FTP CALL TOPICS MANUAL HORIZON EUROPE 2023-2024

The complete manual for the Call topics relevant for the forest-based sector

Annex 1

Call topics 2023 from the Circular Bio-based Europe Joint Undertaking (CBE JU)

V1.0 – 14/02/2023

Forest-based Sector
Technology Platform

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Introduction

This selection of Call Topics is based on the Annual Work Programme and Budget 2023 published by the Circular Bio-based Europe Joint Undertaking (CBE JU) on 19 December 2022.

The entire document is available for download on CBE's website. All the details and additional information needed for the calls in this document can be found in that document.

CBE JU calls follow the rules and procedures of Horizon Europe.

The **budget** of the selected calls relevant for the forest and forest-based sector amount to **€164 million**.

Topic ID and title	HORIZON-JU-CBE-2023-IAFlag-01: Optimised and integrated forest-based value chains				
Budget	EUR 17 million	**Opening date**	20 April 2023	**Deadline 1**	20 September 2023
Budget per project	EUR 17 million			**Deadline 2**	/
Type of action	Innovation Actions (IA) - Flagship				
FTP subsector	F&F, WW, P&P				
Keywords	Cascading use, zero waste, zero pollution, circularity, resource efficiency, woody biomass, social acceptance, industrial competitiveness, new skilled jobs, process technologies, certification				
FTP comments					
FTP SIRA 2030 Challenges addressed	4 – 5C, D – 6A, C, D – 7C – 9C			**FTP relevance**	High
				Starting TRL	/
				End TRL	8

Expected Outcome:

In line with the EU Bioeconomy Strategy, the EU Forest strategy, the EU Biodiversity strategy, the updated Industrial strategy and the Circular Economy Action Plan, successful proposals will facilitate the large-scale deployment of industrial bio-based systems based on primary woody biomass. These systems will contribute to the EU Bioeconomy Strategy implementation, demonstrating improved environmental performances, maximising resource- and energy-efficiency, and optimising cascading use of bio-based primary and secondary feedstock, aiming at 'zero waste' and 'zero-pollution' operations and outputs.

Project results should contribute to the following expected outcomes:

- Deployment of competitive, replicable, regional/local, circular and inclusive bio-based business models in the forest-based sector and industry encompassing all segments of the value chain
- Improved circularity and resource efficiency of wood-based resources via practical applications of the circular (bio)economy concept to reduce the consumption of primary woody biomass
- Significant improvement in environmental sustainability across the value chain against specified fossil-based and/or carbon-intensive benchmarks
- Reduction in the dependency on imported feedstock and products
- Social acceptance of circular bio-based solutions and products
- Availability of broader range of competitive circular bio-based products meeting consumer and market requirements
- Industrial competitiveness, strategic autonomy and resource independence of bio-based value chains of EU member states and/or Associated countries

- New skilled job opportunities and investments in the bio-based sectors, particularly in the regions with underdeveloped capacities and in the rural and coastal areas

Scope:

Forest-based value chains are often vertically integrated but could be further optimised by introducing innovative processing technologies, e.g., upcycling residual flows to higher value applications and exploiting industrial symbiosis concepts (within the same industrial sector but also with other industrial sectors when applicable) to maximise the value extracted from main and side streams of forest biomass. Moreover, there are non-forest woody resources, both primary and secondary, not yet efficiently managed and valorised.

This topic aims to considerably increase resource efficiency by promoting cooperation of companies of different scales and other actors and move towards "zero waste, zero pollution" operations. The feedstock in scope of the topic are woody biomass from sustainably managed forests and wood industry side streams and residues.

For this purpose, seamless and efficient integration of processing technologies of main and side flows of woody biomass between various companies and other actors is needed, specialising manufacturing of diverse materials and products. This may be achieved by the creation of a symbiotic ecosystem with clusters of companies of different scale and technology providers using the residual streams of large-scale industrial plants, but also exploiting the technical opportunities from emerging manufacturing systems. The cascading use of woody biomass already allows for a range of industrial purposes; the better integration would provide efficiency gains and higher value of the wood-based value chains at a regional scale. The cooperation between well-established and emerging industrial operators, forest owners, innovators and RTOs/ academia, as well as financial support from public and private investors must be increased, to ensure circular, resource efficient and zero pollution processing.

Proposals under this topic should:

- Establish a symbiotic and flexible woody biomass processing system involving the cooperation of several actors to maximise the cascading use of feedstock and the use of residues for high value added circular products. Contribute to match interests, priorities and technological status of different participating companies and other actors as well as gaining support from public and private investors to a large-scale systemic change. One example would be clustering several

enterprises/technology providers around a main woody-biomass operator to valorise its side and residual streams.

- Identify regional opportunities to share primary materials, recycled materials, and side-streams between different industries in the wood-based sectors in a secure and economically feasible way.
- Identify and support process technologies and logistical solutions that can be integrated in a symbiotic way to create a circular economy. Develop processes to share heat, process water and chemicals between different businesses, at production site level.
- Develop cost-efficient processes to allow for efficient recycling of secondary woody biomass-products.
- Develop innovative and efficient methods to extract and produce valuable molecules and components from biomass (addressing material decomposition processes which are energy-consuming) and individuate new market sectors for such materials (e.g., pigments, new materials for additive manufacturing, bioadhesive and bio-based functional additives, food and feed ingredients etc.).
- Develop new production methods enabled by innovative, including emerging breakthrough, technologies.
- Develop material-and energy-efficient processing and recirculation of (chemicals) flows, towards the fully circular model, within the single industrial plant and within the extended production site.
- Innovate the outputs from the value chain while applying the principles of eco-design of bio-based products.
- Demonstrate the substantial improvement of environmental performance, including reduction of GHG and other harmful emissions, across the value chain against specified fossil and/or bio-based benchmarks.
- Incorporate and integrate innovative processes and solutions along the value chain into a large-scale system, including woody biomass-based products for high value applications.
- Develop and demonstrate a sound business model, based on experienced bottlenecks/gains, ensuring long-term investments and new jobs opportunities, encouraging the inclusion of all actors in the regional value chain.

- Apply certification schemes of woody biomass, including certification of environmental sustainability, and expand its use along the different types of woody biomass.
- Consider integrating activities contributing to climate change adaptation.
- Demonstrate the replication potential of this flagship concept in the EU and the associated countries.

Proposals are recommended to include a task to perform an assessment based on the safe-and-sustainable-by-design (SSbD) framework, developed by the European Commission, for assessing the safety and sustainability of chemicals and materials. Under this context, proposals are recommended to also include a task to contribute with and develop recommendations that can advance further the application of the SSbD framework.

Proposals may consider making existing/new industrial assets (e.g., labs, test rigs, etc.) or other training packages accessible to researchers, SMEs, etc., for visiting, or training and testing bio-based processes.

Proposals must implement the multi-actor approach and ensure adequate involvement of all key actors in the value chains relevant for this topic, across the sustainable circular bio-based system, e.g., the bio-based processing industry, including brand owners, but also researchers, feedstock producers and suppliers, regional actors, regional policy makers, consumers and civil society.

Proposals should also describe their contribution to the Specific CBE JU requirements, presented in section 2.2.3.1, and the Cross-cutting elements, highlighted in section 2.2.3.2

Where relevant, proposals should seek links with and capitalise on the results of past and ongoing EU funded projects, including from BBI JU.

Topic ID and title	HORIZON-JU-CBE-2023-IAFlag-02: Expansion and/or retro-fitting of biorefineries towards higher-value bio-based chemicals and intermediates				
Budget	EUR 17 million	**Opening date**	20 April 2023	**Deadline 1**	20 September 2023
Budget per project	EUR 17 million			**Deadline 2**	/
Type of action	Innovation Actions (IA) - Flagship				
FTP subsector	P&P				
Keywords					
FTP comments	Cascading use, higher-value products, innovative conversion processes, reduce energy consumption				
FTP SIRA 2030 Challenges addressed	6A, B, C – 9B			**FTP relevance**	Medium
				Starting TRL	/
				End TRL	8

Expected Outcome:

In line with the objectives of the Circular economy and the Zero pollution action plan, the successful proposal will facilitate the large-scale deployment of industrial bio-based systems. These systems will contribute to the EU Bioeconomy Strategy implementation, demonstrating improved environmental performances, maximum resource- and energy-efficiency, and optimal cascading use of bio-based feedstock. The successful proposal will also support the implementation of relevant EU policies and priorities such as the EU Industrial Strategy, Green and Digital transition, Circular Economy Action Plan, as well as contribute to the achievement of the European Green Deal (EGD) objectives.

