Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: the proposals must apply the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [185].

Expected Outcome: The successful proposal will be in line with the European Green Deal priorities and the farm to fork strategy for a fair healthy and environmentally friendly food system, as well as with the EU's climate ambition for 2030 and 2050. It will support R&I to foster advances in research related to integrated approaches along the food system for detecting, assessing, and mitigating food safety risks influenced by climate change. This is along with contributing to the transformation of food systems to deliver co-benefits for climate (mitigation and adaptation), biodiversity, environmental sustainability and circularity, dietary shift, sustainable healthy nutrition and safe food, food poverty reduction and empowerment of communities, and thriving businesses.

Project results are expected to contribute to all of the following expected outcomes:

- Improved understanding of the medium to longer-term climate change impacts in relation to food safety, and the effect these could have on food systems actors from farm to fork;

- Identification, development and widespread dissemination of mitigation and adaptation measures to reduce/prevent climate change-related food safety risks (individual and cumulative risks). Contribution to the farm to fork strategy objectives, in particular the contingency plan for ensuring food supply and food security and deliver co-benefits on each of the Food 2030 priorities as well as contributing to policy and food safety risk assessment needs and priorities, in particular regulatory control and enforcement aspects.

Scope: Proposals should contribute to all of the following aspects:

[185] This decision is available on the Funding and Tenders Portal, in the reference documents section for Horizon Europe, under 'Simplified costs decisions' or through this link: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/ls-decision_he_en.pdf

- Proposals must implement the 'multi-actor approach' and ensure adequate involvement of academia, research-technology organizations, food businesses and other relevant actors of the value chain.

- Anticipate, including through modelling, how climate change may affect food safety in Europe and in particular by increasing the potential for the emergence/re-emergence of new hazards and the changes in exposures and risks;

- Propose methods to monitor the impact of climate change on food safety across food systems and their main critical areas. Explore how climate change could impact risk assessment methods and understand how risk assessment methodologies may need to evolve to meet new climate changed related challenges;

- Analyse the effect of climate change (extreme temperatures, etc.) and its impact with respect to: existing food safety hazards throughout the entire food supply chain (from farm to fork), and risk factors including the appearance of (re)emerging hazards.

- European regions should participate as "demonstrators" areas facilitating research and innovation under different climate conditions;

- Proposals should include a dedicated task, appropriate resources and a plan on how they will collaborate with other projects funded under this topic or other topics such as the HORIZON-CL6-2021-BIODIV-01-11 and HORIZON-CL6-2021-FARM2FORK-01-16 and ensure synergies with relevant activities carried out under other initiatives such as the One Health European joint programme and the LIFE programme ("Strategic Integrated Projects") due to their regional and climate approach.

- Proposals should also foresee the involvement of the European Food Safety Authority (EFSA) as part of the future action once the project starts.

In addition proposals are encouraged to:

- Increase the use of big data and/or artificial intelligence to elucidate the complex interactions between climate change and food safety. Proposals are expected to develop models to understand these interactions experimented and analysed for their replication potential. Proposals might build on existing and new knowledge, data, and models exploiting the full potential of big data and/or artificial intelligence;

- Explore, map and propose funding synergies strategies among European, national and regional programmes and instruments under this scope in a long-term vision;

- Connect research and innovation activities in this topic with start-ups ecosystems.

HORIZON-CL6-2024-FARM2FORK-01-5: Creating smart and attractive tools to enhance healthy and sustainable food provision, eating and treating of food at home

Specific conditions

Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 6.00 million.
Type of Action	Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: the proposals must apply the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Technology Readiness Level	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [186].

Expected Outcome: The topic is in line with the European Green Deal priorities and the farm to fork strategy for a fair, healthy and environmentally friendly food system, as well as of the EU's climate ambition for 2030 and 2050. This will contribute to the Food 2030 priorities: nutrition for sustainable healthy diets, climate, environment, circularity and resource efficiency, innovation and empowering communities. The EU's farm to fork strategy states that: "European diets are not in line with national dietary recommendations, and the 'food environment'[187] does not ensure that the healthy option is always the easiest one".

The overall aim of this topic and associated R&I activities is to enhance healthy and sustainable diets aligned with national dietary advice by empowerment of citizens and their capacity to eat and cook at home in line with budgetary and time constraints as well as their

[186] This decision is available on the Funding and Tenders Portal, in the reference documents section for Horizon Europe, under 'Simplified costs decisions' or through this link: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/ls-decision_he_en.pdf

[187] European Public Health Alliance (2019) "Food environments are the physical, economic, political and socio-cultural contexts in which people engage with the food system to make their decisions about acquiring, preparing and consuming food." https://epha.org/what-are-food-environments/#:~:text=%E2%80%9CFood%20environment%20refers%20to%20the,%2C%20preparing%20and%20consuming%20food.%E2%80%9D

living situation. The activity will develop tools that can be considered by national competent authorities for implementation. Interventions should not target citizens directly, as full alignment with national policies and advice on nutrition and health needs to be ensured.

Projects results are expected to contribute to all the following expected outcomes:

- Empowered citizens supported by tools and applications to make healthy and sustainable food provision, cooking and eating, and treating of food at home the easiest choice;
- Enhanced uptake of beneficial tools and applications by citizens, especially those who need it most, considering socio-economic characteristics and differences across EU and Associated countries.

Scope: Urban lifestyles have led to more consumption of ultra-processed and packaged food[188]. Cooking skills may enhance healthy and sustainable diets, so supporting consumers provides potential[189]. There are also indications, that social change might be enhanced by encouraging minorities to publicly challenge unsustainable norms during social interactions[190]. This potential can be exploited to drive change in behaviour by citizen engagement.

