 79% contribute to increasing the academia-industry cooperation, more than the half contribute to the building of scientific community networks and to technology transfer. These 17 results contribute significantly to KPI 8 (Technology Readiness Level gain) where RIA projects report 33 cases of improved technologies filling gaps in the value chain.

[26] https://www.bbi-europe.eu/sites/default/files/bbi-ju-aar-2018.pdf

The 9 flagship biorefineries alone generate private investments of more than EUR 1,200 million against a BBI JU grant amount of EUR 200 million. This corresponds to the creation of more than 3,300 direct jobs and more than 10,000 indirect ones well spread across Europe, for a total of CO2 emission savings expected to reach 600 kT CO2/year.

Current results show that most of the projects expect to contribute to job creation, as around half of them are located in rural and coastal areas. The nine flagships granted so far are generating private investments in biorefineries of around EUR 1,200 million against a BBI JU financing of EUR 200 million. This represents the creation of more than 3,300 direct and more than 10,000 indirect jobs evenly shared between EU15, EU13 and associated countries. The expected environmental impact is also large as two thirds of the projects report producing biobased products with lower GHG emissions. More than half of them expect to contribute to waste reduction, reuse, valorisation or recycling and a decrease of their energy consumption. Considering only the seven flagships funded so far, the total CO2 saving is expected to reach 600 kT CO2/year. Finally, 40% of the projects report they expect to improve land use and seven projects report a positive impact on biodiversity[27].

The proposal for establishing an institutionalised partnership CBE builds on the achievements and lessons learned from the BBI JTI under Horizon 2020. The interim evaluation of the BBI JTI ([28]) confirmed its positive effect in terms of the competitiveness of the bio-based technologies via the initiative's structuring and mobilising effect. It also made recommendations on, inter alia, the need of the initiative to broaden the scope of its activities and strengthen synergies, while enlarging the range of actively involved stakeholders.

At this stage of the BBI initiative, for most BBI-specific KPIs, BBI JU projects are expected to exceed the targets set for 2020. On one hand this shows that the BBI JU has significantly contributed to the systemic evolution of the sector in bridging the gap between innovation and market. On the other hand, it may also hint at a sub-optimal prior assessment of the quantitative goals for KPIs ([29]).

One issue is that the BBI JU does not yet include representatives of all bio-based economy actors or at least not on equal footing – although BIC has made quite some advances in this respect. The industrial consortium BIC originally included 35 bio-based companies and no associate members. Since the setup of the BBI, the group of BIC members has been growing to over 250 companies. Over 80% of them are SMEs – mostly in BIC via regional SME clusters. The members cover the whole value chain, from primary production to the market, across multiple and diverse sectors. BIC associated members consist currently of 150 members, including research and technology organisations, universities, European associations and organisations, technology platforms (ETPs), public institutions, regional organisations and private banks.

While there has been a growing interaction between companies from different sectors within BIC, which has lead to innovative collaborations and value chains, it was expected that the industries represented within BIC would help develop a favourable ecosystem for the bio-based sector overall. However, this objective was achieved only partially, as the initiative struggles to involve important other players such as primary biomass producers (which is mainly due to their different way of organising themselves) and to identify their role within the BBI initiative.

[27] https://www.bbi-europe.eu/sites/default/files/bbi-ju-aar-2018.pdf

[28] European Commission, *Interim Evaluation of the Biobased Industries Joint Undertaking (2014-2016) operating under Horizon 2020. Experts Group Report*, Brussels, 2017.

[29] It has to be noted, however, that the planned KPIs (set by BIC and agreed by the EC), are linked to commercialised innovative products, processes and value chains. What the BBI JU has been measuring by now are reported intermediate results of running projects. The final results will only be analysed once the projects have been finalised.

Another concern is the lack of understanding of the partnership's environmental and socio-economic impact. Whereas an analysis of the environmental impact of the BBI JU projects is only expected to be carried out via a public procurement in 2020, the contribution to regional development and the distributional impact have not been analysed. It must be conceded, however, that earlier analyses of these issues would not have made sense earlier because of the low number of projects that could have been analysed.

Learning from the BBI JU (and other partnerships) also means setting up the new partnership in a certain way to fill the gap of uncovered areas and avoid past implementation issues. Examples for content issues (and how to act on them):

- The low involvement of agricultural and other primary producers beyond the simple provision of biomass should be tackled from the outset by involving their representatives as partners and working on the actions proposed in the action plan derived from the study on the participation of the agricultural sector in the BBI JU.
- The small coverage of municipal waste as raw material (notably the lack of a flagship in this sector) could be remedied by involving representatives of municipalities and waste collectors as partners – which could be quite challenging however.
- The low focus on biodiversity preservation and enhancement as part of the pursued biomass value chains could be improved by mentioning biodiversity as one of the objectives of the partnerships, which could lead to involving more biodiversity specialists in the governance of the partnership, for example in the scientific committee.
- A socio-economic and environmental impact analysis should be carried out throughout the programme, and/or at the-mid term and final evaluations of the partnership.

Examples for issues of implementation (and ways to overcome them):

- As described above, the private partner of BBI did not follow up its commitment on the financial contribution for the operational costs, in the opinion of BIC clear procedures were not in place to follow up the commitments at the start of the JU, and rules changed during the duration of the current JU (e.g. the Model Financial Regulation). Therefore, it should be excluded that any of the partners commits to figures or activities it cannot comply with, and transparent procedures should be established a priori. In addition, commitments by the partners should be made legally binding in the basic act and should lead to clear actions by the Commission if not followed up.
- The overcomplicated way of reporting the private partner's in-kind contributions has to be made much easier. This could be done by replacing the annual IKOP report by an IT-based system of eligible costs minus reimbursed costs, or by limiting the scope of additional activities that allow accounting for in-kind contribution (see section 3.2 Resources).
- As regards BIC's practice of requesting from (not obliging) all beneficiaries a contribution of 4% of the grant amount in a BBI JU project, there has never been a legal basis for a contribution to the JU administrative costs by beneficiaries that are not industry members of BIC. The JU regulations under Horizon 2020 set out that the private members must contribute to the JU administrative costs – a collective obligation that is not linked to the status of beneficiary. This has to be implemented via the basic act, in line with the Commission Delegated Regulation (EU) 2019/887 of 13 March 2019 on the model financial regulation for public-private partnership bodies.
- The lack of access by Commission services via practical standard Commission IT-systems to proposals ([30]), project information and project documents has led to year-long

[30] This is the only contentious issue remaining in 2020.

discussions between the Commission and BIC / BBI JU on this issue. Clear rules have to be set up in the basic act in this respect.

Since its inception, the BBI JU has been initiating and following up on several activities related to promoting synergies, identifying complementarities and avoiding overlaps with other funding programmes:

- Turning redundancies into synergies and complementarities with the cPPP SPIRE (Sustainable Process Industry through Resource and Energy Efficiency), through an established working group (BBI, BIC, SPIRE and SUSCHEM) and also recently formalised via a joint statement of collaboration on several levels (strategic, implementation, communication).
- Synergies and complementarities with ESIF in order to strengthen national and regional research and innovation capabilities in the context of smart specialisation strategies (S3) – BBI JU synergy label. BBI JU recently received the approval of the GB to launch the 'BBI Synergy Label' pilot to facilitate access to regional funds to support BBI JU IA projects that obtained good evaluation results, but were not selected for funding due to budget limitations.
- Memoranda of understanding between the BBI JU and the European Bank for Reconstruction and Development, and with several Polish regions.
- Collaboration with EASME and DG MARE on the blue bioeconomy; with the JRC Bioeconomy Knowledge Centre; with INEA.
- Development by BIC of guides on alternative sources of funding and financing, such as the planned digital bioeconomy platform ([31]), the guide on principles, synergy scenarios and practical examples on how BBI funding can be cumulatively combined with ESIF and other funding ([32]), and the report on the access to EU financial instruments ([33]) to raise awareness of the EU instruments available for supporting bio-based ventures, especially for demonstration and flagship investments.
- BIC's publication of country reports on Estonia, Latvia, Lithuania, Poland, Portugal, and Romania ([34]). All reports describe: the existing economic sectors (relevant for bio-based activities) and their strengths; the current opportunities for bio-based operations (waste and other residual streams); and potential valorisation of these opportunities. Reports on other less well-represented central and eastern Member States in the bio-based economy are being developed by a BBI JU project.

2.2 Common vision, objectives and expected impacts

[31] The concept is based on a digital, partnering platform where regions and industry can make contact based on mutual interest. The platform focuses on creating local value chains and access to finance, namely helping regions and industry bridge the gap about bio-based investment opportunities at the level of regions.

[32] BIC, *Combining BBI (H2020) and European Structural and Investment Funds (ESIF) to deploy the European bioeconomy – Guiding principles*, Brussels, 2014; https://biconsortium.eu/sites/biconsortium.eu/files/downloads/Guidelines_BBI-ESIF-Final.pdf. This complements the EC's guide *Enabling synergies between European Structural and Investment Funds, Horizon 2020 and other research, innovation and competitiveness-related Union programmes – Guidance for policy-makers and implementing bodies*, Brussels, 2014.

[33] BIC, *Access to EU Financial Instruments suitable for the implementation of large Bio-based Industry investments'*, Brussels, 2017. https://biconsortium.eu/downloads/bic-financial-instruments.

[34] https://biconsortium.eu/publications-latest

2.2.1 Vision and SIRA

BIC collaborated with 15 other associations ([35]) to develop a common vision of a circular bio-society in 2050, published in June 2019 ([36]). This vision "unites the collective knowledge of Europe's bio-based organisations and experts. These include the full spectrum of BIC's membership, encompassing sectors as diverse as agriculture, food and feed production, forestry and pulp & paper, aquatic and marine, chemicals and materials including bioplastics, technology providers and beyond. They also include a broad selection of stakeholders, large and small, other European associations and industries, the primary sector, brand owners, representatives of Member States, scientists and environmental organisations, representing Europe in all its geographical and natural diversity." BIC involved Member States in drafting this vision via the SRG, and Member States took part in discussing partnerships at the shadow configuration of the strategic programme committee for Horizon 2020.

The vision describes a sustainable and competitive bio-based industry in the EU enabling a circular bio-society by 2050 (see box below).

> Sustainable and climate-neutral solutions accelerate the transition to a healthy planet in respect of the planetary boundaries, and at the same time increase industrial competitiveness. In line with the objectives of the European Green Deal, the EU has been transformed into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases and where economic growth is decoupled from resource use. Valorising bio-based feedstock in a cascading approach increases the circularity of the bioeconomy, offers significant opportunities for recycling nutrients, and provides durable bio-based carbon sinks and storages. Primary producers get higher socioeconomic returns from the sustainable production of much needed biological resources, help cherish and preserve our rural areas and invest in their future.

The associations and other stakeholders are also actively involved in developing the Strategic Research and Innovation Agenda (SIRA) 2030, as well as the BBI JU's advisory bodies, the States Representatives Group and the Scientific Committee. After a preliminary draft of 4 November 2019, the updated draft SIRA is expected to be published by BIC in the end of June 2020. For the same purpose, BIC involved two additional organisations representing NGOs (to make a better and clear link to the SDGs), and municipalities. In addition, to stimulate the collaboration with the regions, BIC signed a memorandum of understanding with the European Regions Research & Innovation Network (ERRIN) and the Vanguard Initiative, and has launched a regional bioeconomy platform ([37]).

2.2.2 Objectives

Based on the problems described above, the overall objective of the proposed CBE partnership is to produce significant quantifiable contributions towards the achievement of climate targets in 2030 and to pave the way for climate neutrality by 2050 – fully in line with the European Green Deal and the objectives of Horizon Europe.