Project results should contribute to the following expected outcomes:

- Deployment of competitive, replicable, regional/local, circular inclusive bio-based business models centred on biorefineries encompassing all segments of the value chain
- Availability of a broader range of (environmentally and economically) sustainable processes of bio-based feedstock and by-products in a biorefinery to added value bio-based materials/products
- Availability of broader range of bio-based products meeting market requirements
- Large scale implementation of (environmentally and economically) sustainable biorefinery processes
- Significant improvement in environmental sustainability across the value chain against specified fossil and/or bio-based benchmarks
- Industrial competitiveness, strategic autonomy and resource independence of bio-based value chains of EU member states and/or Associated countries

- Improved circularity and resource efficiency via practical application of the circular (bio)economy concept
- Income and business opportunities diversification for stakeholders and actors (including primary producers) in the bio-based sectors
- New skilled job opportunities and investments in the bio-based sectors, particularly in the regions with underdeveloped capacities and in the rural and coastal areas
- Social acceptance of circular bio-based solutions and products
- Market uptake and growth of scalable circular bio-based solutions

Scope:

Many biorefineries in Europe were built in the past decades with a rather narrow product scope (e.g., biofuel plants, pulp and paper mills). New technologies allow expanding their production capacity to convert bio-based feedstock to added value products, following the cascading approach, and/or to produce new and higher-value products to take full advantage of the existing assets and keep them competitive with the current market requirements. In addition to that, there is a wealth of CAPEX from dismissed or declining industrial assets that could be converted as parts of the biorefinery while exploiting the existing infrastructures, resulting in lower CAPEX, and other economic and technological benefits (e.g., shorter lead times, faster implementation, fewer production time losses and lower risks compared to fully greenfield plant construction).

Proposals under this topic should:

- Integrate innovative and sustainable conversion processes in existing biorefineries (currently producing a conventional and/or narrow range of products), addressing all elements in the value chain, also integrating, if applicable, dismissed or declined industrial assets that could be converted as parts of the biorefinery by:
    - increasing the valorisation of sustainable bio-based feedstock, from primary and secondary sources, respecting the 'cascading use' approach;
    - expanding the use of residual and waste streams from bio-based processes within the biorefinery into added-value products, addressing the technical challenges of converting secondary bio-based feedstock (limited process integration, energy inefficiency, water use, etc.);
    - integrating, when applicable, any other local residual biomass such as residual and waste streams from different sources (aquatic or terrestrial)

to extract maximum value from the incoming feedstock and increase the economic viability;
    - developing new production methods enabled by innovative, including emerging breakthrough, technologies;
    - expanding and diversifying the production capacity and range of bio-based products, and increasing their value, including via symbiosis with other industrial actors when applicable;
    - improving the environmental sustainability profile of the plant by decreasing and controlling polluting emission and energy consumption;
    - improving the efficiency of processes to minimise process losses and reducing or eliminating the use of hazardous substances;
    - improving the flexibility to energy supply, e.g., expanding the use of renewable energy resources, increasing electrification, enabling energy storage, etc.;
    - responding to current and foreseen market requirements, e.g., expanding to markets different from the ones considered when building the plant in the first place.
- Validate the technical and economic viability of the plant conversion concept, enabling its replication including the integration of dismissed industrial assets, if applicable.
- Demonstrate the replication potential of this flagship concept in the EU and the associated countries.
- Demonstrate the economic and social sustainability in terms of maintaining (or increasing) jobs and skilled jobs, including at regional level towards an improved social and economic development of sectors providing bio-based feedstock, such as rural community, with no interference with the food value chains.

Proposals are recommended to include a task to perform an assessment based on the safe-and-sustainable-by-design (SSbD) framework, developed by the European Commission, for assessing the safety and sustainability of chemicals and materials. Under this context, proposals are recommended to also include a task to contribute with and develop recommendations that can advance further the application of the SSbD framework.

Proposals may consider making existing/new industrial assets (e.g., labs, test rigs, etc.) or accessible to researchers, SMEs, etc., for visiting, or training and testing bio-based processes.
Proposals must implement the multi-actor approach and ensure adequate involvement of all key actors in the value chains relevant for this topic, across the sustainable circular

bio-based system, e.g., the bio-based processing industry, researchers, feedstock producers and suppliers, regional actors, policy makers and civil society.

Proposals should also describe their contribution to the Specific CBE JU requirements, presented in section 2.2.3.1, and the Cross-cutting elements, highlighted in section 2.2.3.2

Where relevant, proposals should seek links with and capitalise on the results of past and ongoing EU funded projects.

Topic ID and title	HORIZON-JU-CBE-2023-IAFlag-03: Bio-based packaging materials with improved properties: barrier, food contact, forming, printability, safety, recyclability/circularity-by-design				
Budget	EUR 17 million	**Opening date**	20 April 2023	**Deadline 1**	20 September 2023
Budget per project	EUR 17 million			**Deadline 2**	/
Type of action	Innovation Actions (IA) - Flagship				
FTP subsector	P&P				
Keywords	Bio-based packaging, recyclable, surface and barrier properties, end-users perception				
FTP comments					
FTP SIRA 2030 Challenges addressed	9			**FTP relevance**	Medium
				Starting TRL	/
				End TRL	8

Expected Outcome:

In line with the objectives of the Sustainable Products Initiative as well as the EU Plastics Strategy, successful proposals will facilitate the large-scale deployment of new sustainable and high-performing packaging materials, including alternatives to plastics. Successful proposals will also contribute to the implementation of the EU Bioeconomy strategy, the Circular Economy Action Plan and the updated Industrial Strategy.

Project results should contribute to the following expected outcomes:

- Improved barrier properties (e.g., oxygen, grease and/or water, depending on application) with respect to existing fossil or bio-based benchmarks
- Improved durability also in unfavourable environments (e.g. high humidity, high or low temperatures depending on the application) with respect to existing fossil or bio-based benchmarks
- Improved sustainability and circularity with respect to existing fossil or bio-based benchmarks
- Availability of broader range of circular bio-based packaging products meeting market requirements (depending on specific application)
- Contribution to deployment or strengthening of replicable, regional/local, circular bio-based business models
- Industrial competitiveness, strategic autonomy and resource independence of bio-based value chains of EU member states and/or Associated countries
- Significant improvement in environmental sustainability across the value chain against specified fossil and/or bio-based benchmarks
- Improved circularity and resource efficiency via practical application of the circular (bio)economy concept to packaging solutions

- Income and business opportunities diversification for stakeholders and actors (including primary producers) in the bio-based sectors
- New skilled job opportunities and investments in the bio-based sectors, particularly in the regions with underdeveloped capacities and in the rural and coastal areas
- Social acceptance of circular bio-based solutions and products.
- Market uptake and growth of scalable bio-based solutions

Scope:

The packaging business is undergoing considerable transformations due to pressing legislative changes, the issue of plastic littering and changes in customer behaviour. While consumer products make up a considerable share of packaging products, industrial packaging products also need to be considered. Future packaging products need to be bio-based, recyclable and/or biodegradable, lightweight and functional. A challenge is represented by the seemingly opposing requirements of barrier/surface properties (obtained by innovative coatings or multi-layered structures) and the need to make the product easy to recycle (easier with fully bio-based or mono-material structures).