Proposals are expected to address the following:

- Develop tools and applications that enhance citizens to have a healthy and sustainable food provision, diet and treating of food at home/ or discourage unhealthy and unsustainable choices that can be considered by national policy makers and private actors;
- Include in approaches 'culinary culture dimension' such as based on nationality, religion, culture, regionality and seasonality etc., and time and financial constraints;
- Engage citizens in solutions to create inclusive and sustainable solutions for broad uptake;
- Ensure that national nutritional policies and advice are respected as well as food safety;
- Link solutions to the issue of food waste and to the need to reduce household wastes generally, notably plastics, as part of a circular economy to include all aspects of sustainability tools that can be considered by national policy makers for implementation;
- Take a holistic approach, e.g., delivery (including prepared meals, micro deliveries, decentralised pick-up points) including transport and distribution aspects, short supply chains, marketing, sustainable packaging, recycling and reduction in food waste;

188 FAO. "Urban Food Action (UFA)", 2019

189 Hartmann, C., Dohle, S., Siegrist, M. Importance of cooking skills for balanced food choices, Appetite 65 (65), 125-131, 2013

190 Bolderdijk, W.M., Jans,L. Minority influence in climate change mitigation, Current Opinion in Psychology 41, 25-30, 2021 https://doi.org/10.1016/j.copsyc.2021.02.005

- Develop a sample plan to make available to Member State and Associated Countries authorities for several countries on how to enhance uptake of beneficial tools and applications considering different socio-economic characteristics of citizens and national laws.

Proposals must implement the 'multi-actor approach' and ensure adequate involvement of among others health actors, such as nutritionists, doctors and nurses.

Proposals should include a dedicated task, appropriate resources and a plan on how they will collaborate with other projects funded under this topic and under the topic HORIZON-CL6-2021-FARM2FORK-01-15: "Transition to healthy and sustainable dietary behavior".

Proposal should apply social innovation and citizen engagement for inclusive and long-term solutions beyond the life cycle of the project and include a strong involvement of citizens/civil society, together with academia/research, industry/SMEs/start-ups and government/public authorities.

This topic should involve the effective contribution of SSH disciplines.

HORIZON-CL6-2024-FARM2FORK-01-6: Citizens' science as an opportunity to foster the transition to sustainable food systems

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: the proposals must apply the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Technology Readiness Level	Activities are expected to achieve TRL 3-5 by the end of the project – see General Annex B.

Expected Outcome: This topic is in line with the European Green Deal priorities and the farm to fork strategy for a fair, healthy and environmentally friendly food system, as well as of the EU's climate ambition for 2030 and 2050. This will contribute to the Food 2030 priorities: nutrition for sustainable healthy diets, climate, environment, circularity and resource efficiency, innovation and empowering communities, and thriving businesses.

Data-driven solutions in food systems also benefit the European Open Data Directive to share public data[191] and envisioned data spaces[192] as well as provide a base of AI deployment as enablers of the European Green Deal objectives.

Projects results are expected to contribute to all the following expected outcomes:

- Better understanding of citizens' food consumption behaviour, the factors influencing choices and drivers that would facilitate changes in behaviour in an inclusive manner towards healthy and sustainable food consumption practices;
- Contribution to positive changes in individual behaviour towards healthy and sustainable food consumption and sustainable food system transformation.

Scope: Currently, consumers are sceptical to share data, least to the government[193]. As there is a need for more data-driven decision making, engaging citizens in research through the provision of data on their practices, choices and attitudes towards the food system provides potential for a more direct citizen engagement in transforming food systems. The approach allows to exchange ideas, solutions, and opinions to encourage Responsible Research and Innovation (RRI) in driving sustainable food system transformation.

Citizen's science[194] is a fast-growing mode of research and innovation[195] that can allow for enhanced food system transformation driven by engagement, trust and transparency. It can leverage relevant private relevant data to take stock of current citizens' behaviour towards the food system, including aspects such as food consumption, marketing and food environment influence, health, mobility, regionality/locality, food-related waste generation and management, etc. by using collective intelligence.

Proposals are expected to address all the following:

- Explore the potential of 'citizen's science' in the food systems domain by engaging and empowering citizens in using and providing data and technology to ensure inclusive solutions to drive sustainable food system transformation by promoting sustainable food consumption, reducing food waste, and creating a resilient food system;

191 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L1024&from=EN

192 DIGITAL WP 2021-2022

193 L. Timotijevic, S. Astley, M.J. Bogaardt, T. Bucher, I. Carr, G. Copani, J. de la Cueva, T. Eftimov, P. Finglas, S. Hieke, C.E. Hodgkins, B. Koroušić Seljak, N. Klepacz, K. Pasch, M. Maringer, B.E. Mikkelsen, A. Normann, K.T. Ofei, K. Poppe, G. Pourabdollahian, M.M. Raats, M. Roe, C. Sadler, T. Selnes, H. van der Veen, P. van't Veer, K. Zimmermann, Designing a research infrastructure (RI) on food behaviour and health: Balancing user needs, business model, governance mechanisms and technology, Trends in Food Science & Technology, Volume 116, 2021, Pages 405-414, https://doi.org/10.1016/j.tifs.2021.07.022, Note: this paper discusses an international research infrastructure.

194 Citizen science n. scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions (Oxford English Dictionary)

195 wp-11-widening-participation-and-strengthening-the-european-research-area_horizon-2021-2022_en.pdf (europa.eu)

- Identify the challenges and drivers encouraging citizens to share data to ensure inclusive food system transformation;

- Develop and test tools by using data and technology to enhance uptake of healthy and sustainable diets and foster sustainable food system transformation;

- Explore which data types are most useful to share (behavioural data, data from private providers, such as data gathered by relevant apps, stated data…etc.) and how to meaningfully harmonize data to use data for food system transformation by different actors, and which tools to best make use of, such as Artificial Intelligence (AI) while analysing how consumer data can be shared in an anonymized and safe way complying with the General Data Protection Regulation (GDPR) rules;

- Make concrete efforts to ensure that the data produced in the context of this project is FAIR (Findable, Accessible, Interoperable and Re-usable), particularly in the context of real-time data feeds, exploring workflows that can provide "FAIR-by-design" data, i.e., data that is FAIR from its generation;

- Proposals should include a dedicated task, appropriate resources and a plan on how they will collaborate with other projects funded under this and the topic HORIZON-CL6-2022-GOVERNANCE-01-10 "Piloting approaches and tools to empower citizens to exercise their "data rights" in the area of food and nutrition" and HORIZON-WIDERA-2021-ERA-01-60: "A capacity-building and brokering network to make citizen science an integral part of the European Research Area";

- Proposals are encouraged to cooperate with actors such as the European Commission's Joint Research Centre (JRC). The JRC may provide expertise on how to strengthen the relationship between scientists and European policy makers and to promote research and collaboration on food systems science.