[35] Confederation of European Forest Owners (CEPF); Confederation of European Paper Industries (CEPI); European Association for Bioindustries (EuropaBio); European Association of Sugar Manufacturers (CEFS); European Bioplastics (EUBP); European Farmers and European Agri-Cooperatives (Copa-Cogeca); European Renewable Ethanol Producers Association (ePURE); European Starch Industry Association (Starch Europe); European Vegetable Oil and Protein Meal Industry (FEDIOL); Forest-based Sector Technology Platform (FTP); Primary Food Processors (PFP); European Agricultural Machinery Industry (CEMA); European Chemical Industry Council (Cefic); European Technology Platform 'Food for Life'; European Technology Platform for Sustainable Chemistry (SusChem).

[36] https://biosocietyvision.eu/

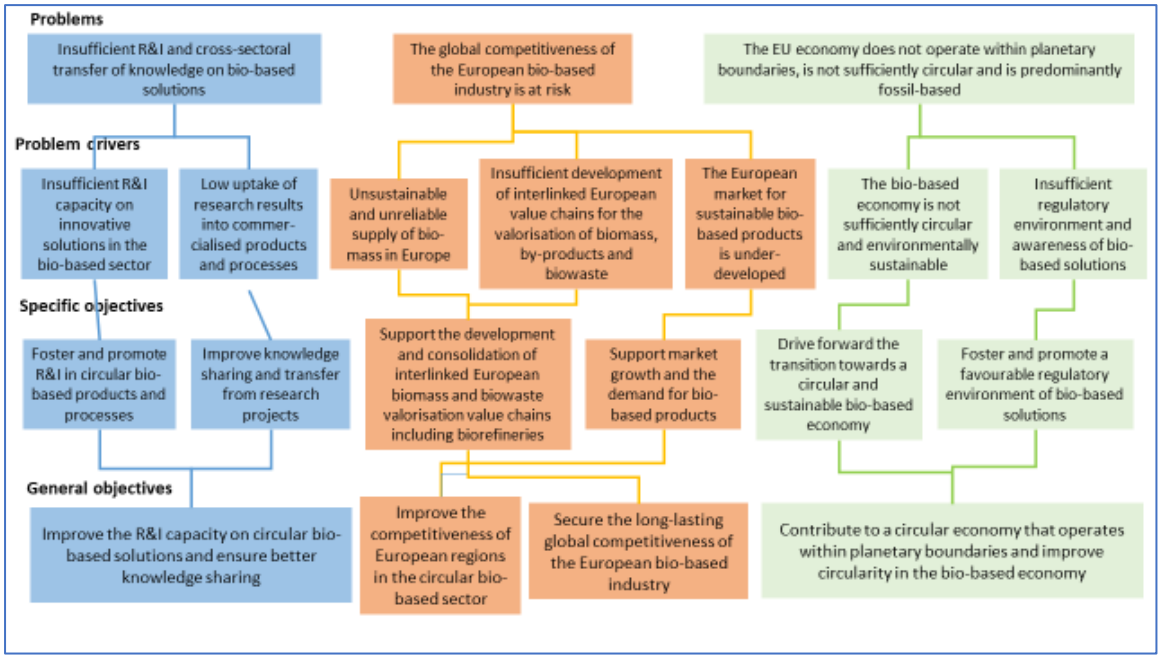
[37] https://www.bioeconomy-regions.eu/

The overall aim of the proposed European Partnership is to drive forward the societal transition towards a sustainable bio-based economy by increased R&I, leading to sustainable and competitive solutions for more circularity and use of European biomass, residues and waste, with a focus on regional approaches, and accelerating the transition to a healthy planet towards implementation of the Sustainable Development Goals.

The general objectives are (see also *Figure 3*):

1) Improve the R&I capacity on circular bio-based solutions and ensure better knowledge sharing (scientific objective)
2) Improve the competitiveness of the circular bio-based sector in the regions (economic/technological objective)
3) Maintain the long-lasting global competitiveness of the European bio-based industry (economic/technological objective)
4) Contribute to a circular economy that operates within planetary boundaries and improve circularity in the bio-based economy (societal objective including environmental and social objectives)

Figure 3: Intervention logic of the initiative on Circular Bio-based Economy



Detailed description of the **general objectives**:

1) Improve the **R&I** capacity on circular bio-based solutions and ensure better knowledge sharing (scientific objective)

   Whereas the circular bio-based sector faces an insufficient R&I capacity overall, the transfer of knowledge on bio-based solutions is insufficient, both within value chains and across different sub-sectors. Increased public and private funding will compensate for the insufficient R&I. There is no single entity able to develop the needed circular bio-based solutions by itself. Improving the circularity and sustainability of the bio-based sector would involve working individually within each sector to address its upstream (raw material supply) and downstream (processing, waste) dimensions, and also across sectors. A long-term S&T basis in Europe will be created by supporting all stages of the innovation cycle, from early research via innovation to unlocking investments (via first-of-its-kind biorefineries) and markets. This needs to be done via

bridging the information gap between researchers, innovators, primary producers and industries and via creating opportunities for cross-fertilisation and synergies across the bio-based ecosystem and value chains. The Green Deal explicitly mentions this partnership with industry on circular bio-based sectors to mobilise research and foster innovation on climate solutions.

2) Improve the competitiveness of the circular bio-based sector in the **regions** (economic/technological objective)

   Valorising European biomass, side streams and food waste will necessarily embark different actors in regional and local value chains on a cooperation path. This addresses the problem driver of different sectors of the bio-based economy not communicating sufficiently with one another, although geographically near. Mobilising a critical mass of stakeholders, structuring the value chains, innovation, de-risking and demonstration are particularly needed in difficult-to-reach rural and coastal regions of countries that are underrepresented so far (in Horizon 2020, in BBI JU, in the sector itself), with a view to driving deep transformation in the sustainable use of bio-based resources. An important contribution to the Green Deal can be expected: to mobilising industry for a clean and circular economy; to an environmentally friendly food system; and to building and renovating in an energy- and resource-efficient way. And it also includes synergies with the Just Transition Mechanism ([38]).

3) Maintain the long-lasting **global** competitiveness of the European bio-based industry (economic/technological objective)

   Fully aligned with the Horizon Europe specific objectives, this general objective corresponds to the problem of the global competitiveness of the European bio-based industry being at risk. One of the ways ahead is to keep innovation and investments as well as new demonstration and flagship infrastructures within Europe. Research results should be able to smoothly find their way to practical industrial applications within Europe, without companies being confronted with obstacles and obliged to deploy innovation outside of Europe. Investing into applicable research and innovation is key to that, together with direct funding and leveraging additional funding for new demonstration and flagship facilities. European R&I funding has the vocation to de-risk otherwise risky projects, and to leverage the much needed additional financing for R&I and deployment. CBE will be an important element of the Green Deal in that it will support and accelerate the transition of the industry to a sustainable model of inclusive growth that can serve as an example worldwide.

4) Contribute to a circular economy that operates within **planetary boundaries** and improve circularity in the bio-based economy (societal objective including environmental and social objectives)

   To substitute fossil-based products and to make new bio-based products with better functionalities, sustainable processes need to be found to make bio-based products from renewable and waste-based European biomass. The latter feedstock is also to be used to produce renewable nutrients for agriculture and forestry, without the need of fossil energy. Both approaches increase the circularity of agro-food and aquatic systems and eventually contribute to a climate-neutral future, in line with the SDGs, the climate objectives of the Paris Agreement, the Green Deal, and the 2015 a d 2020 EU circular economy action plans. Addressing feedstock availability will lead to replacing unsustainable resources, whether

[38] COM (2020) 22, Proposal for a Regulation of the European Parliament and of the Council establishing the Just Transition Fund.

sourced domestically or from abroad. The partnership will contribute to mitigating climate change (by reducing the use of fossil resources and applying the concept of carbon sinks) and will look for ways how to adapt to it. This general objective can be achieved by R&I addressing those aspects, levers and problem drivers within the bio-based sector that will make it more circular and environmentally sustainable. Intensified R&I is expected to lead to discovering more processes and technological solutions for turning biomass and waste into industrial products. This objective is of utmost importance for implementing the Green Deal, supporting the EU's work on its climate ambition for 2030 and 2050 (including the minimum 35% contribution of Horizon Europe actions to climate objectives), contributing to a toxic-free environment and the zero-pollution ambition, and preserving and restoring ecosystems and biodiversity. It will also deliver a major contribution to achieving several Sustainable Development Goals (SDG; [39]).

Figure 3 above, the intervention logic, shows the relationship between the general and specific objectives of CBE in relation to the problems and their drivers. The **specific objectives** shown here are still not SMART (specific, measurable, achievable, realistic, timed), as their further fine-tuning will be for the discussion of the SIRA. The same applies for the related operational objectives and key performance indicators (KPI).

Foster and promote R&I in circular bio-based products and processes

The intensified public and private funding will compensate for the insufficient research and innovation in the bio-based sector. Improving the circularity and sustainability of the bio-based sector would involve working individually with each sector to address its upstream (raw material supply) and downstream (product specifications, waste processing) dimensions. A long-term S&T basis in Europe will be created by supporting all stages of the innovation cycle, from early research via innovation to unlocking investments and markets. In line with the Green Deal, sustainable bio-based products with an inbuilt circular design will be developed, some of which are particularly suited to replace the usual products from resource-intensive sectors (such as textiles, construction, plastics) as well as non-degradable plastics.

[39] COM(2019) 22, *Reflection Paper towards a Sustainable Europe by 2030*. SDGs addressed by CBE (at different degrees) are, together with a relevant example or explanation:

- SDG 2 End hunger, achieve food security and improved nutrition and promote sustainable agriculture (through new protein concentrates from vegetable side streams);
- SDG 3 Ensure healthy lives and promote well-being for all at all ages (through replacing hazardous fossil-based substances by bio-based less hazardous ones);
- SDG 6 Ensure availability and sustainable management of water and sanitation for all (valorisation of waste water);
- SDG 8 Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for al (through new jobs and growth of all parts of different bio-based value chains);
- SDG 9 Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation (through structuring the sector, innovation at all TRLs, and setting up biorefineries);
- SDG 11 Make cities and human settlements inclusive, safe, resilient and sustainable (through valorising the organic fraction of municipal waste);
- SDG 12 Ensure sustainable consumption and production patterns (through creating an increased demand for bio-based products substituting fossil-based ones);
- SDG 13 Take urgent action to combat climate change and its impacts (through emissions reduction);
- SDG 14 Conserve and sustainably use the oceans, seas and marine resources for sustainable development (through cultivating seaweeds);
- SDG 15 Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss (through using wood for construction purposes).

The related KPIs can be taken from the BBI JU and slightly modified: number of grant agreements signed; new bio-based value chains created; new bio-based building blocks; new bio-based materials and chemicals; new demonstrated consumer products.

Improve knowledge sharing and transfer from research projects

This can be done via bridging the information gap between researchers, innovators, primary producers and industries and by creating more opportunities for cross-fertilisation and synergies. The partnership also creates a platform to enable industries – across sectors – to detect and deploy synergies and collaborations (industrial symbiosis).

The related KPIs could be taken from the BBI JU and slightly modified: number of flagship and demonstration grant agreements signed; new cross-sector interconnections set up.

Support the development and consolidation of interlinked European biomass and biowaste valorisation value chains

This specific objective is about fostering collaboration and creating well-working carbon-neutral value chains across industrial and geographical boundaries, thereby creating jobs and growth in the circular bio-based economy. Besides scientific progress, the further development of the circular bio-based sector depends on several favourable conditions such as: sufficient biomass, side streams and waste; well-organised primary producers; the necessary infrastructure; support by cities, local and regional governments; the presence of specific knowledge providers; acceptance by local communities and by the society in general. These favourable conditions can be best achieved by providing specific, tailor-made support to all critical actors to overcome the multi-sectoral nature of the bio-based sector, in the form of knowledge (analysis, technology, guidance), financing (grants, investment), or capacity building (active teaching and training through project development assistance ([40]), coaching, twinning, exchanges, networking). New business models are designed to create start-up companies and develop innovative bio-based value chains that bring benefits to all actors, from feedstock providers through to consumers.