Proposals under this topic should:

- Upscale production technologies and deploy the complete value chain to bio-based packaging materials with improved functional properties, meeting market and sustainability/circularity/environmental performance requirements. Applications and the related requirements should be clearly identified and addressed.
- More specifically, focus on improvement of surface and/or barrier properties, enabling circularity and improved environmental performance while also meeting technical performance requirements. Innovation can focus on one, more or all components (e.g. substrate/polymer, coatings, films, additives) of the bio-based packaging product, provided that technical, circularity and environmental requirements are met by the product as a whole.
- Address and demonstrate at relevant scale the sustainable end-of-life of the developed products, in particular compatibility with the existing recycling streams and/or, based on standards, their compostability or biodegradability, depending on the application sought. Reuse and remanufacturing are also in scope when compatible with the application and common practices.
- Verify the regulatory status of the new product and its safety for the intended use (especially important in food packaging) and for the environment.

- Depending on the biomass feedstock in scope, apply existing certification schemes.
- Consider end-users perception, behaviour and preferences for product design (especially important in food and consumer goods packaging, but also relevant in industrial packaging) but also in terms of disposal at end-of-life (e.g. avoiding littering, enabling easy sorting and high-target recycling with the correct stream).
- Employ low-emission and energy efficient process and ensure improved sustainability profiles for the products in scope compared to existing bio-based solutions.

Proposals are recommended to include a task to perform an assessment based on the safe-and-sustainable-by-design (SSbD) framework, developed by the European Commission, for assessing the safety and sustainability of chemicals and materials. Under this context, proposals are recommended to also include a task to contribute with and develop recommendations that can advance further the application of the SSbD framework.

Proposals may consider making existing/new industrial assets (e.g., labs, test rigs, etc.) accessible to researchers, SMEs, etc., for visiting, training and testing bio-based processes.

Proposals must implement the multi-actor approach and demonstrate the involvement of all concerned key actors, including the involvement of brand owners* and any relevant B2B* actors.

Proposals should also describe their contribution to the Specific CBE JU requirements, presented in section 2.2.3.1, and the Cross-cutting elements, highlighted in section 2.2.3.2

Where relevant, proposals should seek links with and capitalise on the results of past and ongoing EU funded projects38.

Topic ID and title	HORIZON-JU-CBE-2023-IA-01: Small-scale biorefining in rural areas				
Budget	EUR 15 million	**Opening date**	20 April 2023	**Deadline 1**	20 September 2023
Budget per project	EUR 7,5 million			**Deadline 2**	/
Type of action	Innovation Actions (RIA)				
FTP subsector	WW, P&P				
Keywords	Small-scale biorefineries, technical suitability, economic viability, local resource				
FTP comments					
FTP SIRA 2030 Challenges addressed	6B			**FTP relevance**	High
				Starting TRL	/
				End TRL	6-7

Expected Outcome:

Successful proposals will contribute to the Bioeconomy Strategy, the Long-Term Vision for Rural Areas, and the Common Agriculture Policy by promoting new economically viable and environmentally sustainable business models for a successful green transition in primary production and rural areas in line with the European Green Deal objectives.

Project results should contribute to the following expected outcomes:

- Deployment of sustainable, inclusive, and reliable biobased value chains in rural areas with a focus on fair economic returns at local (farm) level
- Industrial competitiveness, strategic autonomy and resource independence of bio-based value chains of EU member states and/or Associated countries
- Improved circularity and resource efficiency via practical application of the circular (bio)economy concept, e.g., by maximising the valorisation of residual biomass
- Contribution to additional, diversified incomes and generational renewal in rural areas, with the potential for a multiplier effect when replicated across the EU
- New skilled jobs opportunities and investments in the bio-based sectors in rural areas, particularly in regions with underdeveloped capacities, improved innovation capacities and product portfolio extension in primary production sectors and SME's
- Significant reduction of land use and other climate and environmental benefits
- Efficient recycling of nutrients transportation and logistics costs reduction and overall enhanced circularity of nutrients cycles
- Social acceptance of circular bio-based solutions and products

Scope:

Small-scale biorefineries are attractive, especially to rural stakeholders, because they may not require a high level of initial investment in comparison to large-scale facilities and, therefore, often provide a quicker return on investment. In addition, technology providers benefit from this model because of its high replication potential across Europe. Small-scale biorefineries have the potential to offer diversification opportunities for primary producers and local rural stakeholders by:

- processing their biomass directly at source (shortening logistic chains and avoiding degradation, increasing production value) to produce new biorefinery products based on the circular use of local resources, and/or
- providing additional sources of income in rural areas and supporting the economy of scale with new biorefinery products based on the circular use of local resources.

While some small-scale and/or modular biorefinery solutions, such as the EIP-OG Biorefinery Glas and BBI IA-DEMO AGRI-MAX, have already been successfully demonstrated, both technical and non-technical barriers still exist that prevent the broad implementation in Europe. Downscaling in particular poses a challenge in maintaining process- and cost-efficiency competitive with large scale processes that can exploit economy of scale. Smart and integrated process designs, as well as circular processes maximising the material use, can provide innovative solutions, while maximising the environmental benefits and bringing more value to the concerned rural actors.

Proposals under this topic should:

- Demonstrate the technical suitability and economic viability of small scale decentralised biorefinery concepts, which may include modular and mobile units, in rural areas, thereby considering safety and security issues for the operators of the plant and the possible interferences with the rural landscape (e.g. in terms of biodiversity).
- Develop, demonstrate and validate resource-efficient technologies with a view to add value to locally available resources (underutilised biomass; by-products; residues; solid, liquid and gaseous waste and residual streams) at the point of origin, either as feedstock for conversion, or as process medium or growing medium for feedstock for further conversion.
- Seek synergies with the existing regional food, feed, or bioenergy value chains to further strengthen their economic and environmental sustainability in line with the cascading principle of biomass use. In the context of CBE JU food, feed, and

bioenergy (including biofuels) as main products are out of scope, but the related existing value chains can be involved. Food and feed ingredients and soil nutrients are in scope.

- Assess the environmental (including elimination / reduction of pollution from the processing operations) and socio-economic performance of the demonstrated value chains.
- Evaluate the replication potential of the small-scale biorefinery concept, provide a sound business plan and training material in particular for primary producers and other rural actors.
- Ensure an active involvement and profit sharing of primary producers in the value system.
- Cooperate, if applicable, with central hubs, such as local and regional hubs, distribution centres, collection and processing points for further processing steps.

Proposals must apply the concept of the 'multi-actor approach' and ensure adequate involvement of primary producers and other relevant actors in rural areas.

Proposals are encouraged to include regions with underdeveloped capacities and regions where rural bio-based pilot plants and demonstrational sites are missing or underrepresented.

Proposals should also describe their contribution to the Specific CBE JU requirements, presented in section 2.2.3.1, and the Cross-cutting elements, highlighted in section 2.2.3.2

Where relevant, proposals should consider synergies and complementarities with results of past and ongoing EU funded projects and calls, including BBI JU.

Topic ID and title	HORIZON-JU-CBE-2023-IA-02: Production of safe, sustainable, and efficient bio-based fertilisers to improve soil health and quality				
Budget	EUR 15 million	**Opening date**	20 April 2023	**Deadline 1**	20 September 2023
Budget per project	EUR 7,5 million			**Deadline 2**	/
Type of action	Innovation Actions (IA)				
FTP subsector	F&F				
Keywords	Bio-based fertiliser, forest residues, product marketability				
FTP comments					
FTP SIRA 2030 Challenges addressed				**FTP relevance**	Indirect
				Starting TRL	/
				End TRL	6-7

Expected Outcome:

This topic contributes to the objectives of the Communication on "Ensuring availability and affordability of fertilisers", EU Bioeconomy Strategy, Mission "A Soil Deal for Europe", Common Agriculture Policy, and EU Fertilising Products Regulation by replacing synthetic fossil and mineral fertilisers and supporting the strategic autonomy of the EU fertiliser industry through the production of sustainable and safe bio-based alternatives to improve soil health and quality. The successful proposals will support the achievements of the Farm to Fork strategy objectives and targets as well as of the European Green Deal (EGD) objectives.

Project results should contribute to the following expected outcomes:

- Enhanced availability of affordable and sustainable fertiliser in the EU
- Safe, precise applicable and efficient bio-based fertilisers to support the transition towards a circular economy (including fertiliser industry) and agricultural production
- Replacement of conventional fossil and mineral fertilisers with bio-based alternatives, while closing nutrient cycles and creating new value chains on a regional level
- Availability of innovative and sustainable bio-based fertiliser delivery systems (e.g., coatings) for controlled-release (if applicable)
- Significant contribution to the objectives of the R&I mission 'A Soil Deal for Europe'
- Social acceptance of circular bio-based solutions and products

Scope:

Fertilisers are critical for the EU agriculture and the current market situation for fossil and mineral fertilisers, together with a general increase of input costs, could have significant impacts on EU farmers and their productivity.