- Connect personal data on food to other areas, such as mobility and health and identify synergies; projects shall leverage the data and services available through European Research Infrastructures federated under the European Open Science Cloud and, where relevant, establish synergies with the Data Space for smart communities[11] and make use of open standards and technical specifications, for example the Minimum Interoperability Mechanisms (MIMs Plus);

- Proposals must implement the 'multi-actor approach' and ensure adequate involvement of citizens/civil society, together with academia/research, industry/SMEs and government/public authorities and include social innovation as the solution is at the socio-technical interface and requires social change, new social practices and social ownership;

- This topic should involve the effective contribution of SSH disciplines.

HORIZON-CL6-2024-FARM2FORK-01-7: Impact of the development of novel foods based on alternative sources of proteins

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 9.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: the proposals must apply the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: In line with the European Green Deal priorities, the farm to fork strategy for a fair, healthy and environment-friendly food system, and the EU's climate ambition for 2030 and 2050, the successful proposal will support R&I to promote the production, provision and safe consumption of alternative sources of protein, and dietary shifts towards sustainable healthy nutrition, contributing to the transformation of food systems to deliver co-benefits for climate (mitigation and adaptation), biodiversity, environmental sustainability and circularity, sustainable healthy nutrition and safe food, food poverty reduction, empowerment of communities, and thriving businesses.

Novel foods are foods that have not been consumed to a significant extent in the EU before 15 May 1997. They can be newly developed, innovative foods, foods produced using new technologies and production processes, as well as foods that are or have been traditionally eaten outside of the EU. Alternative sources of proteins (i.e. other than conventional sources of proteins such as meat and dairy or mainstreamed from classical crops) may be considered as novel foods. Novel Foods can only be authorised in the EU market if they do not pose any risk to human health, the food's intended use does not mislead consumers and are not nutritionally disadvantageous.

Projects results are expected to contribute to all of the following expected outcomes:

- Better and complete information provided about the impact this specific innovation, i.e. the development of novel food (e.g., insect protein, micro and macro algae-based products, microbial proteins, food/aquaculture by-products) would have especially for the food system in terms of sustainability (particularly economic and social aspects).

- Solutions that can help achieving the objectives of the European Green Deal, especially the farm to fork strategy, and Food 2030 priorities: nutrition for sustainable healthy

diets, climate and environment, zero pollution, circularity and resource efficiency, innovation and empowering communities (e.g., meeting the needs, values and expectations of society in a responsible and ethical way).

Scope:

- Assess the potential of insect protein, micro and macro algae-based products, microbial proteins and/or food/aquaculture by-products in terms of market development taking into account the farm to fork strategy objectives based on up-to-date/new knowledge about them.
- Assess their economic impact (e.g., price, production cost, share of market, etc.) and assess the impact such development will have on other sectors, across the food and the bio-based systems.
- Assess their social impact (e.g., health aspects, consumer acceptance including considering gender and age aspects, cultural aspects).
- Assess their potential (as well as related risks and trade-offs) to address the most relevant European Green Deal objectives, including environmental ones, compared to conventional sources of proteins (e.g. meat and dairy), and the need to shift to sustainable and healthy diets.
- Implement the multi-actor approach by involving a wide range of food system actors and conducting inter-disciplinary research.
- International cooperation is strongly encouraged.
- Where relevant, activities should build and expand on the results of past and ongoing research projects (especially related to environmental aspects developed by the projects funded under HORIZON-CL6-2021-FARM2FORK-01-12 and HORIZON-CL6-2022-FARM2FORK-01-07, and projects funded under other relevant topics in this Work Programme). Projects should have a clear plan as to how they will collaborate with other projects selected under this topic (if funding of more than one project is possible) and any other relevant topic. They should participate in joint activities, workshops, focus groups or social labs, and common communication and dissemination activities, and show potential for upscaling. Applicants should plan the necessary budget to cover these activities.

HORIZON-CL6-2024-FARM2FORK-01-8: Preventing and reducing food waste to reduce environmental impacts and to help reach 2030 climate targets

Specific conditions	
Expected EU contribution per	The Commission estimates that an EU contribution of around EUR 4.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a

project	proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 9.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The Joint Research Centre (JRC) may participate as member of the consortium selected for funding. The following additional eligibility criteria apply: the proposals must apply the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: In line with the European Green Deal priorities, the farm to fork strategy for a fair, healthy and environmentally friendly food system, and the EU's climate ambition for 2030 and 2050, the successful proposals will support R&I to prevent and reduce food waste[196]. They should therefore contribute to the transformation of food systems to deliver co-benefits for climate (mitigation and adaptation), biodiversity, environmental sustainability and circularity, sustainable food consumption, food poverty reduction and empowerment of communities, and thriving businesses.

Projects results are expected to contribute to all the following outcomes:

- Reliable data on the environmental impacts related to food waste, in particular GHG emissions;
- Better understanding of the food waste prevention efforts that will accelerate EU's progress to reach climate targets and will help reduce environmental impacts (including on biodiversity) across the food supply chain;
- Integration of actions related to food waste prevention/reduction into emission reduction instruments, national energy and climate plans and other relevant EU initiatives;
- Contribution to the farm to fork objectives and to the Food 2030 priorities: nutrition for sustainable healthy diets, climate, biodiversity and environment, circularity and resource efficiency, innovation and empowering communities.