As regards to biomass and minerals, CBE will continue with good practice of BBI to focus on European biomass and feedstock.. From the recent analytical work on transition processes (OECD, EEA) it is apparent that the bioeconomy transition will most likely happen as emergence of a growing number of bioeconomy regions or regional bio-based industrial clusters. The peculiarity of the bio-based industry is that it depends on biomass feedstock that is often specific to a region. Biomass is bulky and sometimes perishable. Therefore it cannot always be transported over long distances at reasonable cost ([41]). Each region has specific sources of biomass (agriculture, forestry, fisheries, side streams, waste, food waste, municipal waste, waste water, etc.), which require different organisational and technological solutions, integration into different value chains, and a different set of stakeholders. Often whole value chains operate on a regional scale, especially in the case of high-volume and low-value bio-based products.

A related KPI can be the number of new well-established bio-based regions.

[40] Project development assistance has been identified as one of the key instruments to support the transition towards a circular bio-based economy and make it concrete, mainly at the regional and urban level. It aims to bridge the gap between policy strategies and real investments through supporting all activities necessary to prepare and mobilise investments into real projects.

[41] For example, in the large Porto Torres biorefinery on Sardinia it is only economically viable to bring biomass from within a maximum distance of 70 km – with the exception of sunflower oil produced on the Italian mainland.

Support market growth and the demand for bio-based products

All bio-based activities operate in a broader market and social context. The partnership needs to have an influence on markets including the financial market, the educational system and societal attitudes to be able to work within a more favourable environment that fully supports the bio-based systems development. Enabling or supporting measures to be implemented are for example networks, self-commitments and raising public awareness. The consumers' concerns and priorities should be dealt with at programming level already, including brand owners and consumer organisations to stimulate and enable consumers' input.

Related KPIs need to be developed.

Drive forward the transition towards a circular and sustainable bio-based economy

This specific objective is about valorising residues, side streams and biowaste including food waste, reducing landfill and incineration, producing in closed loops, reducing polluting effects and greenhouse-gas emissions due to nutrients, and fostering biodiversity and the environmental protection of water, air and soil, also providing durable land- and water-based carbon sink opportunities. This also includes the capture and use of CO_2 from emissions from bio-based processing into valuable chemicals, materials and products. The initiative will aim to contribute to the valorisation of residues, side streams and food waste in order to provide durable land and water-based carbon sink opportunities. It will also increase the actors' awareness of the environmental impact the bio-based industries have. Links will be made to ensuring food and nutrition security for a growing world population and at the same time meet the demand for sustainable products, through integrated, efficient production of food, feed, bio-based products, and services with minimal environmental impact – all fully in line with the Green Deal. The EU model for separate waste collection (as proposed in the Green Deal) will give support to the circular approach.

A related KPI could be formulated for greenhouse-gas reduction.

Foster and promote a favourable regulatory environment of bio-based solutions

All bio-based activities operate in a broader policy and legal context. A wide range of applicable policies (agriculture, waste, industry, fertilisers, chemicals, etc.) at EU, national and regional level lead to a complex and sometimes fragmented policy environment. By working also on regulatory issues, the partnership will give input into discussions on policies and standards towards a more coherent, supportive and stable environment that fully supports the bio-based systems development. Strong measures could be implemented to advance the bio-based economy, such as a fossil carbon tax, CO_2 tax, quotas, tax credits, abolishing fossil subsidies, and mandates and bans. However, these measures are difficult to implement in the near future under the prevailing public, political and industrial conditions. Other measures, which can be considered enablers or supporters but have less impact, can be implemented comparatively easily (e.g. certificates and labels). This specific objective particularly relates to substantiating green claims as mentioned in the Green Deal.

To deliver on the general and specific mid- and long-term objectives the CBE partnership is envisaged to achieve several **operational objectives** in the short term. *Figure 4* below shows how these objectives connect to the standard types of activities, and how they can feed into the specific and general objectives. It also shows activities going beyond R&I that can be implemented under Horizon Europe. This reflects the definition of European Partnerships in the Horizon Europe regulation as initiatives where the Union and its partners "commit to jointly

support the development and implementation of a programme of research and innovation activities, including those related to market, regulatory or policy uptake."

Figure 4: Objectives of the initiative on Circular Bio-based Economy

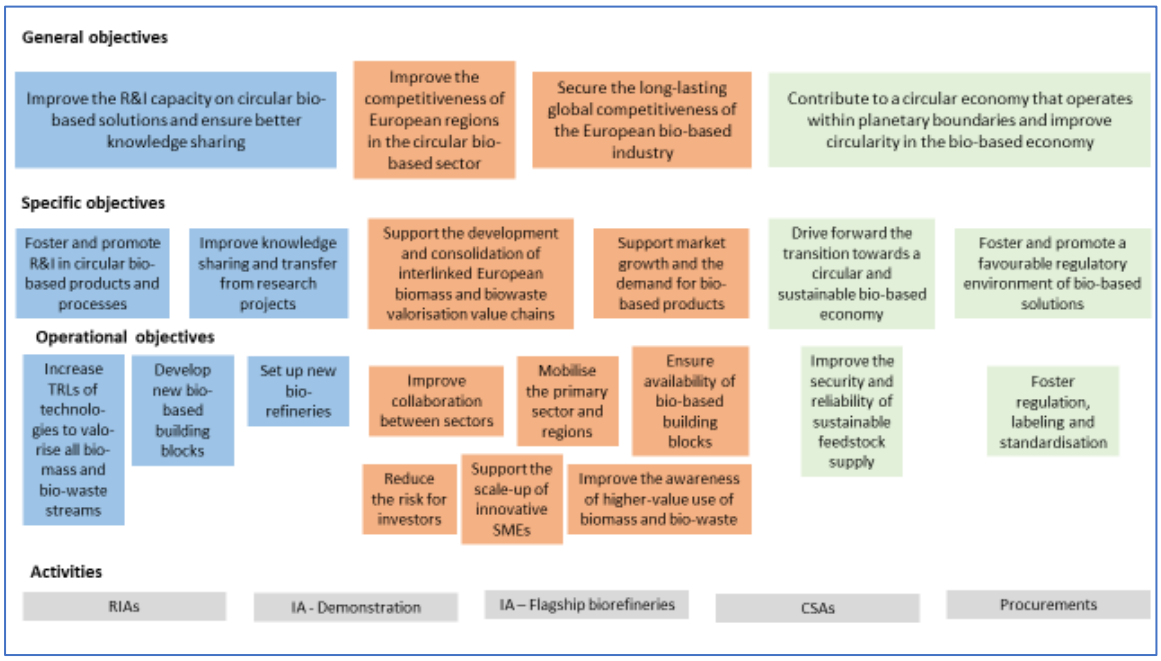


Table 1 below suggests a number of **key monitoring/performance indicators** (KPI) for tracking the progress of the initiative towards its targeted impacts in addition to the ones identified for the Horizon Europe key impact pathways. It intends to reflect on the impact pathways set out earlier and the operational objectives defined above, and add partnership-specific indicators if not already covered. Short-term effects (outputs) relate to the operational objectives, medium-term effects (results) to specific objectives, and long-term impacts to general objectives. This rather long list will be shortened and finetuned in the SIRA.

Table 1: Monitoring indicators in addition to the Horizon Europe key impact pathway indicators

	Short-term (typically as of year 1+)	**Medium-term (typically as of year 3+)**	**Long-term (typically as of year 5+)**
Scientific impact	N of scientific publications from CBE projects	N of patents from CBE projects N of CBE projects with new technologies demonstrated	N of technologies and products patented or demonstrated in CBE that reached the market and have been commercialised Scientific performance of the EU increases in international statistics on bio-based and circular economy
Technological / economic impact	N of new circular bio-based building blocks identified N of new circular bio-based value-chains created N of new biorefineries set up N of new circular bio-based products created	N of jobs created as a result of the new value chains, technologies and (commercialised) products Value added created as a result of the new value chains, technologies and (commercialised) products	Economic performance indicators (turnover, export, etc.) of the EU increases in international statistics on bio-based and circular economy or products Performance of the EU on sustainable biomass

	Short-term (typically as of year 1+)	Medium-term (typically as of year 3+)	Long-term (typically as of year 5+)
	N of new feedstock suppliers engaged in projects or new value chains N of new cross-sectoral collaborations	N / % of regions with new building blocks, value chains, biorefineries and products	production and sustainable use of bio-waste improved. Investments in the EU of in the circular bio-based industry increased
Societal impact	N of feedstock suppliers reached by information campaigns on opportunities of the bio-based and circular economy N of new feedstock suppliers in CBE projects N of SMEs engaging in CBE projects N of activities on streamlining regulations, standards and certifications	N of new feedstock suppliers engaged in new value chains N of regulations, standards and certifications schemes improved by CBE results, tested and/or launched	Global performance of the EU in creation of high-quality jobs in the circular bio-based economy increased Increased income of primary producers active in the circular bio-based sector
Environ-mental impact	New ways of bio-waste valorisation (or diversion from discard) introduced New ways to avoid CO_2 emissions avoidance or new carbon sink functions More efficient biomass use processes introduced Sustainable primary production practices introduced as parts of new value chains	Tons of biomass waste valorised of diverted from discard Tons of CO_2 emissions avoided or sunk Change (%) in efficiency of biomass use per ton of bio-based product Square km of land on which sustainable agricultural or forestry practice is envisaged to be introduced as part of new value chains	Diffusion of sustainable practices on biomass and waste valorisation beyond CBE projects National and regional climate neutrality improved Circular economy targets approached Biodiversity enhancement observed as a result of sustainable biomass supply to bio-based value chains Ecosystem services improved or emerged as a result of sustainable biomass supply to bio-based value chains

The partnership does not cover value chains that lead to bioenergy and biofuels as main products. The focus is on applications with an added value that is greater than the added value the feedstock would have if used for energy or heating. However, the partnership does cover value chains in which, in a cascading approach, residual amounts of the feedstock are turned into bioenergy, if possible used as input into the process. The partnership neither covers value chains that are only circular but not bio-based, such as circular approaches to metals.

2.2.3 Differences with BBI JU

The area covered, the objectives and the expected impacts go beyond those of the running BBI Initiative, namely those relating to circularity, nutrients, biodiversity, ecosystems, the regional level, recommendations on policy, and the engagement of public authorities. In addition, learning from the challenges faced in implementing the BBI JU, the following changes will have to be implemented:

- The initiative needs to broaden the scope of its activities and strengthen synergies, while enlarging the range of actively involved stakeholders.

- The private partner of CBE should include representatives of all bio-based economy actors.
- BIC's industry members should interact more with other actors in the value chains and help to develop a favourable ecosystem for the bio-based industry.
- In particular, primary producers such as farmers, foresters, fishermen and producers of biomass from aqueous environments need to be better represented by involving their representatives as partners. In addition, one could reflect about involving representatives of municipalities and waste collectors (as partners or in specific fora).
- A more balanced decision making process would be needed where diverse stakeholder voices, also from outside the industry, are heard and considered in shaping the research agenda. Better synergies with national and regional developments have to be built up, by involved regional authorities in the partnership and its governance.
- The partnership's environmental and socio-economic impact has to be measured at project level constantly and not only ex post.
- The KPIs have to be assessed more accurately beforehand to reflect better what can be reached by the initiative, and the corporate IT tools need to accommodate for such reporting.
- Biodiversity could be mentioned as one of the objectives of the partnership, which could lead to involving more biodiversity specialists in the governance of the partnership, for example in the scientific committee.
- A system has to be put in place to ensure that a situation is avoided in the future in which the private members are unable to fulfil their obligation related to financial contributions. Given the revised Model Finance Regulation, there should be a clear understanding with partners from the very beginning that they have sustainable and reliable long-term sources that will allow them to contribute financially to the administrative costs of the new partnership.
- The complicated way of reporting the private partner's in-kind contributions to operational and additional costs has to be simplified significantly.

2.2.4 Links with other partnership candidates and other Union programmes

Within Horizon Europe, links have been identified with Cluster 4 'Digital, industry and space' and Cluster 5 'Climate, energy and mobility'. There are also links with possible **mission areas** (adaptation to climate change including societal transformation; healthy oceans, seas, coastal and inland waters; climate-neutral and smart cities; soil health and food) and with potential **partnerships** (Safe and Sustainable Food System for People, Planet & Climate; Carbon Neutral and Circular Industry; Rescuing Biodiversity; Water4All). CBE could also have synergies with the four EIT-KICs Food, Climate, Raw Materials, and Manufacturing.