Bio-based fertilisers have the potential to make the food system more sustainable in line with the Farm to Fork objectives and targets but also support the availability and affordability of fertilisers by providing bio-based alternatives to farmers with similar or even improved properties. The recycling of nutrients from nutrient-rich waste and side-streams (such as agricultural by-products and waste, food waste or sewage sludge) also offer great opportunities to diversify and enhance rural incomes.

However, these alternatives need to comply with the requirements laid down in the EU Fertiliser Product Regulation, including the provisions to restrict intentionally added microplastics from 2026 onwards. Polymeric materials and plastic coatings, used to optimise the release properties of fertilisers, remain a significant problem in terms of environmental pollution and risks to human health.

Proposals under this topic should:

- Demonstrate the technical validation and implementation of bio-based fertiliser production from nutrient-rich waste and side streams (such as agricultural/forest/aquatic residues and wastes, municipal waste, food waste, sludge, etc.), thereby reducing the environmental impact linked to the dispersion of nutrients.
- Develop and validate novel bio-based fertilisers, including biodegradable fertiliser coatings or other delivery system (if applicable), ensuring their agronomic efficiency, safety and sustainability with similar or improved properties compared to synthetic and mineral fertilisers.
- Contribute to the substitution of conventional, non-renewable fertilisers, thereby reducing the dependency and risks related to depletion, market volatility as well as import dependency.
- Address the product marketability and compliance with EU Regulation 2019/100 to the largest possible extent.
- Optimise the costs of the value chain (including logistics) and circular approaches of waste and side streams and increase resource efficiency of the fertiliser production.

- Engage with primary producers and test the developed products on demo farms, including the machinery for application, and monitor the effects on soil health and quality. If applicable, connect and cooperate with existing living labs in the framework of the EU mission 'A soil deal for Europe'.
- Include a task to closely cooperate with projects funded under Horizon 2020, Horizon Europe (including the R&I partnership 'Accelerating farming systems transition: agroecology living labs and research infrastructures') and the Mission 'A Soil Deal for Europe'.

Proposals are recommended to include a task to perform an assessment based on the safe-and- sustainable-by-design (SSbD) framework, developed by the European Commission, for assessing the safety and sustainability of chemicals and materials. Under this context, proposals are recommended to also include a task to contribute with and develop recommendations that can advance further the application of the SSbD framework.

Proposals must implement the multi-actor approach and demonstrate the involvement of all concerned key actors, such as primary producers, in the bio-based systems.

Proposals should also describe their contribution to the Specific CBE JU requirements, presented in section 2.2.3.1, and the Cross-cutting elements, highlighted in section 2.2.3.2

Proposals should build on and avoid replication of results of previous and ongoing projects such as from BBI JU portfolio, and from Horizon 2020, and Horizon Europe portfolio.

Topic ID and title	HORIZON-JU-CBE-2023-IA-03: Improve fermentation processes (including downstream purification) to final bio-based products				
Budget	EUR 15 million	**Opening date**	20 April 2023	**Deadline 1**	20 September 2023
Budget per project	EUR 7,5 million			**Deadline 2**	/
Type of action	Innovation Actions (IA)				
FTP subsector	P&P				
Keywords	biocatalyst(s) optimisation, reactor design, process design innovation, process agents innovation, energy and resource efficiency				
FTP comments					
FTP SIRA 2030 Challenges addressed	6B, D			**FTP relevance**	Medium
				Starting TRL	/
				End TRL	6-7

Expected Outcome:

In line with the objectives of the Circular economy and the Zero pollution action plan, successful proposals will demonstrate processing technologies to facilitate the large-scale deployment of industrial bio-based systems. These systems will contribute to the EU Bioeconomy Strategy implementation, demonstrating improved environmental performances, maximum resource- and energy-efficiency, and optimal cascading use of bio-based feedstock, aiming for 'zero waste' and 'zero-pollution' operations.

Project results should contribute to the following expected outcomes:

- Availability of new industrial biotechnology-based production routes to bio-based products from sustainably sourced biomass;
- Improved productivity, yield, titre and selectivity of scaled up fermentation processes to bio-based products;
- Increased competitiveness of European biorefineries;
- Significant improvement of environmental performance across the value chain against specified fossil and/or bio-based benchmarks;
- Improved circularity and resource efficiency via practical application of the circular (bio)economy concept;
- Social acceptance of circular bio-based solutions and products;
- Availability of broader range of bio-based products meeting market requirements;
- Facilitation of market uptake of scalable bio-based solutions

Scope:

Fermentation of bio-based feedstock is powerful but often still cost-intensive and resource-intensive process. This is mainly due to costly enzymes, low process yields, high by-product toxicity, poor microorganism growth, high nutrient requirements but also inefficiencies in downstream purification. Moreover, most used biocatalysts are optimised for converting conventional sugars and are less effective (or unable) to deal with second generation and non-food quality sugars, thus preventing the exploitation of additional sources of biomass feedstock. Solving all these issues may require the development of new metabolic pathways and the scale-up of related processes to industrially relevant scale. In addition, the presence of by-products often requires complex and expensive downstream purification processes, especially when the desired end products are non-volatile. This aspect adds to the complexity and cost of the process and needs to be optimised as well.

Proposals under this topic should:

- Specify and justify the choice of one or more sustainable feedstock types to be valorised via optimised, scaled up fermentation processes, and the targeted bio-based products. With regards to the targeted bio-based products, non-volatile as well as thermally and/or chemically unstable compounds, presenting higher downstream purification constraints, should be in the scope.
- Demonstrate improved process design strategies to solve previously identified bottlenecks in industrially relevant fermentation processes considering both upstream and downstream steps. The proposed strategies can consider biocatalyst(s) optimisation, reactor design, process design innovation but also process agents (e.g. solvents) innovation. Address fermentation processes productivity (yield, titre, selectivity) as well as cost-, resource- and energy-efficiency in view of further scale-up to commercial level;
- Ensure the improvement of the energy and resource efficiency of downstream purification strategies for obtaining the end products in scope, thus also enabling cost-effective production, in particular when dealing with non-volatile or chemically/thermally unstable products.
- Target end products with tangible market applications and ensure that the products meet market and regulatory requirements (e.g. in terms of consumers safety and Health, Safety and Environment (HS&E))
- Include a task to integrate assessment based on the safe-and-sustainable-by-design (SSbD) framework, developed by the European Commission, for assessing the safety and sustainability of chemicals and materials. Under this context,

projects are expected to contribute with and develop recommendations that can advance further the application of the SSbD framework.

- Analyse and prove techno-economic feasibility as well as commercial viability of further scaling up the process to commercial scale.

Proposals must implement the multi-actor approach and demonstrate the involvement of all concerned key actors, such as the processing industry, end users and brand owners.

Proposals should also describe their contribution to the Specific CBE JU requirements, presented in section 2.2.3.1, and the Cross-cutting elements, highlighted in section 2.2.3.2

Where relevant, proposals should seek links with and capitalise on the results of past and ongoing EU funded projects.

Topic ID and title	HORIZON-JU-CBE-2023-IA-06: Selective, sustainable production routes towards bio-based alternatives to fossil-based chemical building blocks				
Budget	EUR 15 million	**Opening date**	20 April 2023	**Deadline 1**	20 September 2023
Budget per project	EUR 7,5 million			**Deadline 2**	/
Type of action	Innovation Actions (IA)				
FTP subsector	P&P				
Keywords	circular biomass sources				
FTP comments					
FTP SIRA 2030 Challenges addressed	9C			**FTP relevance**	Indirect
				Starting TRL	/
				End TRL	6-7

Expected Outcome:

Successful projects will contribute to scaling up the sustainable production of bio-based chemicals with a large market potential and as alternatives for fossil-based platform chemicals, thus going beyond niche and specialty applications, while considering both technical and sustainability performance.