Scope: Climate change and environmental degradation are recognised as the main challenges to tackle in the European Green Deal. Food waste prevention and reduction could contribute to climate change mitigation and adaptation, pollution reduction, better air quality, biodiversity preservation...

[196] Definition of food waste included in the Waste Framework Directive: *Food waste means all food as defined in Article 2 of Regulation (EC) No 178/2022 of the European Parliament and of the Council that has become waste*.

The 2030 climate target plan sets out to raise the EU's ambition on reducing greenhouse gas emissions to at least 55% below 1990 levels by 2030.

Member States have prepared integrated national energy and climate plans (NECPs) to achieve their 2030 targets.

The Commission brought support and expertise to Member States in the elaboration of their NECP and will continue to do so by supporting the full implementation of the plans, and prepare their update due in 2023[197].

Key policies within the framework of the European Green Deal also include the EU biodiversity strategy for 2030, the farm to fork strategy, and the EU zero pollution action plan.

Proposals should address all the following points:

- Provide reliable quantitative data for several Member States/Associated Countries on the environmental footprint of food waste, based on Life Cycle Assessments, and more specifically the Product Environmental Footprint (PEF) method developed by the European Commission.
- A specific focus on the following Environmental Footprint (EF) impact categories identified in the PEF method is required:
    - Climate change (main focus)
    - Land use
    - Water use
    - Resource use
    - Other relevant categories that could help assess the impacts on biodiversity.
- Combined data for the entire food supply chain but also data for each stage of the food supply chain[198] are expected, including a focus on sorting, storage, logistics and waste treatment. A detailed analysis for relevant food products is also expected.
- Concerning the climate change category in particular, provide estimates on the life cycle GHG emissions due to food waste. Potential double counting of avoided emissions should be analysed. If possible, these data would have to be compared to GHG reductions assumed by Member States in the NECPs – in order to enable measuring of potential impact from food waste prevention measures towards reaching the objectives of NECPs.

197 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0564&from=EN

198 The main stages of the food supply chain identified by the Commission in the Delegated Decision (EU) 2019/1597 establishing a common EU methodology to measure food waste: primary production; processing and manufacturing; retail and distribution; restaurants and other food services; households.

- Elaborate different pathways of food waste prevention/reduction interventions and assess their potential for climate change adaptation/mitigation, reduction of pollution and preservation of biodiversity. The analysis should be carried out for several types of stakeholders.

- Assess the potential for rebound effects due to food waste reduction[199].

- Carry out mapping activities of relevant emission reduction and funding instruments and other EU initiatives in which food waste prevention/reduction could be well integrated.

- Establish a set of recommendations on how to integrate food waste prevention/reduction in those instruments and initiatives (including NECPs).

- Implement the multi-actor approach (see eligibility conditions) by conducting inter- and trans-disciplinary research and involving a wide range of food system actors (including possibly food start-ups).

Proposals should also build on past or ongoing research projects and ensure synergy with relevant initiatives. In particular, they should build on the work done by the Commission's Joint Research Centre in support of the EU Platform on Food Losses and Food Waste[200] and be aligned with the Environmental Footprint method developed by the Commission. The possible participation of the JRC in the project would consist of gathering data collected in the projects into a consistent framework for modelling food waste. It will also ensure that the proposed approach will be compatible with existing databases for the assessment of environmental impacts and aligned with the Environmental Footprint method, helping translating results into policy relevant outputs.

Proposals should include a dedicated task, appropriate resources and a plan on how they will collaborate with other projects funded under this topic and any other relevant topic, e.g. by participating in joint activities, workshops, etc. Selected proposals under this topic will thus need to work together and adapt their initial work plan. Communication and dissemination activities should also be grouped and coordinated in a complementary manner.

This topic requires the effective contribution of SSH disciplines.

HORIZON-CL6-2024-FARM2FORK-01-9: Microbiome for flavour and texture in the organoleptic dietary shift

Specific conditions	
Expected EU contribution per	The Commission estimates that an EU contribution of around EUR 4.50 million would allow these outcomes to be addressed appropriately.

199 e.g.: if households save money through reducing waste, they may use this additional income to purchase other products/services with potentially higher environmental impacts. e.g.: impact from reduction of food waste on energy generated from waste.

200 https://ec.europa.eu/food/safety/food-waste/eu-actions-against-food-waste/eu-platform-food-losses-and-food-waste_en

project	Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 9.00 million.
Type of Action	Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: International organisations with headquarters in a Member State or associated country are exceptionally eligible for funding. The following additional eligibility criteria apply: the proposals must apply the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Technology Readiness Level	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.

Expected Outcome: The successful proposal should be in line with the European Green Deal priorities, the farm to fork strategy and Food 2030 priorities[201] for a fair healthy and environmentally friendly food system, as well as with the EU's climate ambition for 2030 and 2050. It will support innovation to foster advances related to microorganisms for safer, healthier and more environmentally friendly food industry. This is in addition to contributing to the transformation of food systems to deliver co-benefits for climate (mitigation and adaptation), biodiversity, environmental sustainability and circularity, dietary shift, sustainable healthy nutrition and safe food, food poverty reduction and empowerment of communities, and thriving businesses.

Projects results are expected to contribute to all of the following expected outcomes:

- Applicable business solutions in new precision fermentation/ post-fermentation techniques;
- Develop bioinformatics prediction of smell, texture, colour and taste of microbes to create new nuances and flavours in cooperation with chefs/restaurants;
- New, improved and demonstrated microbial fermentations to yield dairy, fish or meat flavours and textures to plant-based foods and ingredients as well as to exploit flavour and texture enhancing properties of fermented vegetables;
- Clearly explain how the proposal will deliver co-benefits to each of the Food 2030 priorities: nutrition for sustainable healthy diets, climate, biodiversity and environment, circularity and resource efficiency, innovation and empowering communities.