Another link is with the European Innovation Partnership for Agricultural Productivity and Sustainability (EIP AGRI), which brings together innovation actors (farmers, advisers, researchers, businesses, NGOs and others) in agriculture and forestry, at EU level. Together they form an EU-wide EIP network that can collaborate with the industry to mobilise and organise farmers and foresters in such a way that they can more easily participate as partners in the new biobased value chains. Discussions between BIC and DG AGRI are ongoing to analyse how this could be practically done.

Other links in terms of funding exist with the EU regional policies and their instruments (e.g. the European Structural and Investment Funds (ESIF)), the Programme for Environment and Climate Action (LIFE), the Invest EU programme, the EU Emission Trading System Innovation Fund (EU ETS IF), and the European Circular Bioeconomy Fund (ECBF).

For CBE to be successful it will require further awareness-raising of the availability of the different funding sources, a "one-stop" contact point interested parties and as well as the

possibility to combine (more easily) different funding sources. R&I investments overall necessary to achieve the specific objectives, contributions by partners and other sources (additionality, possible quantitative direct and indirect leverage effects).

Leverage will be created by the partnership through an active network of industries and public authorities leading to the implementation of innovative value chains and investments in Europe. It also stimulates deployment and de-risks investments. It facilitates private investments to realise bio-based operations at commercial level, making products that meet the objectives set forth in the long-term strategic agenda. The leverage is therefore not only to be measured in terms of contributions to projects of the partnership (both private and public), but also via private investments in the sector not directly linked to the projects.

For the period from 2021 to 2027, investments of about EUR 3 billion in the sector will be needed. Supposing that EUR 1 billion is brought up from the budget of Horizon Europe[42], the private partner will need to bring up EUR 2 billion, mainly as in-kind contributions to operational and additional activities. Other investments cannot be quantified here, such as the amounts to be brought up by Members States and especially regions.

2.2.5 Triggering transformational changes in the broader research and innovation ecosystem (qualitative impacts) at national and/or sectorial level

Beyond the planned R&I activities, and without pre-empting the SIRA (still to be agreed between the private partner and the EC), the proposed partnership includes work at national and regional level with European biomass producers and processors, as well as work on making the societal transformation happen. Often whole value chains operate on a regional scale, especially in the case of high-volume and low-value bio-based products. Therefore, the goal of driving the bio-based transition can be best achieved by supporting the emergence of bio-based regions and industrial clusters. For example, the development of regional-specific policies and roadmaps can be supported, taking into account the EU sustainability objectives, local strengths and opportunities. However, the process of transition needs to remain inclusive and linked with innovation and European cooperation. Setting up a biorefinery demands large financial efforts. Therefore, the partnership should build pipelines for projects that can apply for financial instruments (EIC, EU Invest) or structural funds. If possible, the partnership will directly involve investors to the largest extent possible. The partnership will also be active in improving the perception and driving the acceptance of bio-based products by consumers. In addition, pre- and co-normative research needs to be done to develop and promote standards, labels and the market-uptake of bio-based products where needed[43]. Communication activities will make known the work done in the partnership.

2.2.6 Exit strategy and measures for phasing-out from the Framework Programme funding

By 2030 the bio-based industry and innovative value chains should be able to develop and deploy without further support of a public-private partnership. This means that the investments are considered less risky and most of them bankable, that the awareness of cross-sectoral collaboration is seen as advantageous, that there are sufficient alternative sources of financing and funding, and that the legal and regulatory framework is in place without severe hurdles. To reach all this, other actions will be needed during the timeframe of CBE, such as the

[42] The proposed Union contribution to European Partnerships wil only be determined after political agreement on the next Multiannual Financial Framework.

[43] https://www.researchgate.net/publication/319999851_Overview_of_policies_standards_and_certifications_supporting_the_European_bio-based_economy

development of alternative sources of funding and financing. BIC commits itself to setting up a digital regional platform (together with regions, and private and public financing organisations) to support excellent projects and investments. This platform will be launched in 2020 between BIC members and the regions as a start ([44]); other stakeholders such as the EIB, EBRD and private banks will be added at a later stage. In addition, already during the duration of CBE, synergies will be developed with other EU financing instruments (under Horizon Europe or else), such as InvestEU, the European Circular Bioeconomy Fund (ECBF) ([45]) and the Connecting Europe Facility (CEF) ([46]). Starting in 2021, BIC will organise an annual "European Bioeconomy B2B Convention", a major partnering event for the industry that brings together different sectors and enables the creation of collaborations and new value chains. Moreover, in the field of education, BIC will continue organising the Biobased Innovation Student Challenge Europe, which gives students the opportunity to explore the bio-based field ([47]). In addition, BIC will become a partner in the Marie Skłodowska-Curie COFUND PhD programme for the bioeconomy.

Appropriate measures ensuring the phasing-out of Framework Programme funding as a partnership will be taken without prejudice to possible continued transnational funding by national or other Union programmes, and without prejudice to private investment and on-going projects. With the last call likely to be published in 2027, project implementation is expected to run until 2032. However, as it does not make sense to have a full-fledged joint undertaking run until the last project has received its final payment, the CBE JU shall be wound up already by the end of 2030. In addition to this, a winding-up procedure shall be automatically triggered if the Union or all members other than the Union withdraw from the JU. When the CBE JU is being wound up, its assets shall be used to cover its liabilities and the expenditure relating to its winding-up. Any surplus shall be distributed among the members at the time of the winding-up in proportion to their financial contribution to the CBE JU. Any such surplus distributed to the Union shall be returned to the Union budget.

2.2.7 Expected impacts

The Union's investment in the proposed partnership would contribute to all of the expected impacts described in the inception impact assessment. The main overall task would be to deploy circular bio-based systems at regional and local level with improved environmental, social and economic impacts, also in so far underrepresented countries, most of which are EU-13. CBE will be key to develop and scale up sustainable bio-based solutions to tackle society's major challenges. BIC's 2019 vision mentioned earlier ([36]) describes a sustainable and competitive bio-based industry in the EU enabling a circular bio-society by 2050 as the main impact.

Most of the impacts follow the formulation of the objectives of Horizon Europe. The contribution to the SDGs ([39]) will follow the principles of the Agenda 2030 and the Paris Agreement. They will be implemented at the level of the strategic objectives of the partnership down to project level (selection, performance measurement).

The overall **scientific and technological impact** will be to put the EU at the forefront of R&I in bio-based solutions and technology. This will be made possible by more critical R&I mass for the development of technologies and solutions, and via creating a higher capacity for the uptake of research results in innovative products. Strengthening the knowledge transfer

[44] https://www.bioeconomy-regions.eu/
[45] ECBF is a dedicated 250-million fund to invest via equity in the circular and bio-based industries at TRL 6-9 in Europe. https://www.ecbf.vc/about
[46] CEF is an EU funding instrument for targeted infrastructure investment at European level, supporting the development of high-performing, sustainable and efficiently interconnected trans-European networks in the fields of transport, energy and digital services. https://ec.europa.eu/inea/en/connecting-europe-facility
[47] http://www.bisc-e.eu/images/eufinal.pdf

between and within knowledge chains will lead to more uptake of research results in commercialised products and processes. This will stimulate an innovative and effective use of biomass, and the chemical complexity of biomass and waste will be exploited through a cascading use of feedstock via extracting and producing different chemical building blocks (platform molecules) or materials (e.g. cellulose, proteins, nutrients).

The overall **economic impact** is an enhanced competitiveness of the European bio-based industry, reached by fostering all forms of innovation, facilitating technological development, demonstration and knowledge and technology transfer, strengthening deployment and exploitation of innovative solutions. A more rapid uptake of both technical and systemic innovations will be ensured through supporting the access to and taking up innovative solutions in European industry, notably in SMEs, made possible via the engagement of all necessary stakeholders along value chains and around local circular bio-based systems. All actors in the bio-based economy will be in a position to make economic benefits in order to achieve a balanced regional and local development. The potential of the circular bio-based economy will be boosted to create long-term growth and jobs in Europe, stronger leverage of investments, and the engagement and commitment of relevant actors in the long term. This will all lead to keeping innovation in Europe to support the strengthening of primary production and the renewal of the EU's industrial base. 300 biorefineries could be created and deployed in the EU by 2030 ([48]). The overall economic impact thus comprises contributing to SDGs 8 and 9.

One important **societal impact** is a more rapid awareness, acceptance and uptake of both technical and systemic innovations, through supporting the access to and taking up innovative solutions in the European society. This will help generating fair revenues and diversification for primary biomass producers. Additional opportunities in rural and coastal areas will be created, which empower local communities to manage their local natural resources, and create a new manufacturing base linking R&D activities to local/regional production. One million new direct and indirect jobs could be created in bio-based industries by 2030 ([49]), supporting rural regeneration by re-industrialisation. Other impacts are a higher engagement of public authorities as key actors in the deployment of innovative circular bio-based systems, and the raised awareness of civil society, such as consumers and non-governmental organisations. The societal impact thus contributes to SDGs 2, 8, 10, 11, 12, 14 and 15.

Due to their large importance for the CBE partnership, its **environmental impacts** are described here separately and not as part of the societal impact. CBE will deliver on the Union strategic priorities on the environment and contribute to the realisation of EU objectives and policies in this field:

Overall, the European bio-based industries will be characterised by an enhanced circularity and environmental sustainability, which in the end leads to making the EU economy as a whole increasingly circular and environmentally sustainable, with a large impact on climate change mitigation and adaptation. This can be done via developing and contributing to climate-neutral production processes. It will make the EU less dependent on fossil resources where carbon is needed for non-energy purposes, and make the EU less dependent on imported protein and minerals. CBE will contribute to preserving Europe's natural environment and to limiting the impacts of industrial and agricultural activities within safe planetary boundaries. Greenhouse-gas emissions will be reduced by increasing carbon (and greenhouse gas) sinks and substituting fossil and mineral materials, thereby fulfilling EU obligations under the Paris Agreement by

[48] Current estimates based on OECD, Meeting Policy Challenges for a Sustainable Bioeconomy, 2018, ISBN 9789264292375; BIO-TIC, A roadmap to a thriving industrial biotechnology sector in Europe, 2015.

[49] The strong and fast-growing startup ecosystem in the biotechnology sector will play a leading role in the realising of this potential. EuropaBio Report, Jobs and growth generated by Industrial biotechnology in Europe, 09.2016

contributing to the EU's nationally determined contributions (NDC; [50]) to reduce greenhouse gas emissions by at least 40% by 2030 compared to 1990. For example, the implementation of the bioeconomy strategy could save between 1-2.5 billion tonnes of CO_2 equivalents every year by 2030 ([51]), which is equal to emissions from 490 million cars. The improved and more sustainable biomass production will help avoid over-extracting biomass from the natural environment, unsustainable land-use changes, and conflicts with food production. At the same time, this will preserve and restore ecosystems, biodiversity and ecosystem services. Circularity of production will be increased by valorising bio-waste and closed-loop production, leading to a reduction of the problem of biowaste in cities, both from the industry and from households, and to reduced landfilling. CBE will improve the resource efficiency of many value chains, for example through the recovery of nutrients for agriculture and forestry from waste, waste water and agricultural residues. 40-45% of the demand of mineral fertilisers could be supplied by recycled ones by 2030 ([52]). Properly managing agricultural activities within safe planetary boundaries will reduce excess nitrogen and phosphorus flows and their polluting effects, thereby fostering the environmental protection of water, air and soil. CBE will contribute to achieving land degradation neutrality by 2030 aspecific target of this ambition will be defined in the KPIs. The environmental impact thus contributes to SDGs 2, 13, 14 and 15.

A range of impacts go beyond those of the running BBI Initiative, namely those relating to circularity, nutrients, biodiversity, ecosystems, the regional level, and the engagement of public authorities.