Projects are overall expected to address the EU Bioeconomy Strategy and its action plan, the Chemicals Strategy for Sustainability (under the EU Zero pollution ambition), the EU Industrial strategy, the EU Biodiversity strategy 2030, as well as and the upcoming transition pathway for the energy-intensive industries ecosystem ('chemicals transition pathway').

Project results should contribute to the following expected outcomes:

- Reduced biomass feedstock imports dependency and land use impact with positive effects of the feedstock sustainability along the value chain;
- Improved circularity and resource efficiency via practical application of the circular (bio)economy concept, encompassing the resource- and energy-efficient, cascading use of sustainably sourced biomass;
- Significantly improved sustainability, strategic autonomy, resilience and competitiveness of the European chemical industry while reducing the fossil feedstock dependence in other downstream sectors;
- Significant improvement of environmental performance across the value chain against specified fossil and/or bio-based benchmarks;
- Reduction of direct and indirect emissions against available fossil-based and/or bio-based benchmarks of the chemical industry, with a clear technical pathway to carbon neutrality;
- Social acceptance of circular bio-based solutions and products;

- Availability of broader range of bio-based chemicals meeting market requirements & facilitation of market uptake of scalable bio-based solutions (therefore, improving on the present market penetration and impact of the bio-based chemicals).

Scope:

The production of a wider portfolio of bio-based platform chemicals is presently at low maturity, and CAPEX (and OPEX) investments are still needed to scale up production. The EU bio-based production share still amounts to 0.3 %. The main current feedstock platforms deployed for bio-based chemicals are the sugar/starch, vegetable oils and glycerine platforms. Concerning the current land use impact of bio-based platform chemicals, an index of 0.5 ha/t of product has been reported, with a medium level imported feedstock dependency of 34%.

The bio-based platform chemicals portfolio remains relatively limited, with an approximate of 90% of the global bio-based production capacity accounted by a limited amount of platform chemicals. Yet, the list of bio-based platform chemicals is growing and with a projected 10% CAGR. It is essential to progress further with the market penetration of bio-based chemicals, with a holistic consideration of sustainability across the value chain.

Proposals under this topic should:

- Demonstrate novel or improved production routes that are resource and energy efficient towards bio-based platform chemicals which have a large market potential. Such novel improved production routes can encompass different enabling technologies.
- Address and assess feedstock sustainability and imports dependency to produce bio-based platform chemicals from EU-sourced feedstock, including the valorisation of circular biomass sources (e.g., agricultural and agro-industrial waste and residual streams, municipal waste, etc).
- Propose and deduce reaction mechanisms and pathways to produce the studied bio-based platform chemicals; enabling reaction kinetics elucidation and mechanistic understanding. This should be provided also in the context of further advancing process scale-up;
- Include a task to integrate assessment based on the safe-and-sustainable-by-design (SSbD) framework, developed by the European Commission, for assessing the safety and sustainability of chemicals and materials. Under this context,

projects are expected to contribute with and develop recommendations that can advance further the application of the SSbD framework.

- Demonstrate the applicability and added-value of the bio-based chemical building blocks compared to the fossil-based ones, while considering the target end uses in bio-based products.
- Develop and propose a strategic roadmap for closing the competitiveness between well-established fossil-based routes and the proposed novel or improved bio-based routes.

Proposals must implement the multi-actor approach and demonstrate the involvement of all concerned key actors in the bio-based systems, such as feedstock suppliers, researchers and technology providers bio-based processing industries, end-users and consumers (in case of B2C* value chains).

Proposals should also describe their contribution to the Specific CBE JU requirements, presented in section 2.2.3.1, and the Cross-cutting elements, highlighted in section 2.2.3.2.

Proposals should consider synergies with past and ongoing projects.

Topic ID and title	HORIZON-JU-CBE-2023-IA-07: High performance, circular-by-design, bio-based composites				
Budget	EUR 15 million	**Opening date**	20 April 2023	**Deadline 1**	20 September 2023
Budget per project	EUR 7,5 million			**Deadline 2**	/
Type of action	Innovation Actions (IA)				
FTP subsector	P&P				
Keywords	Bio-based thermoset, bio-based thermoplastic, innovative fibres production, recyclable, biodegradability, compostability				
FTP comments					
FTP SIRA 2030 Challenges addressed	6C – 9C – 10A			**FTP relevance**	Medium
				Starting TRL	/
				End TRL	6-7

Expected Outcome:

Successful proposals will contribute to the implementation of the EU Bioeconomy strategy, the Circular Economy Action Plan, the Sustainable Products Initiative (SPI), as well as the New European Bauhaus initiative and the EU Industrial Strategy.

Project results should contribute to the following expected outcomes:

- Availability of sustainable and circular bio-based composites meeting high technical performance requirements;
- Improved circularity and overall sustainability of downstream sectors taking into account both the production and use phase, as well as end of life considerations of composites;
- Significant improvement of environmental performance across the value chain against specified fossil and/or bio-based benchmarks;
- Improved circularity and resource efficiency via practical application of the circular (bio)economy concept;
- Facilitation of market uptake of scalable bio-based solutions.

Scope:

Many sectors applying composites in their products have set a target of shifting from fossil-based towards bio-based and/or materials with a high recycled content. Current commercial bio-based polymers and natural fibre-based materials are however suited to respond only to a part of the projected increased demand. Limitations include not being fully compatible with current industrial processing, not being able to fully meet target application requirements, and/or their higher cost vs existing solutions.

Like conventional polymer matrices for composites, bio-based matrix materials can be divided into two different polymer groups of: i) thermoplastics and ii) thermosets. Thermoplastic polymers are characterised by reversible chemical bonds while thermosets have strong covalent bonds and crosslinking (aspects that may impact their recyclability). Regarding bio-based composites, demonstration activities have mainly focused on the integration of (natural or synthetic bio-based) fibres in fossil-based polymer matrices up to now, rather than fully bio-based composites (i.e. including both bio-based matrix and fibres).

Processability during manufacturing (including aspects of thermal stability), technical performance of the end product along its life cycle, and durability are some of the key challenges to address for bio-based composites. It is also important to address the end of life and circularity challenges of composites, including recycling, re-using or upcycling.

Proposals under this topic should:

- Demonstrate, at a relevant scale, the production of bio-based composite materials and products made from bio-based natural (e.g. plant) fibres and/or bio-based synthetic fibres (e.g. lignin carbon fibres), in bio-based thermoset and/or thermoplastic matrices. Proposals can address one or more classes of fibres and matrices depending on the application(s) and products in scope.
- In addition to the demonstration of the innovative composite end product, proposals may also include demonstration of the production of innovative fibres, matrix or both, as well as full formulation with relevant innovative bio-based additives where applicable.
- Meet end-product technical performance requirements dictated by the final application (e.g. mechanical and thermal stability properties, fire resistance, corrosion resistance, durability…).
- Design for sustainability and with a focus on enabling circularity to address major challenges of end of life in end use sectors. Circularity aspects can include also considerations in increasing the recyclable content, biodegradability and/or compostability (under specified conditions). The choice of the end of life option must be compatible with application and technical performance requirements. In case of recycling, the recycling routes for the composite materials in scope should be tested and a strategy should be proposed on the basis of existing practices and infrastructures.
- Address composites manufacturing issues, minimising CAPEX impacts, employing energy- and resource-efficient processes and minimising the amount of hazardous substances used in production.

- Include a task to integrate assessment based on the safe-and-sustainable-by-design (SSbD) framework, developed by the European Commission, for assessing the safety and sustainability of chemicals and materials. Under this context, projects are expected to contribute with and develop recommendations that can advance further the application of the SSbD framework.

Proposals must implement the multi-actor approach and demonstrate the involvement of all concerned key actors in the bio-based systems, such as researchers and technology providers bio-based processing industries, end-users and consumers (in case of B2C* value chains).

Proposals should also describe their contribution to the Specific CBE JU requirements, presented in section 2.2.3.1, and the Cross-cutting elements, highlighted in section 2.2.3.2.

Proposals should consider synergies with past and ongoing projects.