[201] https://ec.europa.eu/info/publications/food-2030-pathways-action-research-and-innovation-policy-driver-sustainable-healthy-and-inclusive-food-systems-all_en

Scope: The need for a holistic approach to realize the full potential of microbiome innovation has to develop bioinformatics prediction of smell and taste of microbes to create new nuances and flavours.

Proposals are expected to address the following:

- Develop and pilot innovations to provide new precision fermentation/ post-fermentation techniques to foster dietary shift by enhancing organoleptic properties (smell, texture, colour, taste).
- Development of new microbial biomasses that can be a source of micro and macro nutrients for humans.
- Demonstrate the safety of the developed approach, in accordance with relevant EU regulatory frameworks, related to its placing on the market.
- Produce food with higher nutritional quality, and potential for positive effects on the human microbiome.
- Assess the economic and social impact of the products.
- Proposals must implement the 'multi-actor approach' and ensure adequate involvement of academia, research-technology organizations, small-medium enterprises (including start-ups), restaurants, food businesses and other relevant actors of the value chain.
- In order to achieve expected outcomes international cooperation is strongly encouraged, in particular in the framework of the International Bioeconomy Forum.
- Proposals should include a dedicated task, appropriate resources and a plan on how they will collaborate with other projects funded under this topic and other relevant topics. They should participate in joint activities, workshops, focus groups or social labs, as well as organise common communication and dissemination activities and show potential for upscaling. Applicants should plan the necessary budget to cover these activities.

Targeted international cooperation

Proposals are invited against the following topic(s):

HORIZON-CL6-2024-FARM2FORK-01-10: EU-African Union cooperation on agroforestry management for climate change adaptation and mitigation

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Indicative budget	The total indicative budget for the topic is EUR 18.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: Due to the scope of this topic, legal entities established in all African Union member states* are exceptionally eligible for Union funding. * "African Union member states" includes countries whose membership has been temporarily suspended. International organisations with headquarters in a Member State or associated country are exceptionally eligible for funding. The following additional eligibility criteria apply: the places of establishment of at least two of these legal entities must be in the same geographical region of Africa (as defined by the African Union: https://au.int/en/member_states/countryprofiles2). The following additional eligibility criteria apply: due to the specific challenge of this topic, in addition to the minimum number of participants set out in the General Annexes, consortia must include at least three independent legal entities established in Africa. The following additional eligibility criteria apply: the proposals must apply the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Technology Readiness Level	Activities are expected to achieve TRL 3-5 by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal priorities and the farm to fork strategy for a fair, healthy and environment-friendly food system, and in support of the climate objectives of the African Union (AU) and the EU, the successful proposal will contribute to the AU-EU High Level Policy Dialogue (HLPD) on Science, Technology and Innovation, and its priority on Green Transition (and the respective R&I partnerships on Food and Nutrition Security and Sustainable Agriculture and Climate Change and Sustainable Energy), as well as to the implementation of the short-term actions outlined in the working document of the AU-EU Innovation Agenda, aiming to translate R&I efforts into tangible business, development and employment opportunities in Africa and Europe.

Projects results are expected to contribute to all of the following expected outcomes:

- Improved availability of qualitative and quantitative data pertaining to the contribution of agroforestry to climate change adaptation and mitigation, biodiversity preservation, and to sustainable agriculture;

- Improved management of agroforestry systems (conventional, agroecological and/or organic), including agro-pastoral systems, in Africa;

- Enhanced capacities to evaluate the socioeconomic and environmental performance of agroforestry for climate change resilience;

- A strengthened agroforestry innovation ecosystem for better user acceptance and implementation of agroforestry in the African Union (AU).

Scope: Achieving sustainable agricultural production that fosters both climate change mitigation and adaptation and biodiversity preservation and enhancement is a policy objective that implies finding a balance with farm productivity, socio-economic viability and wider sustainability goals. Agroforestry systems include both traditional and modern land-use systems where trees are managed together with crops and/or animal production systems in agricultural settings. These systems have the potential to increase ecosystem services – including soil carbon sequestration, water retention, erosion control, soil nutrients, pollination, pest- and disease-control – and biodiversity, while improving farming productivity, profitability and sustainability of farmers' incomes. Implementation of agroforestry in the EU and the AU needs to be boosted in order to maximise this potential. The management of agroforestry systems is critical for their positive impact on climate and the environment as well as to ensure a balance with productivity and profitability for farmers. This is essential to promote the uptake and long-term sustainability of agroforestry.

Proposals should address the following:

- Identification of the most suitable plant and animal species and breeds to be used in agroforestry for different geographic regions in Africa, generating sustainable ecosystems with positive impact on local communities, and on women, looking for models where this impact is greater. In vegetation management systems preference should be given to local species, to avoid potential unintended consequences linked to the introduction of alien species;

- Assessment of local multi-purpose agroforestry species and breeds with benefits for food, pharmaceutical uses as well as ecosystem functions for the soil, biodiversity and their functions in a vegetation mosaic;

- Assessment of specific agroforestry management measures aiming at preserving/enhancing biodiversity;

- Assessment of the potential of carbon farming[202] as a possible future business for farmers and foresters, and analysis of its potential to contribute to reaching climate-neutrality in a few decades;

[202] https://ec.europa.eu/clima/eu-action/forests-and-agriculture/sustainable-carbon-cycles/carbon-farming_en

- Identification of the structural needs of agroforestry crops and animals in different geographical regions in Africa, including the analysis of production burdens, suggesting solutions and addressing traceability of all steps in the production chain to measure the effectiveness of solutions;
- Supporting this new value chain with knowledge and capacity building to be efficient, fair, and easily adopted, or not abandoned, by landowners and farmers;
- Establishing local agroforestry pilot plots.

Proposals must implement the "multi-actor approach" including a wide range of actors to ensure that knowledge and needs from various sectors, such as research, farmers/foresters, advisory services, are brought together.

This topic should involve the effective contribution of SSH disciplines.