Links have been identified with possible **mission areas** (adaptation to climate change including societal transformation; healthy oceans, seas, coastal and inland waters; climate-neutral and smart cities; soil health and food) and with potential **partnerships** (Safe and Sustainable Food System for People, Planet & Climate; Carbon Neutral and Circular Industry). CBE could also have synergies with the three EIT-KICs Food, Raw Materials, and Manufacturing.

2.3 Necessity for a European Partnership

The proposal for Horizon Europe, in the version of the political agreement between the Council and European Parliament, outlines the approach (Article 8), areas (Article 8.a) and criteria (Annex III) for R&I partnerships. The general objective of Horizon Europe ([53]) is fully addressed by the proposed partnership, as can be deduced from chapters 2.2 (Impact) of the present document. The proposed partnership also addresses most of the specific objectives of Horizon Europe ([54]). The details are not repeated here.

[50] NDCs are national climate plans highlighting climate actions, including climate related targets, policies and measures governments aims to implement in response to climate change and as a contribution to global climate action.

[51] OECD, (2011), 'Industrial biotechnology and climate change. Opportunities and challenges'; EuropaBio (2018) Industrial biotechnology – Contributing towards achieving the UN global Sustainable Development Goals.

[52] NPK (Nitrogen, phosphorus and potassium) Interreg Project Phos4You; Verstraete, W. et al., 2009 Bioresource Technology Volume 100, Issue 23; https://www.susfert.eu/wp-content/uploads/2018/09/SUSFERT_presentation.pdf

[53] (Article 3 (1)): "The Programme's general objective is to deliver scientific, technological, economic and societal impact from the Union's investments in research and innovation so as to strengthen the scientific and technological bases of the Union and foster its competitiveness in all Member States including in its industry, deliver on the Union strategic priorities and contribute to the realisation of EU objectives and policies, contribute to tackling global challenges, including the Sustainable Development Goals by following the principles of the Agenda 2030 and the Paris Agreement, and to strengthen the European Research Area. The Programme shall thus maximise Union added value by focusing on objectives and activities that cannot be effectively realised by Member States acting alone, but in cooperation."

[54] (Article 3 (2)):

The partnership aims to tackle long-term challenges that go beyond the capacity of a single company, industry sector, Member State or civil society actor. An action at EU level will enable the entire bio-based sector to collectively build on the foundations provided by assets, strengths and skills available at national and regional level.

- Biomass, waste and waste-water sludge are scattered, variable and seasonal. Furthermore, they are a resource with a number of competing uses, as well as fossil and mineral resources. An EU rather than local or MS approach will result in a systemic understanding of the resource variability and flows, thus reducing the uncertainty around feedstock availability and costs.
- Flagship and first-of-its-kind biorefinery plants require costly demonstration. The demonstration and deployment of small and large biorefineries is a high-risk and capital-intensive exercise that will take advantage from cross-border and cross-sector collaboration and investment at European scale. Implementing innovation activities at high Technology Readiness Levels (TRL 6 to 8) requires strong involvement levels of all players of the value chain – from primary producers over industry to brand owners – which are normally not achievable under standard collaborative research, but only via a partnership as shown by BBI JU. This is why the European Green Deal and the updated bioeconomy strategy have been calling for a partnership on a circular bio-based Europe.
- The deployment of circular bio-based systems at local/regional scale, involving all levels of stakeholders and addressing technical, policy, regulatory, social, behavioural and economic aspects requires an integrated approach, underpinned by a strategy at European scale. This will also allow for replicating demonstration activities throughout Europe that have been developed within the partnership.
- Densely forested countries and highly productive agricultural regions would be linked to industrial centres in Europe to generate new value through the development of integrated sustainable value chains. Local authorities need links with industries and support by regions to solve their waste problems in a sustainable way that leads to added economic value. A large majority of participants in the online public consultation on the CBE initiative were favourable to an EU-level intervention.
- The bio-based sector forms part of a wide range of policies ([55]), already being dealt with at EU level, leading to a complex and sometimes fragmented policy environment. Action at EU level on the bio-based sector will help to rationalise and overcome the fragmented policy framework.

The partnership will support R&I within the scientific and industrial communities and assist relevant actors on the ground (Member States, regional and local authorities, biomass primary

(a) to develop, promote and advance scientific excellence, support the creation and diffusion of high-quality new fundamental and applied knowledge, skills, technologies and solutions, training and mobility of researchers, attract talent at all levels and contribute to full engagement of Union's talent pool in actions supported under this Programme;
(b) to generate knowledge, strengthen the impact of research and innovation in developing, supporting and implementing Union policies and support the access to and uptake of innovative solutions in European industry, notably in SMEs, and society to address global challenges, including climate change and the Sustainable Development Goals;
(c) to foster all forms of innovation, facilitate technological development, demonstration and knowledge and technology transfer, strengthen deployment and exploitation of innovative solutions;
(d) to optimise the Programme's delivery for strengthening and increasing the impact and attractiveness of the European Research Area, to foster the excellence-based participations from all Member States, including low R&I performing Member States, in Horizon Europe and to facilitate collaborative links in European research and innovation.

[55] E.g. the bioeconomy strategy, the circular economy strategy, the common agricultural policy, the rural development policy, the climate change policy including the Paris agreement, the renewed industrial policy strategy and the UN sustainable development goals.

producers, the private sector and wider public) to align strategies and visions, and engage in cross-border, cross-sector, interdisciplinary R&I, thus achieving the policy objectives in a more efficient, coherent and impactful way.

The constructive collaboration with Member States via an advisory group (the States Representatives Group of the BBI JU) should be continued. SRG members are pro-actively involved in the development of the vision, the SIRA and the annual work programmes. They should continue to collaborate with the private partner in projects (e.g. setting up digital platform for regions, developing specific country reports for central and eastern Europe, organisation of round table in specific countries, visiting possible stakeholders/companies).

A good collaboration with the SRG members will be crucial, especially to give an answer to their wish to strengthen the following aspects in the potential partnership: more emphasis to the local production of biomass; opportunities for the development of local small-scale technological solutions for rural regions; growth in rural and coastal areas that are rich in natural resources; clusters that can benefit from industrial symbiosis.

In order to make a link to smart specialisation and structural funds, a deployment committee should be set up that combines regions (via existing organisations and initiatives) and Member States that support bioeconomy-related activities on smart specialisation and other financial instruments, as well as investors.

2.4 Partner composition and target group

The Bio-based industries Consortium (BIC) – the member other than the Union of the BBI JU – is already very representative of the bio-based sector as a whole, with 250 members from across the value chains, including agricultural and forestry cooperatives, and over 80% SMEs. BIC has also got over 150 associate members, including the R&D community ([56]).

As it looks now, BIC is going to be the member other than the Union in the partnership. At present, CBE is not building upon any other existing groupings. However, the Commission expects BIC to broaden its membership to cope with the broader scope and objectives of CBE. In a wider circle, 15 associations in the sector ([35]) have already taken part in the discussions on the vision and the SIRA.

Given that the bio-based sector is a truly multi-sectoral segment of the bioeconomy, the partnering approach will need to evolve to become **systemic, reaching beyond a mainly industrial interlocutor**. The private partners must have the capacity to represent the bio-based industries as a whole, including forest-based, agriculture, food industry, marine-based, processors of bio-waste, waste water and other biological components, textile, cosmetics, packaging, construction, chemical or biotechnology, both separate companies and clusters, with a view to benefitting from industrial symbiosis. In addition, the approach of broadening and regionalising the partnership should be mirrored by the membership and organisational structure of the private partner, which should thus also have members representing primary production, regions and municipalities, and investors.

It is paramount to actively engage additional **key actors** in a more participative way: the primary producers of biological resources from land and sea (farmers, land and forest owners, fishermen, etc.); waste operators (cities or regional authorities), additional end users (brand owners, consumers); and public authorities managing local and regional development and environmental protection. This is particularly relevant for the local production of biomass, and

[56] An overview of BIC's current membership, including information about the type of membership (industry or associate, the industrial sector, large or SME …) is available athttps://biconsortium.eu/sites/biconsortium.eu/files/documents/BIC%20members%20list%20January%202020.pdf.

in order to contribute to increased sustainability and resilience of the activities of primary producers. Biorefineries can have all sizes, and a biorefinery can be equally installed by a large multinational corporation, a local midcap company or by a farmer. There are investment opportunities for both locally operating investors and large international institutional investors through their local branches and intermediated operations. Companies will never be discouraged from becoming a member and playing an active role in the partnership.

On the **public side**, there is a need to develop a deep and coherent engagement with Member States across the EU and public authorities at regional and local levels, helping ensure a balanced and active stakeholder participation. This includes funding or implementing bodies responsible for programmes and funds related to research, innovation, deployment and macro-regional, regional and urban initiatives, protection of climate and the environment. Circular bio-based value chains need to funded on inclusive patterns with different actors participating in the creation of value, maximising positive societal, environmental and climate impact, thus, the need to include also civil society and non-governmental organisations.

The **scientific community** is essential for addressing knowledge gaps in technological developments as well as in environmental science, social science and economics to promote behavioural change and support a just transition.

The EU, having proactively invested early in a highly efficient and sustainable biomass production for food, feed and bio-based products, is the global hub for bio-based industrial investment and the international reference point for the circular bioeconomy. A few international partners and stakeholders have been involved in defining the SIRA and the AWP as members of BIC – showing the interest the bio-based partnership has attracted also beyond Europe ([57]). Specific activities on international cooperation are not envisaged under CBE; however organisations from third countries are able to participate in open calls as laid down in the Horizon Europe rules for participation. They might also be involved better in a more open programming strategy. The international dimension of CBE can be broadened during implementation if specific developments point at this and no specific strategic needs at European level restrict it.

[57] E.g. from JapanBrazil and USA…

3 Planned Implementation

The implementation of the initiative via a European partnership, be it pursuant to Article 187 TFEU or co-programmed, is necessary to enable the different actors of this truly multi-sectoral sector to address its objectives in a more efficient, coherent and impactful way. The chosen implementation mode must favour the openness of the initiative and the coherent engagement with Member States, regional authorities, cities, consumers and civil society. It should also allow for the necessary flexibility in programming and priority setting, while leveraging private investment from a broad range of stakeholders. Whichever instrument is selected, the programming process involving the EC and the partner(s) needs good EC policy calibration in an industry-led process, ensuing also work at low TRLs.

The initiative will fund dedicated projects focusing on the development of new processes, technological solutions and concepts, which will aim at substituting fossil-based products with renewable and waste-based products. The initiative is also expected to be a forum that ensures, as concretely and operationally as possible, an ongoing reflection on new emerging technological trends and new sub-areas for scientific research and development. The partnership would build on the experiences on the current BBI JU, but would also address some of the challenges that the BBI JU has faced over the past years: the better involvement of primary producers, regional authorities and investors.

Two options for partnerships are possible according to BIC and the Commission and have been discussed in the impact assessment, together with the baseline option of traditional calls.

CBE as an institutionalised partnership (Option 3 of the impact assessment) would be set up via a Council Regulation. The Commission as the only public partner and one single private partner ("a new BIC" for the time being) would be kept as in BBI JU. A scientific committee and a state representatives group would continue to advise the Governing Board of the partnership.

CBE as a co-programmed partnership (Option 1 of the impact assessment) would be based on the formal commitment of partners to deliver within their capacities on the common objective. The Commission as the only public partner and one single private partner (BIC for the time being) would be kept as in BBI JU.

3.1 Activities

The partnership supports sustainability-driven innovation for new local value-creation from European waste and biomass, driving sustainable, resource-efficient and climate-neutral solutions towards a healthier planet, replacing non-renewable fossil and mineral resources by biomass and waste for renewable products and nutrients.

The main activities will be financial support to research and technology development, via **open calls for proposals** and procurement for studies ([58]). Actions types will be coordination and support actions (CSA) ([59]), research and innovation actions (RIA) ([60]) and innovation actions

[58] As requested by the MS, there will be no general ring-fencing of (part of) call budgets for members. However, if during implementation there is a clearly justified need to address specific topics with a focused target group, it will be possible to use the Horizon Europe provisions and include a limitation for participation or funding at the level of individual call topics.