Topic ID and title	HORIZON-JU-CBE-2023-R-02: Optimised forest-based value chains for high value applications and improved forest management				
Budget	EUR 10 million	**Opening date**	20 April 2023	**Deadline 1**	20 September 2023
Budget per project	EUR 5 million			**Deadline 2**	/
Type of action	Research & Innovation Actions (RIA)				
FTP subsector	F&F, WW, P&P				
Keywords	forest health monitoring, wood quality control, forest-based operations, early intervention actions, forest resilience, valorisation of woody feedstock, Life Cycle Environmental Assessment, Forest Information System for Europe (FISE)				
FTP comments					
FTP SIRA 2030 Challenges addressed	1A, B – 2D, E – 5B - 6E			**FTP relevance**	High
				Starting TRL	/
				End TRL	5

Expected Outcome:

Successful proposals will contribute to the Bioeconomy Strategy, the Long-Term Vision for Rural Areas, Biodiversity Strategy and Forest Strategy by promoting new business models for a successful green transition in primary production and rural areas in line with the European Green Deal objectives. Project results should contribute to the following expected outcomes:

- Improved overall environmental impact of the forest management practice, due to higher understanding and appreciation of natural forest biodiversity, knowledge on climate change impacts, and improved non-invasive quality control.
- Optimized application of the cascading use of biomass in regional industrial ecosystems, based on the principles of circularity, residue up- and re-cycling and industrial symbiosis.
- Increased engagement and innovation capacity of regional and local actors, including bio-based industry, and in particular SMEs, as well as social impact in rural areas.
- Increased consideration of the sustainability objectives, for the multifunctional forestry value chains, contributing to speeding up deployment and maximising the opportunities in new rural industrial ecosystems.
- Strengthened application of the hierarchy of materials use, trade-offs, synergies, business models, participatory approaches, with positive environmental, social and economic impacts in regional and rural development.

Scope:

European forests are important providers of multiple feedstocks and services including biomass used for a wide variety of uses, where the assurance of sustainability plays a key role. Moreover, they host a wealth of biodiversity and act as highly effective carbon sinks, in addition to other multiple functions in bioeconomy (e.g. recreation, 'reconnection with nature'), and ecosystem services (e.g. water retention, soil quality/prevention of erosion etc). However, they are presently facing increasing pressure from climate change and other environmental pressures. Extreme weather conditions and fluctuations, changing pathogen niches, water stress and infestations from insects, rot and fungi, resulting from or worsened by climate change, are having an increasingly stronger negative impact on trees and forest ecosystems. Availability and quality of data and information about the growing forest is a key for success together with digital tools of handling the data in specific purposes of interest. The speed of development in both data handling, machine learning and data collection bring new opportunities to this research field. Forest operators need to adapt to these fast-changing conditions to ensure the continued role of forests in providing biomass, enhancing biodiversity and absorbing atmospheric carbon. Sensing, data acquisition and predictive technologies can prove a key enabler for data-driven decision making in forest-based operations. These range from maintaining forest health through monitoring and corrective actions, to quality control of wood and non-wood biomass, to support decision making on the best application of each biomass (wood and non-wood, when applicable) component.

Proposals under this topic should:

- Develop or upgrade non-invasive solutions for forest health monitoring and wood quality control (including remote and automated operations), taking into account the European and regional variety of forests. The developed solutions should support sustainable forest management via better understanding of forest ecosystem characteristics (including multi-species' interactions in forest ecosystems), and of the relation between growth conditions of the trees/forest ecosystems (presence of parasites or pests, biodiversity, climate change stress) and the resulting woody biomass quality.
- Apply data gathering and monitoring across the whole value chain from forest operations to transport, storage and processing of wood. Use this knowledge for decision support and prediction throughout forest-based operations to optimise the value chain in scope. Decision support is needed for instance to identify the best moment for harvesting/conservation/treatment options. Data gathering and

monitoring of tree growth will assist in anticipating and projecting resulting wood quality and forest ecosystem health.

- Identify early intervention actions to restore and enhance forest health, (e.g. new or better adapted varieties with higher resistance to pathogens, pests, water scarcity adaptation etc) in particular to mitigate and adapt to effects of climate change and to enhance the natural biodiversity potential and forest resilience ('learning from nature' approaches). A feedback loop should be created with the forest management and the ecosystem research sectors to reach this goal.
- Identify the most suitable application(s) for different grades of woody feedstock (which may include wood rot, insect damaged and storm damaged wood, but also local varieties and wood whose characteristics are affected by climate change stress) and apply innovative solutions for their valorisation. When applicable, the activity can include additional sources of primary biomass such as bark, stumps, leaves, nuts etc. aiming at full valorisation of forest biomass. Higher quality of wood means it is increasingly used for high value and durable applications (e.g. construction sector), increasing its carbon storage potential.
- Optionally, proposals can include downstream processing of the selected feedstock for the identified applications, to assess the impact of the innovations introduced by the project in relation to the benchmark.
- In a dedicated task on Life Cycle Environmental Assessment conducted to understand the environmental impact of the proposed solutions, consider in particular the biodiversity enhancement and resource efficiency potentials. Conduct the social impact assessment to understand the impact on rural actors. Identify the economically viable opportunities and new business cases, for the forest economy stakeholders, developing the recommendations and suggestions, in particular for any uptake or deployment actions.

Proposals should build on past or ongoing research projects and collaborate with relevant initiatives, including the Forest Information System for Europe (FISE).

Proposals must implement the multi-actor approach and ensure adequate involvement of all key actors in the rural value chains relevant for this topic including researchers, feedstock producers and suppliers (including forest managers), regional actors, and civil society.

Proposals should also describe their contribution to the Specific CBE JU requirements, presented in section 2.2.3.1, and the Cross-cutting elements, highlighted in section 2.2.3.2.

Topic ID and title	HORIZON-JU-CBE-2023-R-03: Robust and optimised industrial biotech and chemical/industrial biotech processes				
Budget	EUR 10 million	**Opening date**	20 April 2023	**Deadline 1**	20 September 2023
Budget per project	EUR 5 million			**Deadline 2**	/
Type of action	Research & Innovation Actions (RIA)				
FTP subsector	P&P				
Keywords	Process optimisation, microbial hosts, enzymes, (bio)catalyst				
FTP comments					
FTP SIRA 2030 Challenges addressed	6C - 9C			**FTP relevance**	Medium
				Starting TRL	/
				End TRL	5

Expected Outcome:

Successful proposals will contribute to the Industrial Strategy, Green and Digital transition and Circular Economy Action Plan, as well as to the achievement of European Green Deal objectives. Proposals will also contribute to the EU Bioeconomy Strategy implementation, developing processes with improved environmental performances, maximum resource- and energy-efficiency, and optimal cascading use of bio-based feedstock, aiming for 'zero waste' and 'zero-pollution' operations.

Project results should contribute to the following expected outcomes:

- (Industrial) biotech or chemical/(industrial) biotech processing routes with improved efficiency compared to established routes, or completely new processing routes that are currently unavailable;
- Cost-competitive bio-based products;
- Improvement of the environmental performance of bio-based processes through resource-efficient valorisation of sustainable biomass feedstock, while addressing (i.e. reduction/elimination) pollution issues in production processes;
- Significant improvement environmental performance across the value chain against specified fossil and/or bio-based benchmarks;
- Improved circularity and resource efficiency via practical application of the circular (bio)economy concept;
- Availability of broader range of bio-based products meeting market requirements.

Scope:

Industrial biotech processes often have limitations of scaling up and continuous processing. There is an additional complexity of reduced biocatalyst robustness and poor process metrics, especially when applied in sequence with chemical pre-processing. Industrial biotech processes can be used to replace chemical conversion steps which may pose safety or resource efficiency issues (e.g. necessitating complex reactions with protective groups, hazardous solvents etc.), or may be high in energy demand (heat, pressure) etc. Vice versa, some biotechnological conversion steps can be difficult to scale up because of e.g. substrate inhibition, difficult product removal, co-factor regeneration: in this case, chemical conversion steps can provide improvements.