Proposals should include a dedicated task, appropriate resources and a plan on how they will collaborate with other projects funded under this topic, as well under topic HORIZON-CL6-2021-CLIMATE-01-08: 'Agroforestry to meet climate, biodiversity and farming sustainability goals'.

HORIZON-CL6-2024-FARM2FORK-01-11: EU-African Union – towards climate-neutral, social just fair trade food systems

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 9.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: at least three partners from Africa and at least two from the same region as defined by the African Union (https://au.int/en/member_states/countryprofiles2). Due to the scope of this topic, legal entities established in all African Union member states* are exceptionally eligible for Union funding. * "African Union member states" includes countries whose membership has been temporarily suspended. International organisations with headquarters in a Member State or

	associated country are exceptionally eligible for funding. The Joint Research Centre (JRC) may participate as member of the consortium selected for funding. The following additional eligibility criteria apply: the proposals must apply the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties. The support to third parties can only be provided in the form of grants. The maximum amount to be granted to each third party is EUR 60 000.

Expected Outcome: In line with the European Green Deal priorities and the farm to fork strategy for a fair, healthy and environment-friendly food system, and in support of the African Continental Free Trade Agreement, the successful proposal will contribute to the AU-EU High Level Policy Dialogue (HLPD) on Science, Technology and Innovation, and its first priority on Food and Nutrition Security and Sustainable Agriculture.

The farm to fork strategy aims to accelerate the transition to a sustainable food system that should have a neutral or positive environmental impact, help to mitigate climate change and adapt to its impacts. New opportunities in EU-African trade are opening-up for trade regimes with co-benefits for producers, climate and citizens. Innovative Information and Communications Technology (ICT) based, traceability and certification schemes should maximise co-benefits while helping to keep the effects of Non-Tariff Measures (NTMs) in particular administrative and transaction costs low.

The African countries signed the African Continental Free Trade Agreement and launched an action plan for Boosting Intra-African Trade with a view to strengthening regional integration. It is also one of the key priorities of the Africa Agenda 2063 and a major step towards African continental economic integration.

Project results are expected to contribute to all of the following expected outcomes:

- Improved assessment systems for sustainable food trade regimes with co-benefits for producers, climate and citizens, biodiversity, assessment of certification schemes (organic, carbon neutral, de-forestation free, conventional), testing innovative solutions with food systems/certification actors;
- Provide data and recommendations for improved Non-Tariff Measure (NTM) regimes;
- Provide solutions to food trade, Ministries in charge, border regime management (digital solutions).

Scope: Proposals are expected to address the following:

- Study the tipping points to scale-up climate-neutral, fair and just food supply;
- Explore the climate, biodiversity and social impacts of food supply (organic and conventional) and linked products due to land-use change;
- Better understanding of the aim, collection, quantification and modelling of NTMs relevant for intra-African and EU-AU trade relations;
- Clearly explain how the proposal will contribute towards scaling-up of business models of climate-neutral fair and just and efficient food supply;
- Implement the multi-actor approach by involving a wide range of food system actors and conducting inter-disciplinary research;
- Link to previous projects on urban – rural food systems for solutions to strengthen resilience of food systems in view of supply and/or price shocks.

Innovation: Proposals should foresee a space for mentoring and accelerating innovative business concepts, including social innovation and upscaling in view of African or European food business entrepreneurs and start-ups with special consideration of women and the diaspora using cascading funding opportunities. Proposals should involve financial support to third parties e.g. to academic researchers, start-ups, SMEs and other multidisciplinary actors, to, for instance, develop, test or validate developed assessment approaches or collect or prepare data sets or provide other contributions to achieve the project objectives... Consortia need to define the selection process of organisations, for which financial support will be granted. Maximum 20% of the EU funding can be allocated to this purpose.

Call - Fair, healthy and environmentally-friendly food systems from primary production to consumption

HORIZON-CL6-2024-FARM2FORK-02

Conditions for the Call

Indicative budget(s)[203]

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution	Indicative number of

[203] The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2023 and 2024.

		2024	per project (EUR million)[204]	projects expected to be funded
Opening: 17 Oct 2023 Deadline(s): 22 Feb 2024 (First Stage), 17 Sep 2024 (Second Stage)				
HORIZON-CL6-2024-FARM2FORK-02-1-two-stage	IA	12.00	Around 6.00	2
HORIZON-CL6-2024-FARM2FORK-02-2-two-stage	IA	11.00	Around 5.50	2
HORIZON-CL6-2024-FARM2FORK-02-3-two-stage	IA	8.00	Around 4.00	2
HORIZON-CL6-2024-FARM2FORK-02-4-two-stage	RIA	13.00	Around 6.50	2
HORIZON-CL6-2024-FARM2FORK-02-5-two-stage	RIA	7.00	Around 7.00	1
HORIZON-CL6-2024-FARM2FORK-02-6-two-stage	IA	9.00	Around 4.50	2
HORIZON-CL6-2024-FARM2FORK-02-7-two-stage	IA	9.00	Around 4.50	2
Overall indicative budget		69.00		

General conditions relating to this call	
Admissibility conditions	The conditions are described in General Annex A.
Eligibility conditions	The conditions are described in General Annex B.
Financial and operational capacity and exclusion	The criteria are described in General Annex C.
Award criteria	The criteria are described in General Annex D.

[204] Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Documents	The documents are described in General Annex E.
Procedure	The procedure is described in General Annex F.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G.

Enabling sustainable farming

Proposals are invited against the following topic(s):

HORIZON-CL6-2024-FARM2FORK-02-1-two-stage: Increasing the availability and use of non-contentious inputs in organic farming

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 12.00 million.
Type of Action	Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: Applicants submitting a proposal under the blind evaluation pilot (see General Annex F) must not disclose their organisation names, acronyms, logos, nor names of personnel in Part B of their first stage application (see General Annex E).
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must apply the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Technology Readiness Level	Activities are expected to achieve TRL 7-8 by the end of the project – see General Annex B.
Procedure	The procedure is described in General Annex F. The following exceptions apply: This topic is part of the blind evaluation pilot under which first stage

	proposals will be evaluated blindly.