[59] Common Understanding on the Proposal for a Regulation of the European Parliament and of the Council establishing Horizon Europe – the Framework Programme for Research and Innovation, laying down its rules for participation and dissemination, Article 2 (25h): "'coordination and support action' means an action contributing to the objectives of the Programme, excluding research and innovation activities, …"

[60] See Common Understanding, Article 2 (25aa): "'research and innovation action' means an action primarily consisting of activities aiming to establish new knowledge and/or to explore the feasibility of a new or improved

(IA) ([61]), with [COM: a balance between lower and higher TRLs / BIC: majority for higher TRLs] and covering the whole value chain. All TRL levels up to 8 will be covered in Pillar II of Horizon Europe without prejudice to Union competition law ([62]). Thus both demonstration actions and flagship actions can run as innovation actions in normal calls. In no way non-members will be obligatorily "taxed" or penalised, and any negative effects on the attractiveness of the initiative to members, non-members and newcomers will be avoided.

The **R&I activities** of the proposed partnership have to be considered against the background of the specific objectives of fostering and promoting R&I in circular bio-based products and processes, and improving the knowledge sharing and transfer from research projects. They will give strong support to the development and consolidation of interlinked European biomass and biowaste valorisation value chains, and drive forward the transition towards a circular and sustainable bio-based economy.

Without pre-empting the SIRA (still to be agreed between the private partner and the EC), the R&I activities of the proposed partnership may include: developing, testing and disseminating solutions for resilient and sustainable biomass production and use in Europe; novel industrial biotechnologies and bioprocesses to enhance performances and reduce environmental impact of consumer products (e.g. detergents, pesticides, construction materials and textiles); promoting the recovery, recycling and sustainable management of nutrients; provision of environmental services (e.g. bioremediation, water sanitation). The partnership will work within the envisaged new standards for biodiversity, cutting across trade, industry, agriculture and economic policy. The solutions developed under the proposed partnership will result in keeping the value of biological resources in the economy for longer, i.e. by optimising product design, promoting reuse, repair and recycling patterns, implementing the principle of cascading use of biomass, and benefiting from the use of 'nature's assets', i.e. its functions and principles. The partnership will also carry out the pre-normative and co-normative research needed to develop the necessary quality standards for the products and processes ([63]), with the aims to support market growth and the demand for bio-based products, and to help authorities build up a favourable regulatory environment for the circular bio-based sector.

Communication and dissemination activities, e.g. publications, social media, conferences and other public events will make the results of the R&I work known. Beyond that the partnership should build pipelines for projects that can apply for financial instruments (EIC, EU Invest) or cohesion funds.

The standard mechanism of double-funding checks in accordance with Article 129 of the Financial Regulation (EU, Euratom) No 966/20122 for the actions that are proposed for funding (or are reserve-listed) will help ensure the complementarity of activities and avoid unnecessary duplications with other relevant initiatives of Horizon Europe, including with other relevant European Partnerships, missions and EU actions / initiatives beyond Horizon Europe.

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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."

[61] See Common Understanding, Article 2 (25b): "'innovation action' means an action primarily consisting of activities directly aimed at producing 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."

[62] Partial General Approach on the Proposal for a Decision of the Council on establishing the specific programme implementing Horizon Europe – the Framework Programme for Research and Innovation, p.54.

[63] Pre-normative research is carried out to establish the validity and reliability of the subject matter to be standardised. Co-normative research is necessary to quantify the repeatability, reproducibility and uncertainty of the procedures that are incorporated in the standard.

Besides deploying R&I, support activities to regions and cities will also play an important role. The goal of driving the bio-based transition in regions can best be achieved by supporting the emergence of bio-based regions and industrial clusters, for example by supporting the development of regional-specific policies and roadmaps, taking into account the EU sustainability objectives, local strengths and opportunities. However, the process of transition needs to remain inclusive and linked with innovation and European cooperation.

There are clear **synergies** with the Common Agricultural Policy after 2020 including the European Innovation Partnership for Agricultural Productivity and Sustainability (EIP AGRI). Farmers and foresters are becoming strategic partners. This will help contribute to most of the proposed nine CAP objectives, such as: (2) to increase competitiveness; (4) climate change action; (8) vibrant rural areas; and (9) to protect food and health quality. As it covers nutrients for agriculture and forestry, the partnership will also contribute to the aims of the fertiliser regulation. Further synergies exist with the EU regional policies and their instruments (e.g. the European Structural and Investment Funds (ESIF)), the Programme for Environment and Climate Action (LIFE), the Invest EU programme, and the EU Emission Trading System Innovation Fund (EU ETS IF). Synergies between Horizon Europe and other Union programmes are indeed a priority in this Commission mandate. CBE could set up a 'one-stop' contact point for interested parties to make them aware of the availability of the different funding sources, and of the possibility to combine (more easily) different funding sources.

A new approach to manage nutrients within safe boundaries will be operationalised in geographically defined areas. It couples research, innovation, policy and implementation actions addressing the life cycle of nutrients to halt their harmful emissions into air, water and sensitive habitats. In this approach, compliance with existing environmental and climate targets will be pursued, directly delivering to the objectives of the European Green Deal on reducing greenhouse-gas emissions, zero pollution, biodiversity, farm to fork and circular economy. Key innovation actions will be developing safe nutrient cumulative flow budgets for regions, governance arrangements and industrial symbiosis, and importantly financial support for the development and deployment of technologies for safely recovering and recycling nutrients from human, animal and industrial waste flows and the application of these to soil to recover soil health.

The necessary work on policy will be done by the European Commission, via developing EU strategies and influencing EU legislation, and is thus not a specific task for the partnership itself. However, a potential lack of specific regional policy or roadmap development would represent a major risk of failure and malinvestment of EU funds.

3.2 Resources

A large range of options for the budget setup exist. All have to be based on the legal framework proposed under Horizon Europe as legal background, the lessons learned from Horizon 2020, and internal "political" guidelines given by the Commission hierarchy. These reflections will be subject to separate discussions between potential partners and Commission Services in the context of the possible preparation of a legislative proposal.

The financial resources from the European Union cannot be specified yet due to the missing agreement on the MFF 2021-2027. Resources will come from Horizon Europe, Cluster 6 "Food, bioeconomy, natural resources, agriculture and environment". The partners have not proposed yet any amount as an overall contribution either.

The type of resources contributed by the private side will be:

1. In-kind contributions to the funded projects (on the basis of non-reimbursed eligible costs), with lower funding rates for higher TRLs;

2. In-kind contribution for additional activities foreseen in the SRIA not covered by Union funding;
3. Investments in operational activities that are spend beyond the work that is foreseen in the SRIA;
4. Financial contribution to the administrative costs of the Joint Undertaking implementing the programme (only in case the option of an institutionalized Partnership based on Artciel 187 is choosen).

All commitments made by the partners will be made legally binding in the basic act and will lead to clear actions by the Commission if not followed up. The basic act will ensure that the private partners are able to fulfil their commitments.

BIC has originally suggested three options for the budget and commitment structure with figures. Calculations done by the Commission on these options lead to more or less the same results in terms of BIC contribution and leverage. Finally one specific proposal was proposed to analyse in more detail.

In this option, calls are fully open but for certain topics the industry members of the consortium have to be members of BIC or the JU. The commitment proposal is based on a Union budget of EUR 1 billion, and is taking into account the following conditions:

- The allocation of EU funding in the CBE: 20% for RIA & CSA; 45% for Demos; 35% for Flagships
- The applications of and following funding rates: 100% in RIA & CSA, 60% for all industry participants in IA (demo and flagship)

The commitment proposal also implies that a significant number of topics for IA will need to have an eligibility condition: the industry member(s) of the project consortium should be a member of BIC or of the CBE JU. This could be combined with a permanently open call for new JU members, without the need to be a BIC member, or this could be realised via a 2-steps evaluation procedure where the membership (BIC or CBE) could be a eligibility criteria for the second evaluation. This will guarantee industry participation & commitment in IA's (but fully open to BIC and non-BIC members)..

Under such conditions, BIC is able to commit to in-kind contributions of 50% of the EU contribution to the initiative[64], and additional activities of 150% of the EU contribution[65].

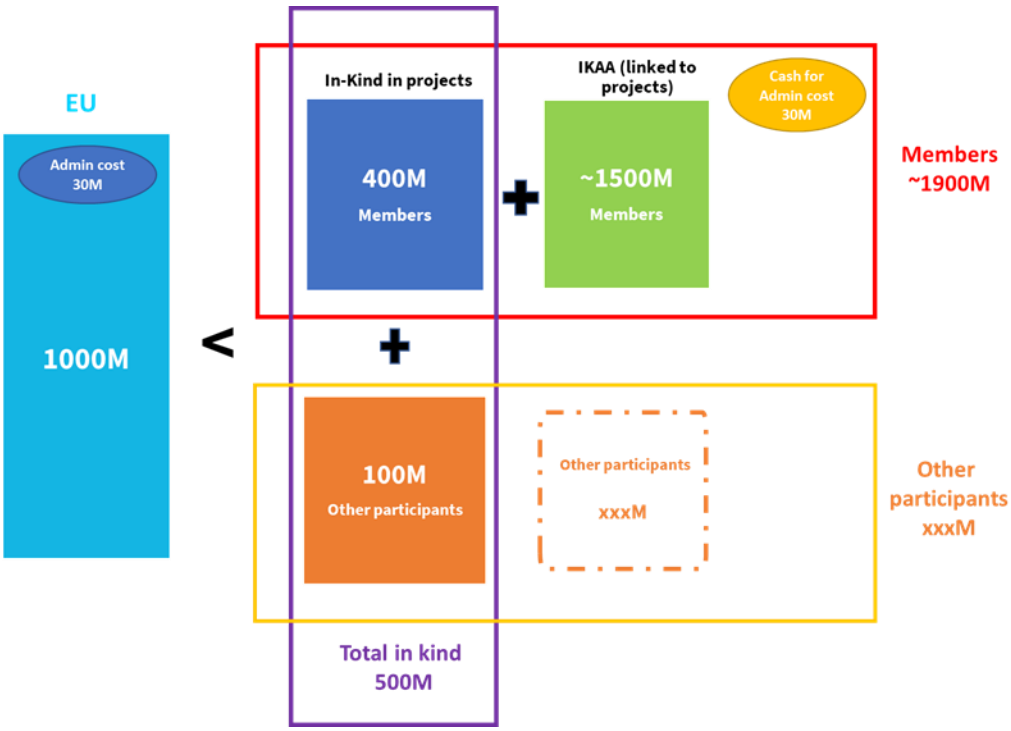
So in total, BIC is able to commit 200% of the EU contribution to the initiative, and a total leverage effect of over 200%[66].

This example is illustrating the current assumption, details for commitments and contributions are still subject to ongoing discussion between the private side and the European Commission.

[64] As an example, this means – with a EU contribution of 1 bn EUR - a commitment of 500 million EUR

[65] As an example, this means – with a EU contribution of 1 bn EUR - a commitment of 1.5 bn EUR

[66] As an example, this means – with a EU contribution of 1 bn EUR - a commitment of 2 bn EUR and a leverage effect >2 bn EUR



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Outside the narrow definition of the partner's contributions, **other investments** are needed for the take-up of results, particularly for setting up first-of-its kind biorefineries. For example, creating and deploying the full potential of 300 biorefineries by 2030 as described by the OECD ([67]) would go far beyond the potential of CBE: BBI has been contributing with EUR 227 m to the eleven flagship biorefineries being built up (calls 2014-2019), with total project costs of EUR 386 m and far higher costs for setting up the actual infrastructures. The total investment for the first nine flagships is 1.2bn EUR. Synergies should be found with EU regional policy, ESIF and other EU financing instruments (under Horizon Europe or else), such as InvestEU, the European Circular Bioeconomy Fund (ECBF) and the Connecting Europe Facility (CEF).