Proposals under this topic should:

- Identify existing, industrially relevant, bio-based process(es) (upstream and conversion steps) and identify the areas of intervention and bottlenecks to improve process flexibility, robustness, techno-economic feasibility and environmental performance. The proposal should consider the case of developing combined processes using biotech and chemical approaches synergistically in order to optimise process and/or (bio)catalyst design for obtaining bio-based products.
- Incorporate reactor design (e.g. membrane reactors, small-scale reactors, microfluidics), process design, process control and optimisation as well as catalysis optimisation aspects that are relevant to also enable tandem chemical/biotech processes, and where applicable for optimisation of continuous production approaches (batch2continuous).
- Identify, optimize/engineer and test more active and robust microbial hosts and their enzymes, or other (bio)catalysts, against relevant process conditions (including physical and chemical stressors). The projects should also consider integrating the biofoundry and synthetic biology advances ;
- Ensure and assess productivity, yield, robustness, flexibility of the process.

Overall, modifications and optimisation of the (physico)chemical steps to further optimize chemical/biotech tandem processes are also in scope and could be considered.

Proposals should also describe their contribution to the Specific CBE JU requirements, presented in section 2.2.3.1, and the Cross-cutting elements, highlighted in section 2.2.3.2.

Where relevant, proposals should seek links with and capitalise on the results of past and ongoing EU funded projects.

Topic ID and title	HORIZON-JU-CBE-2023-R-04: Development of novel, high-performance bio-based polymers and co-polymers				
Budget	EUR 10 million	**Opening date**	20 April 2023	**Deadline 1**	20 September 2023
Budget per project	EUR 5 million			**Deadline 2**	/
Type of action	Research & Innovation Actions (CSA)				
FTP subsector	P&P				
Keywords	Co-polymerisation, pilot scale production, energy and resource efficiency, techno-economic feasibility analysis				
FTP comments					
FTP SIRA 2030 Challenges addressed	6C – 9C			**FTP relevance**	Medium
				Starting TRL	/
				End TRL	4-5

Expected Outcome:

In line with the objectives of the EU Bioeconomy Strategy, Plastics Strategy and Industrial strategy, successful proposals will contribute to development of new, high performance materials for the European industry. Successful proposals may also contribute to achieving the objectives of the Sustainable Products Initiative (SPI) and the Sustainable Textiles strategy.

Project results should contribute to the following expected outcomes:

- Availability of broader range of bio-based products meeting market requirements;
- Unlocking new applications presently not covered by bio-based polymers;
- Improved sustainability, safety and circularity when compared to fossil-based (or bio-based) state of art;
- Evidence of promising product and process performance for reference applications in view of subsequent upscaling;
- Significant improvements in environmental performance across the value chain, against specified fossil and/or bio-based benchmarks;
- Improved circularity and resource efficiency via practical application of the circular (bio)economy concept.

Scope:

Many bio-based monomers and polymers are (relatively) new: while some are well characterised and already produced at industrial scale, there are hundreds of molecular structures with limited application outside the lab, which may be worth exploring in view of future upscaling and market uptake. Often, bio-based polymers have a limited application space in comparison with established fossil-based counterparts also due to

some undesired properties (e.g. brittleness, low glass transition temperature). Co-polymerisation or blending with other materials could also be one way to provide a solution to overcome at least some of these issues, but research in the field is scarce due to their (relative) novelty and unavailability of materials in sufficient quantity (at least pilot scale) to perform testing and characterisation.

Proposals under this topic should:

- Develop polymers with improved or unprecedented properties by:
    - Polymerisation of bio-based monomers with no fossil-based counterpart to produce new polymers with unprecedented properties, and/or
    - Co-polymerisation of (new or known) bio-based monomers to improve the properties of the copolymer with respect to the original polymer(s), and/or
    - Blending of (new or known) bio-based polymers to obtain materials with novel, advanced properties
- Design the polymers so that they are able to match application requirements without using potentially hazardous additives and substances of concern in the end product formulations. Proposals need to specify the end applications sought and involve potential end users to provide specific application requirements.
- Develop pilot scale production and test the products against application requirements, demonstrating high performance and market suitability. Process design choices should take into account energy and resource efficiency showing the potential for future scale up.
- Perform a preliminary assessment of the safety, circularity and overall sustainability of the developed polymers in view of the subsequent scale-up phase. Circularity aspects should be considered from the early stages of material design, based on existing or novel end of life (EoL) options. In the absence of suitable EoL options, projects should highlight R&I gaps that may be taken up by future projects.
- Perform a preliminary techno-economic feasibility analysis of the subsequent scale-up phase, including market considerations (demand; target price; competing products; estimated lead time)

Proposals should also describe their contribution to the Specific CBE JU requirements, presented in section 2.2.3.1, and the Cross-cutting elements, highlighted in section 2.2.3.2.

Where relevant, proposals should seek links with and capitalise on the results of past and ongoing EU funded projects.

Topic ID and title	HORIZON-JU-CBE-2023-R-05: Pre-normative research to develop standards for biodegradability of bio-based products in controlled and in open environments				
Budget	EUR 5 million	**Opening date**	20 April 2023	**Deadline 1**	20 September 2023
Budget per project	EUR 5 million			**Deadline 2**	/
Type of action	Research and Innovation Actions (RIA)				
FTP subsector	P&P				
Keywords					
FTP comments					
FTP SIRA 2030 Challenges addressed	9A, D			**FTP relevance**	Indirect
				Starting TRL	/
				End TRL	5

Expected Outcome:

The successful proposal will enable the bio-based industries in the Union to contribute to the enhancement of European bio-based industrial sustainability and to the development of innovative and sustainable value-chains in the bio-based sectors. Project results will contribute to deliver bio-based solutions which are biodegradable either in controlled or in open environments, with reduced environmental impacts on soil, water and air quality, biodiversity and climate, in line with the EGD objectives, the EU circular economy and the EU zero pollution action plans.

Project results should contribute to the following expected outcomes:

- Development and validation of the methodology to test the safe biodegradation of bio-based materials and products both in controlled and in open environments
- Support to the development of standard(s) for biodegradability in controlled/open environments and clear labelling for end consumers and customers
- Societal acceptance of bio-based circular bio-based solutions and products
- More responsible and informed choices in consumption
- Significant improvement in environmental sustainability and safety across the bio-based value chains
- Significant contribution to the objectives of the R&I missions 'A soil deal for Europe' and 'Restore our oceans and waters'

Scope:

The amount of waste littered in the open environment and causing pollution from harmful substances released from such waste streams, e.g., from plastic littering, has

reached the level of a global emergency, especially affecting soil and water quality and biodiversity in land and marine environments. The overall low level of recycling of many waste streams, including collected plastic waste, is also part of such global pollution challenge. Biodegradability of materials and products for targeted applications may offer viable end-of-life solutions in case of safe and sustainable biodegradation either under controlled conditions, i.e., in composting plants and anaerobic digestors, or in open environments. However, there is still a need for clarity on how to label biodegradable products and a lack of standards covering the range of conditions under which a (claimed) biodegradable material actually biodegrade to the desired extent and in the desired time frame to ensure a safe end-of-life.

Proposals under this topic should:

- Select applications for biodegradable bio-based materials and products. Such applications should include materials and products which show environmental benefits from being biodegradable in one (or more) of the following cases: i) controlled environments (if separately collected after their use), such as industrial composting plants, anaerobic digesters and home-composting, for example in cases where products and materials are contaminated from food or from other organic substances during their use; ii) open environments, for example in those cases of uncontrolled waste littering, or in those cases where the products are used already in the open environment and their biodegradation 'in situ' is the expected end-of-life.
- Identify gaps and needs of existing methods and standards to test the biodegradability of materials and certification schemes applicable to the bio-based material and products selected.
- Select a set of combinations of bio-based products and end-of-life environments. The set of combinations should cover all of the following end-of-life pathways in: industrial composting plants, anaerobic digesters and home-composting, as controlled environments, and soil and water, as open environments. The choice of products and applications should be based on the review of existing standards and gaps and on the indications from the current legislative framework, as well on current market volume, projected market volume (to capture emerging materials) and, in the case of end-of-life in open environments, the likelihood of the product being released (fully or partially) to the environment during its use of afterwards.
- Design new/improve existing tests of biodegradability in the specific environments for the selected set of combinations, under representative ranges of physical/chemical conditions. The tests should include the monitoring of all relevant environmental impacts, including, but not limited to, emissions, eco-

toxicity and any impacts on natural ecosystems, from biodegraded materials, including from micro-plastics, and from their additives during the biodegradation process. The tests should include, as a parameter of biodegradation process, the time-frame of partial up to full biodegradation. A risk assessment should be planned as well, based on the monitored parameters.