Expected Outcome: A successful proposal should support the objective of the farm to fork strategy to transition to fair, healthy and environmentally-friendly food systems from primary production to consumption, notably the objective to promote and increase organic farming in Europe, in line with the target of at least 25% of the EU's agricultural land under organic farming by 2030. Activities will support the implementation of concrete actions in the EU action plan for the development of organic production[205] and of Regulation (EU) 2018/848 on the rules on organic production and labelling of organic products[206]. Activities will also support the farm to fork and biodiversity strategies' objective to reduce the risk and use of chemical pesticides by 50% and the use of more hazardous pesticides by 50%.

Project results are expected to contribute to all of the following expected outcomes:

- Increased availability, accessibility and adoption by farmers of cost-efficient alternatives to contentious inputs used in organic farming;
- Fair, reliable and implementable rules on the use of inputs in organic farming;
- Significantly reduced environmental impact of practices and input use in organic farming systems and enhanced organic crop and livestock production;
- Provision of scientific support and recommendations for the development, implementation and evaluation of EU policies and strategies relevant for organic production, in particular on the reduction of contentious inputs as well as on the increased use of alternative products, strategies and solutions;
- Increased networking and knowledge exchange among all relevant actors for organic farming, contributing to a strengthened research and innovation ecosystem on organic farming in Europe that also supports the spreading of research outcomes to farmers involved in low-input farming and/or agroecological production.

Scope: Promoting the use of more sustainable farming practices is a policy objective enshrined in the European Green Deal and its related strategies. Boosting organic farming, one of the objectives of the farm to fork and of the EU biodiversity strategies, can greatly contribute to achieving this ambition, and thereby also contributing to climate ambition as, as organic farming contributes directly and significantly to carbon storage in soils and biomass. Moreover, the Commission communication 'Safeguarding food security and reinforcing the resilience of food systems'[207] highlights the role that organic farming can play in reducing the EU's dependence on external inputs, since organic farming is recognised, among others, for the limitation in the use of off-farms inputs.

205 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC0141R%2801%29
206 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32018R0848
207 https://ec.europa.eu/info/sites/default/files/food-farming-fisheries/key_policies/documents/safeguarding-food-security-reinforcing-resilience-food-systems.pdf

The organic legislation authorises the use of a specific set of products with a lower impact on the environment and on the soil. However, some of these substances have a harmful effect on terrestrial and aquatic species, which calls for the need to replace these substances either by lower impact products or methods or by resistant varieties. It is important to continue exploring ways to phase out and replace contentious inputs used in organic farming, and to increase the availability, accessibility and use of alternatives to these products. In doing so, due attention should be given to system approaches that consider the entire farm system, and its relation with the territorial and landscape levels. Moreover, in order to address farmers' needs in this specific area, socially innovative solutions are required.

Proposals should develop scientifically robust and transparent methodologies, building on achievements from previous research activities, notably those funded under the Horizon 2020 call 'SFS-08-2017 - Organic inputs – contentious inputs in organic farming' (projects Organic-PLUS and RELACS).

Proposals should address all the following activities:

- Develop, test and put in the place alternative products and solutions, including to the use of copper fungicides, mineral oils, external nutrient inputs (e.g. manure from conventional agriculture, recycled nutrients) in organic plant production, and to the responsible use of anthelmintics, antibiotics and synthetic vitamins used in organic livestock production.

- Among the alternatives, consider those containing biologically active substances (microorganisms and other naturally occurring substances), invertebrate biological control agents, (micro)biological agents for soil amelioration or cultivation techniques, and considering effective functional biodiversity systems.

- Building on existing demonstration sites and experiments where available and relevant, test the alternatives and, if relevant, their combinations.

- Further develop toolboxes, strategies and technologies for the minimisation or phasing-out of the use of contentious inputs in organic farming.

- Demonstrate the safety of the alternatives, in line with the EU regulatory framework related to their placing on the market, and generate data to enable the registration of the alternatives.

- Deepen analysis and produce data on the efficacy, resource efficiency, climate and environmental impacts of the alternatives developed, compared to the contentious inputs they are to replace. This should include analysis of impact on non-target species and on human health.

- Analyse farmers' and consumers' acceptance of the alternatives developed and consider new governance models/relations among food chain actors. This should include the development of business plans, with the support of Agricultural Knowledge and Innovation Systems (AKIS), and assessment of stakeholders' (farmers, policymakers,

researchers, advisors, companies, consumers, etc.) perspectives and needs to improve already existing policy instruments to reduce the use of contentious inputs and increased availability of alternatives.

- Set up demonstration sites that are representative of the diversity of organic farming systems in Europe, to promote participatory activities, and the exchange of knowledge and best practices among farmers.

- Develop training packages targeted to farmers and other actors of the organic agri-food chain, and awareness raising activities towards citizens and consumers, engaging with existing initiatives where relevant.

Proposals must implement the 'multi-actor approach' and ensure adequate involvement of the main stakeholders involved in finding alternatives to the use of contentious inputs used in organic farming (farmers, breeders, researchers, advisors, industry, etc.). Proposals should cover contentious inputs used in a range of organically-grown crops (in- and out-door), both arable and perennial, as well as the organic livestock sector. Sectors with high economic relevance in different pedo-climatic conditions and various biogeographical regions should be targeted in a representative way. Proposals should include a dedicated task, appropriate resources and a plan on how they will collaborate with other projects funded under this topic, and ensure coherence and synergy with other relevant activities carried out under other initiatives in Horizon Europe, including under the topic HORIZON-CL6-2023-GOVERNANCE: 'Developing an EU advisory network on organic agriculture', HORIZON-CL6-2024-GOVERNANCE: 'Organic farming thematic network to compile and share knowledge ready for practice' and the future partnership 'Accelerating farming systems transition: agroecology living labs and research infrastructures'.