In addition, **framework conditions** need to be changed for the results to be taken up in the economy. As described as one of the societal specific objectives, CBE can only contribute with input into discussions of policies (agriculture, forestry, waste, industry, fertilisers, chemicals, etc.), standards and labels, but does not have a decisive influence on them.

3.3 Governance

The different options given below are based on the legal framework proposed under Horizon Europe, the lessons learned from Horizon 2020, and discussions among Commission services.

The objective is a more suitable governance with a streamlined membership structure across JUs, including clear processes for selecting new members where relevant, and a clear repartition of tasks between the GB and the ED.

Private partners contribute to the legal obligations set out in the basic act. Any application for membership shall be addressed to the GB, which will assess the relevance and their potential added value.

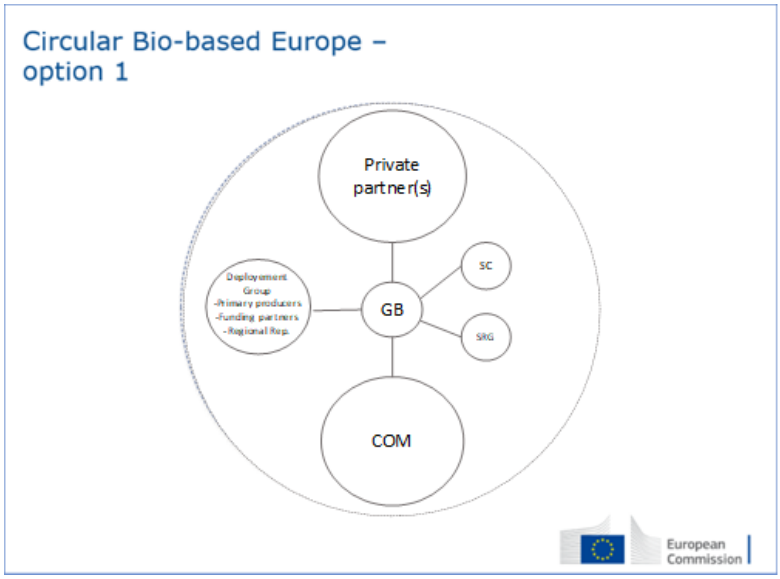
The possible JU bodies can be:

[67] Current estimates based on OECD, Meeting Policy Challenges for a Sustainable Bioeconomy, 2018, ISBN 9789264292375; BIO-TIC, A roadmap to a thriving industrial biotechnology sector in Europe, 2015.

- **Governing Board**:
    - Composition: representatives of the EC; representatives of the member other than the Union, including from SMEs; one representative each from the advisory groups (as observers); CEO level commitment and active role of CEOs in governance, in particular for strategic issues (less for operational issues).
    - Role: purely strategic; decisions on implementing rules to the Staff Regulations?
    - Voting rights: EU 50%; the partners other than the EU shall hold an equal number of votes; GB majority of at least 75% of all votes; GB (co-)chaired by EC and/or a rotating chair.
- **Executive Director and Programme Office**:
    - Tasks: Implementation as in BBI; delegated to carry out administrative tasks; decisions on implementing rules to the Staff Regulations.
- **Scientific Committee**: advisory function. Its main tasks should be to advise on the scientific priorities to be addressed in the SIRA and AWPs as well as on the scientific achievements described in the AAR.
- **States Representatives Group**: MS have an advisory function or re-defined cooperation and involvement. The SRG shall be consulted, review information and provide opinions on scientific orientations in the SIRA, annual work plans, involvement of SMEs, and links to other programmes. A stronger and clearer mandate for the SRG members is needed than in BBI, and their nomination process has to be harmonised and clear.
- **Group of Primary Producers**: advisory and mobilising function; provide input to the SIRA; advise on priorities for the annual work plans; mobilise their sector; establish and develop close and long-term cooperation between the Union, industry, primary producers of biomass, regional authorities and investors, and engage in information, communication, exploitation and dissemination activities. Additional mobilising role to gather their peers and make them aware of the opportunities the partnership can offer.
- **Deployment Group**: advisory and mobilising function; composed of industry actors, regional / local authorities and actors, and investors (**Error! Bookmark not defined.**); provide input to the SIRA; advise on priorities for the annual work plans; mobilise their sector; establish a coordinating mechanism to identify and remedy regulatory hurdles to commercialising bio-based products; establish and develop close and long-term cooperation between the Union, industry, primary producers of biomass, regional authorities and investors, and engage in information, communication, exploitation and dissemination activities.
- **Stakeholder Forum**: a possible way of involving more stakeholders in the call drafting
- For all bodies, tasks have to be defined in advance.

It remains to be seen how the additional three groups of non-industrial and support actors (primary producers, regional authorities, and investors) can be best involved. One way would to bring them in as an additional advisory group (*Figure 5*). Next to their advisory role, this body would have an additional mobilising role to gather their peers and make them aware of the opportunities the partnership can offer. In particular, this would help change the role of primary producers from simple providers of biomass into beneficiaries of the bio-based solutions, ensuring a more direct communication between them and the GB. The success of this model will probably depend on how big a part of the regional, primary and investor work CBE can cover. If it is a significant part, the CBE will become a driving force and it may be a viable model at least conceptually.

Figure 5: Governance with additional advisory groups



The structure shown would effectively help achieve the vision, as the different stakeholders (industry, Members States, regions, primary producers, investors) are all involved in the governance.

The newly proposed group is sometimes not yet well organised nor well informed about the possibilities to be involved in a European partnership. This issue is particularly crucial in the central, eastern and some southern European regions. Involving these groups requires an action plan that can lead the way to the creation of the primary producers group and the deployment group. This action plan needs to include preliminary measures that ensure the thorough mapping of stakeholders for each of the groups. It is important that the relevant stakeholders in the Member States and beyond are aware of the possibility to be represented or part of those groups, and for this a significant outreach exercise is needed. One of the ways to attract possible stakeholders is to organise workshops or info day events in Member States, together with a discussion about CBE and its mandate, objectives and challenges. These events could help identify possible areas for improvement as well as an occasion for the stakeholders to widen their horizons. Another way would be that BIC increases its range of members in line with section 2.4 already now, before launching the partnership.

The figure above envisage an institutionalised form with the GB in place, but this does not exclude the possibility to implement the programme in a co-programmed way. However, it remains to be seen whether also in a co-programmed partnership three advisory bodies (or their integration into the private partner would be feasible.

A number of activities will be outsourced to partners who may be in the best position (institutionally, financially and personally) to perform specific roles of supporters, facilitators, network secretariat and coordinators. A possible gap in the institutional structure could be filled in by contracting out certain tasks as a service to the Commission. DG RTD may support some individual partners in this partnership in an appropriate form through calls for proposals and procured service contracts under Cluster 6.

Several Commission services – represented by unit RTD.C.1 Circular Economy and Bio-based Systems as lead service – have been involved in discussing the setup of the potential future partnership from the outset. RTD.C.1 as leader, together with RTD.F, AGRI.B and GROW.D in the GB, have been active in overseeing the BBI JU and can make sure that the lessons learnt are applied for the new partnership, including defending the public interest. RTD.C.1 is also expected to overview the implementation of the new partnership.

3.4 Openness and transparency

As described in 2.2.1 Vision and SIRA, BIC has collaborated with 15 other associations ([35]) to develop a common vision of a circular bio-society in 2050, as an important step to keep the **partnership preparation open**. This vision "unites the collective knowledge of Europe's bio-based organisations and experts. These include the full spectrum of BIC's membership, encompassing sectors as diverse as agriculture, food and feed production, forestry and pulp & paper, aquatic and marine, chemicals and materials including bioplastics, technology providers and beyond. They also include a broad selection of stakeholders, large and small, other European associations and industries, the primary sector, brand owners, representatives of Member States, scientists and environmental organisations, representing Europe in all its geographical and natural diversity." The associations and other stakeholders are also actively involved in developing the Strategic Research and Innovation Agenda (SIRA) 2030, together with the BBI JU's advisory bodies, the States Representatives Group and the Scientific Committee. BIC also involved two additional organisations representing NGOs (to make a better and clear link to the SDGs), and municipalities. In addition, to stimulate the collaboration with the regions, BIC signed a memorandum of understanding with the European Regions Research & Innovation Network (ERRIN) and the Vanguard Initiative.

Openness during implementation will be guaranteed by selecting a governance structure that involves as many stakeholder groups as possible on decisive levels. The process for establishing **annual work programmes** will be in line with the action(s) to be suggested by BBI in response to the IAS audit on processes. An improvement over how this process was carried out in BBI JU will be sought, where only full members of BIC had a decisive role on the actual drafting of topics, with associate members only getting a consultative role at a later stage without much influence. One of the options given by BIC is a constantly open call for BIC membership, which would improve the openness of the private partner.

In principle, **calls will be fully open** in line with the Horizon Europe provisions (see however the text still in blue showing the negotiations going on). Ring-fenced budgets, where only partners are eligible for funding, should better not be introduced as an option in the basic act. However, if during implementation there is a clearly justified need to address specific topics with a focused target group, it will be possible to use the Horizon Europe provisions and include limitations for participation or funding at the level of individual call topics.

The JU shall provide the Union institutions and other Union bodies, offices or agencies, via the standard IT tools of the Commission, **access to the results** of beneficiaries participating in indirect actions of the JU, projects and proposals (also those not selected for funding) and any other information deemed necessary for developing, implementing and monitoring Union policies or programmes. Such access rights are limited to non-commercial and non-competitive use.

4 Annex: Bioeconomy – Circular economy – Bio-based economy

What is bioeconomy? What are its goals and principles?	**What is circular economy? What are its goals and principles?**	**What is bio-based economy? What are its goals and principles?**
Definition in the Bioeconomy Strategy 2018 ([5], p. 4): *The bioeconomy covers all sectors and systems that rely on biological resources (animals, plants, microorganisms and derived biomass, including organic waste), their functions and principles. It includes and interlinks: land and marine eco-systems 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 pro-cesses to produce food, feed, bio-based products, energy and services. Biomedicines and health biotechnology are excluded. To be successful, the European bioeconomy needs to have sustainability and circularity at its heart. This will drive the renewal of our industries, the modernisation of our primary production systems, the protection of the environment and will enhance biodiversity.*	Based on the EU Action Plan for the Circular Economy, Ellen McArthur, BSI, Wikipedia: Circularity means a conceptual departure from a linear take-make-waste economy, which requires a systemic approach to the design of processes, products, services and business models. Resources are used in a restorative and regenerative way. To make the most of resources, material loops are slowed down, narrowed, diversified, and closed. Resources, materials and products are used as long as possible while their value is maintained. Material efficiency is maximised. Material losses such as waste and emissions and their negative impacts are minimised. EU Action Plan for the Circular Economy (CEAP) ([68]): *[In] a more circular economy [, where] the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimised.*	There is no definition of the bio-based economy as such in any official Commission document. However, Standard EN 1657569 defines 'bio-based' as "derived from biomass" and 'bio-based product' as a "product wholly or partly derived from biomass". This standard focuses on areas other than food, feed and energy applications. In fact, the text on biomass and bio-based products in the CEAP ([70]) describes very well the bio-based economy: *Bio-based materials, i.e. those based on biological resources (such as wood, crops or fibres) can be used for a wide range of products (construction, furniture, paper, food, textile, chemicals, etc...) and energy uses (e.g. biofuels).*
An explanation for dummies, in two sentences		

[68] Circular Economy Action Plan, https://eur-lex.europa.eu/resource.html?uri=cellar:8a8ef5e8-99a0-11e5-b3b7-01aa75ed71a1.0012.02/DOC_1&format=PDF, p. 2
[69] CEN-CENELEC. EN 16575:2014 (Bio-based products – Vocabulary).
[70] See EU Action Plan for the Circular Economy, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52015DC0614, pp-17-18.