- Validate the tests of biodegradability of the selected set of combinations and develop protocols for their replication. The trials of biodegradation of bio-based materials in different environments should be performed and monitored under representative ranges of physical/chemical conditions.
- Develop a proposal for the development and/or the update of standards for tests of biodegradability for the selected applications.
- Perform a survey among the concerned consumers and end-of-life stakeholders to get insights on the information necessary on the correct use and end-of-life disposal options of the selected bio-based products. This includes information about the specific conditions/environments for use and end-of-life (e.g., recycling, composting, anaerobic digestion, home-composting, 'in situ' biodegradation, etc.) and recommendations on the integration of such information in the existing labelling systems.
- Design measures to deliver transparent communication, aiming at improved societal acceptance of bio-based innovation and at supporting consumers, public procurers and the business-to-business market in making responsible and informed choices. It should include the information about the environmental impacts, including on ecosystems, of uncontrolled disposal and of uncontrolled littering into the open environments and of the consequent risks.

In order to achieve the expected outcomes, the consortium should include a standardisation body, to monitor and be consulted on the development of the tests, to the development of the standers proposal, to participate in the consultations on the labelling systems. Suggested members of the consortium are researchers in the bio-based technologies, bio-based industries, trade bodies, consumers' associations and any relevant stakeholder along the value chain of industrial bio-based systems, as well as waste management companies and facilities.

An advisory board shall be established by the project. The Bio-Based Industries Consortium and a representative from the European Commission should be part of this advisory board to provide expertise in the implementation and follow up of the different tasks.

Proposals should also describe their contribution to the Specific CBE JU requirements, presented in section 2.2.3.1, and the Cross-cutting elements, highlighted in section 2.2.3.2.

Where relevant, proposals should seek links with and capitalise on the results of past and ongoing EU funded projects.

Topic ID and title	HORIZON-JU-CBE-2023-S-02: Extending regional assessment of environmental sustainability screening for the bio-based sectors				
Budget	EUR 3 million	**Opening date**	20 April 2023	**Deadline 1**	20 September 2023
Budget per project	EUR 3 million			**Deadline 2**	/
Type of action	Coordination and Support Actions (CSA)				
FTP subsector	F&F, WW, P&P				
Keywords	environmental sustainability assessment, Life Cycle Assessment (LCA), market growth, biomass availability, LULUCF, policy analysis, awareness raising				
FTP comments					
FTP SIRA 2030 Challenges addressed	3E – 4 – 10D			**FTP relevance**	Indirect
				Starting TRL	/
				End TRL	/

Expected Outcome:

The successful proposal will enable the bio-based industries in the Union to contribute to the fair and just green transition, enhancement of European bio-based industrial sustainability and socio-economic viability at regional level, and to boost inclusive innovation of sustainable value-chains in the bio-based sectors. Project results will contribute to increasing engagement, understanding and participation of regional stakeholders, including policymakers, to develop policy on bio-based solutions, in line with the EGD objectives, updated EU Bioeconomy Strategy, Biodiversity Strategy, the EU circular economy and the EU zero pollution action plans.

Project results should contribute to the following expected outcomes:

- Increased deployment of circular bio-based solutions in the regional settings, especially of the actors currently lagging behind90, based on correct understanding of sustainability challenges and opportunities/benefits, while ensuring inclusive engagement of market operators and civil society, thus contributing to regional revitalization and fair and just green transition.
- Implement (i.e. integrate into regional/local policies) monitoring systems and assessment of the environmental impacts and circularity of bio-based systems for the EU single market and for international trade.
- Improved understanding and awareness by the regional and local stakeholders including at the authorities' level, of the sustainability and circularity screening methodologies (for resources such as water, biodiversity, land use including 'marginal land' potentials/limitations, biological primary and secondary feedstock, which are all critical for the development of bio-based sectors and applications), supporting higher innovation capacity and inclusion of such methodologies into the regional bioeconomy strategies and action plans based on local resources, as well as social engagement.

- Improved resource efficiency of local resources and lowered environmental impact of the circular bio-based industrial activities in the regional and local scales (maximizing biodiversity enhancement and restoration through bio-based solutions, and the climate adaption and resilience of bio-based systems).

Scope:

While the bioeconomy carries great potential for achieving various policy aims related to sustainability, sustainability is not an intrinsic characteristic of the bioeconomy, but a potential it could achieve. For this reason, and to achieve the expected benefits, improving our capacity to assess the environmental impacts of bioeconomy (including any bio-based activity) development is of great importance. Regions can be considered the most appropriate territorial level at which to implement bioeconomy strategies, including for the innovative bio-based sectors. The aim of this action is to support decision-makers to incorporate considerations of ecological limits into their regional bioeconomy strategies and roadmaps, when it comes to circular bio-based activities.

Proposals under this topic should:

- Consider the existing datasets related to environmental sustainability assessment and its methodology options and in particular Life Cycle Assessment (LCA) data developed under the past BBI JU projects, as a baseline to develop/expand guidelines, digital tools and other policy recommendations for the regional-level authorities and other bio-based sector' stakeholders. Within the scoping of methologies for safe and sustainability assessment, the safe and sustainable by design assessment framework should be considered.
- Include into study the following considerations: i) projections on bio-based chemicals and materials market growth, their value chains including biorefining options (small, including mobile, and large scale) and applications at EU/national and regional level, based on available sources, ii) tools to assess/model biomass (including secondary) availability requirements for chemicals, polymers and materials. iii) cover scenarios of growth while estimating impacts on food security Land Use, Land Use Change and Forestry (LULUCF), biodiversity and ecosystems integrity (including potentials/limitations of biomass provision from marginal land).
- Perform a policy analysis (e.g. conflicting policies/trade-offs)/SWOT) and provide recommendations to policy makers at local/regional/EU level, taking into account the geographical distribution of the feedstock, and considering the regional ecological and socio-economic boundaries, as well as the related social impacts

- Collect and analyze the (range of) best available industrial bio-based systems in the scope of CBE JU within the EU in terms of environmental and circular performances,
- Develop practical forums for case studies' collection and exchange of best practice at regional level, to build a preliminary set of benchmarks or references of best performing industrial systems, across a diversity of European regions, providing an inclusive platform for all stakeholders, including expert voices, market actors (especially SMEs), civil society (especially NGOs) and policy makers.
- Deploy actions to create or improve awareness of the policy makers related to opportunities in bio-based sectors, with a specific focus on under-represented regions.
- Ensure synergies and complementarities with parallel activities, including those of Circular Cities and Regions Initiative (CCRI) and the projects funded under the Horizon Europe programme on bioeconomy governance, in particular when related to circular bio-based innovation systems.

Proposals must apply the concept of the 'multi-actor approach' and ensure adequate involvement of civil society, public authorities and other relevant actors at regional scales, in particular in policy-making capacity. This will contribute towards the aim to support 'fair and just green transition', and aiming at not leaving anyone behind in this process.

Proposals should also describe their contribution to the Specific CBE JU requirements, presented in section 2.2.3.1, and the Cross-cutting elements, highlighted in section 2.2.3.2.

An Advisory Board shall be established by the project. The Bio-Based Industries Consortium should be part of this Advisory Board to provide expertise in the implementation and follow up of the different tasks and provide support to the organisation of meetings and workshops.

Cooperation with macro-regional initiatives such as BIOEAST Initiative is encouraged. Explore the possibility to collaborate with and/or provide inputs to the European Commission Knowledge Centre on Bioeconomy.

International cooperation is encouraged, in order to collect best practices (indicators, methodologies, tools and data) outside EU and to expand the outreach of projects outputs, as a win-win solution, while taking care of the European industrial competitiveness.