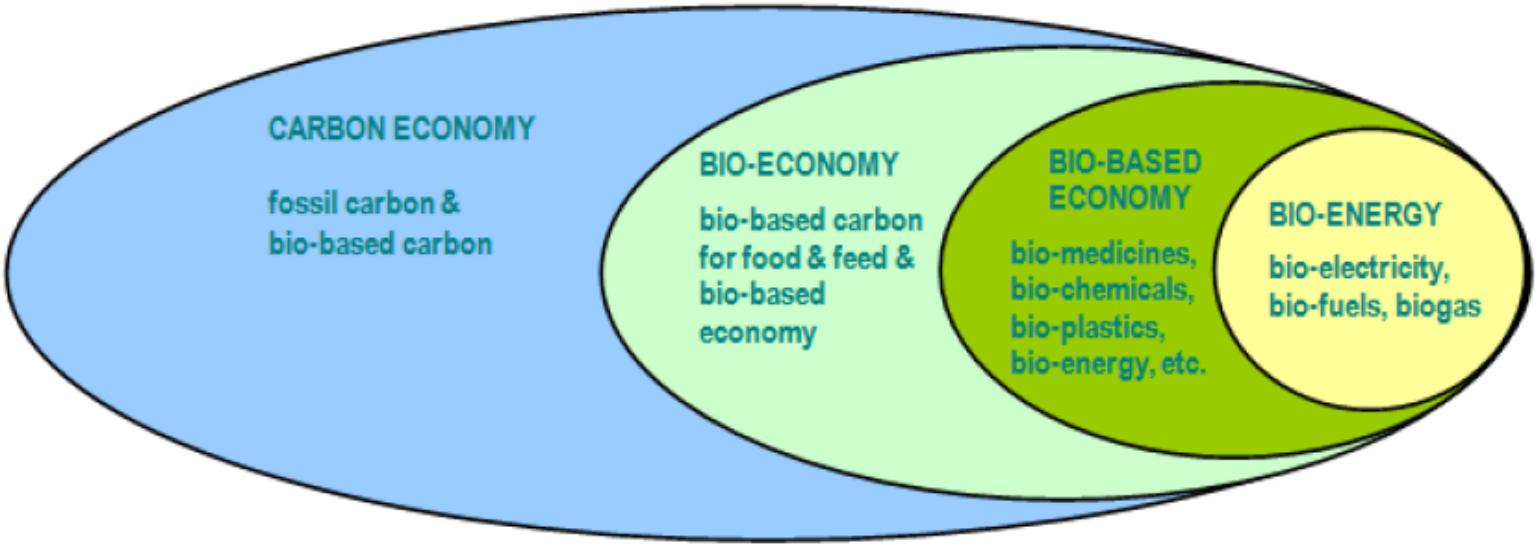
	Circular replaces linear material and resources use.	Biobased replaces fossil material use.
What are the overarching / shared goals and principles?		
• *The concepts of bioeconomy and circular economy have similar targets and they are overlapping to a degree, but neither is fully part of the other nor embedded in the other* ([71]). • Systemic approach • Goal of increased sustainability • *The bioeconomy and circular economy share some of the targets: A more sustainable and resource efficient world with a low carbon footprint. Both the circular economy and the bioeconomy avoid using additional fossil carbon to contribute to climate targets* ([71]). • *The circular bioeconomy includes: bio-based products; share, reuse, remanufacture, recycling; cascading use; utilisation of organic waste streams; resource-efficient value chains; organic recycling, nutrient cycling. … What do the concepts of bioeconomy and circular economy have in common? Improved resource and eco-efficiency; low GHG footprint; reducing the demand for fossil carbon; valorisation of waste and side streams* ([71]).		
What could be synergies of a circular and bio-(based) economy?		
As given in the Bioeconomy Strategy ([5]): *Circularity is a quintessential element of the European Commission's vision for an EU Bioeconomy … The scopes of the Circular Economy and the Bioeconomy intersect in their common aim to add value to biological waste and residues. … The Circular Economy includ[es], but [is] not limited to, renewable biological resources,* As given in the CEAP of 2015 ([72]): *Bio-based materials, i.e. those based on biological resources (such as wood, crops or fibres) can be used for a wide range of products (construction, furniture, paper, food, textile, chemicals, etc...) and energy uses (e.g. biofuels). The bioeconomy hence provides alternatives to fossil-based products and energy, and can contribute to the circular economy. Bio-based materials can also present advantages linked to their renewability, biodegradability or compostability. … Biobased materials, such as for example wood, can be used in multiple ways, and reuse and recycling can take place several times. … The bio-based sector has also shown its potential for innovation in new materials, chemicals and processes, which can be an integral part of the circular economy. Realising this potential depends in particular on investment in integrated bio-refineries, capable of processing biomass and bio-waste for different end-uses. …* *The circular economy is not complete without the bioeconomy and vice versa* ([71]). *The bioeconomy provides renewable carbon to the industry and can directly replace fossil carbon in almost all applications* ([71]). *The cascading use of biomass is strongly overlapping with the concept of the circular economy and is mostly a part of it* ([71]).		

[71] Carus, M., Dammer, L., *The "Circular Bioeconomy" – Concepts, Opportunities and Limitations*, nova paper #9 on bio-based economy, 2018. http://bio-based.eu/nova-papers/
[72] https://eur-lex.europa.eu/resource.html?uri=cellar:8a8ef5e8-99a0-11e5-b3b7-01aa75ed71a1.0012.02/DOC_1&format=PDF, pp. 17-18.

Where should bioeconomy become (more) circular?	**Where should circular economy become (more) biobased?**	**Where should bio-based economy become (more) circular?**
Already given in the BE Strategy 2018: *To be successful, the European bioeconomy needs to have sustainability and circularity at its heart.* *The bioeconomy encompasses additional activities other than [the circular activities of] adding value to biological waste and residue streams, such as the transformation of non-residual biological resources into higher value products and the efficient production of renewable biological resources* ([71]). *It is a challenge to keep the value of biomass during cascading, which is much easier with metals and minerals. Thus, the circular economy is dominated so far by the metal and mineral industry* ([71]). *Biodegradable products being returned to the organic and nutrient cycles* ([71]); *Cascading of paper, other wood products, natural fibres textiles and many more* ([71]); *Once the critical volume of new, bio-based polymers is reached, collection and recycling of bioplastics will become economically viable and attractive* ([71]).	Organic recycling as an expansion of circular economy still has to find its position and acceptance in the circular economy, e.g. through new legislation on fertilisers, including bio-based ones ([71]). *Biodegradable products being returned to the organic and nutrient cycles* ([71]); *Cascading of paper, other wood products, natural fibres textiles and many more* ([71]*);* *Once the critical volume of new, bio-based polymers is reached, collection and recycling of bioplastics will become economically viable and attractive* ([71]). *Valorisation of organic waste and residues through the production of innovative bio-based products substituting equivalent fossil-based products.*	All areas described by Carus et al. 2018 (see field to the left)
What are important independent areas of bioeconomy that can/should/will not become circular?	**What are important independent areas of circular economy that can/should/will not become biobased?**	**What are important independent areas of bio-based economy that can/should/will not become circular?**

• Linear transformation of biological resources (animals, plants, micro-organisms and derived biomass) into food and feed (due to its physiological metabolisation). Only the food waste part of this can become circular.	• Non-biological resources such as fossil carbon (crude oil, coal, natural gas), minerals, metals.	• Linear transformation of biological resources (animals, plants, micro-organisms and derived biomass, organic waste) into food and feed ingredients. • All energy uses of biological resources.

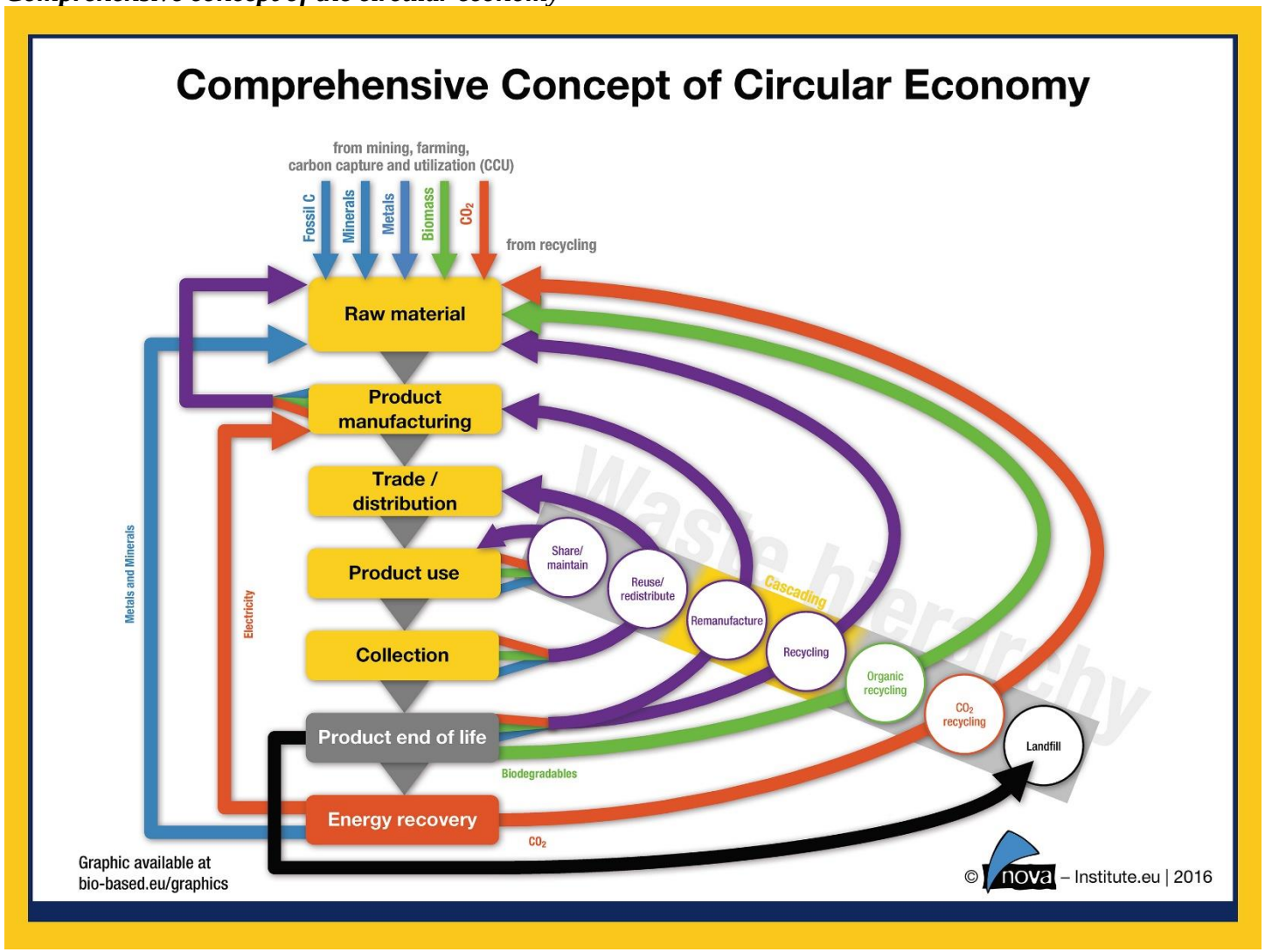
The bio-based economy in context



- The bio-energy arena is a subset of the bio-based arena (non-food use of biological resources), itself a subset of the bio economy, and ultimately of the 'carbon economy'.
- Our society is to a significant extent based on the 'carbon economy', fed both by fossil and renewable (or biological) carbon.

After: Kwant K.W., *Biobased Economy in the Netherlands and the regions – Opportunities & Challenges*, Netherlands Enterprise Agency, 2017 (after: van Beeck, N. et al., *An innovative perspective: Transition towards a bio-based economy*, in: Sustainable Energy Solutions in Agriculture, ed. J. Bundschuh and G. Chen, London, 2014).

Comprehensive concept of the circular economy



Carus, M., *Biobased Economy and Climate Change – Important Links, Pitfalls, and Opportunities*, Industrial Biotechnology 13(2), 2017.