To ensure trustworthiness, swift and wide adoption by user communities, and to support EU and national policymakers, actions should adopt high standards of transparency and openness, going beyond ex-post documentation of results and extending to aspects such as assumptions, benchmarks, models and data quality during the life of projects.

Concrete efforts shall be made to ensure that the data produced in the context of this topic is FAIR (Findable, Accessible, Interoperable and Re-usable), particularly in the context of real-time data feeds, exploring workflows that can provide "FAIR-by-design" data, i.e., data that is FAIR from its generation.

HORIZON-CL6-2024-FARM2FORK-02-2-two-stage: Sustainable organic food innovation labs: reinforcing the entire value chain

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Indicative budget	The total indicative budget for the topic is EUR 11.00 million.
Type of Action	Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: Applicants submitting a proposal under the blind evaluation pilot (see General Annex F) must not disclose their organisation names, acronyms, logos, nor names of personnel in Part B of their first stage application (see General Annex E).
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must apply the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Technology Readiness Level	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.
Procedure	The procedure is described in General Annex F. The following exceptions apply: This topic is part of the blind evaluation pilot under which first stage proposals will be evaluated blindly.

Expected Outcome: By producing high quality food with low environmental impact, organic farming plays an essential role in developing sustainable food systems in the EU, an objective that is at the heart of the European Green Deal. Under the European Green Deal's farm to fork and biodiversity strategies, the European Commission has set a target of 'at least 25% of the EU's agricultural land under organic farming by 2030 and a significant increase in organic aquaculture'. To achieve this target and to help the organic sector reach its full potential, the Commission has put forward a new action plan for the development of organic production in the EU[208].

In 2020, 9,1% of the total EU's agricultural land was under organic production. This number hides substantial differences between Member States as regards the share of agricultural land dedicated to organic farming: from 0.5% to more than 25%. These differences are partially due to the lack of structures adequate for organic farm products in some countries. In line with the EU action plan for the development of organic production, the successful proposals will support the establishment of adequate structures that enable the proper channelling of organic production in supply chains allowing farmers to fully benefit from the added value of organic production.

Project results are expected to contribute to all of the following expected outcomes:

208 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC0141R%2801%29

- Reinforced local and small-volume processing of organic food;
- Boosted innovative sustainable packaging solutions resulting in reduced waste (in particular of non-renewable and fossil derived plastics);
- Fostered innovative supply and distribution models and short trade circuits;
- Added value to organic agricultural products, improved organic farmers' incomes and their positioning in agri-food value chains;
- Enhanced market orientation and capacity of organic farmers and small and medium scale processors to meet consumer demand for sustainable and healthy diets based on organic food;
- Increased availability, affordability and accessibility of organic food with positive impacts on sustainability, including on biodiversity, on climate, ecosystems services and public health.

Scope: Organic farming has developed mainly at the primary production level, while the processing of organic farm products is less developed and regulated. Besides, the organic sector is characterised by its scattered nature, with imbalances in the food value chains limiting the bargaining power of organic farmers and producers still having access to a limited number of processors and retailers. Therefore, investing in innovative careful processing techniques and sustainable and reusable packaging, streamlining the distribution and logistics of organic produce and agricultural input networks, and achieving a better understanding of quality and safety issues in organic supply chains, in combination with regulations, is important for creating new value for consumers.

This will enable small organic producers, in particular those located in remote areas, to find an outlet for their production and benefit from the added value of their organic certification. However, operators are often reluctant to convert to organics due to the lack of organised and efficient organic commercial supply chains. In addition to the cross-cutting problems faced by agri-food supply chains, organic distribution can entail high operating costs and an imbalance between supply and demand. Exchanging experience and knowledge can encourage the creation of local food markets and short supply chains, and uphold the integrity of the organic quality of the product.

Proposals should establish and animate locally-driven, multi-actor organic food innovation hubs, bringing together researchers, innovators, farmers, processors and others, to:

- Develop, test and pilot innovations in organic small-scale food processing, in particular careful processing, and new, sustainable and reusable packaging (avoiding non-renewable and fossil-derived plastics), optimising the preservation of nutritional quality, reducing perishability and ensuring food safety;
- Foster diverse innovative solutions/approaches that are tailored to the needs of farmers and SMEs, while ensuring links between food processing and primary production, and

adapted to the seasonal character of raw material production and processing in small(er) batches;

- Develop and explore innovative supply and distribution models (including business models, market outlets and marketing strategies, short trade circuits, public procurement, food services), that are adapted to proposed innovative solutions;
- Assess the impacts of the innovative solutions on sustainability (climate, environmental, social, including health, and economic);
- Build a community of practice to share learnings, build capacity and support adoption of innovations at scale.

Proposals should cover a range of crops (indoor and outdoor), both arable and perennial, representative of the organic sector in Europe, as well as the organic livestock sector.

Projects must use the 'multi-actor approach', ensuring adequate involvement of all relevant actors, including farmers and SMEs. Proposals may build on existing research infrastructures, where relevant. Proposals are encouraged to build on past and ongoing EU-funded research and innovation projects, and are strongly encouraged to cluster with ongoing and upcoming projects. Proposals should include a dedicated task, appropriate resources and a plan on how they will collaborate with other projects funded under this topic, and ensure synergy with relevant activities carried out under other initiatives in Horizon Europe, in particular the topic in this Work Programme HORIZON-CL6-2023-GOVERNANCE-01-20: Developing an EU advisory network on organic agriculture' and the future partnerships 'Accelerating farming systems transition: agroecology living labs and research infrastructures' and 'Sustainable food systems for people, planet and climate'.

HORIZON-CL6-2024-FARM2FORK-02-3-two-stage: Tools to increase the effectiveness of EU import controls for plant health

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 8.00 million.
Type of Action	Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: Applicants submitting a proposal under the blind evaluation pilot (see General Annex F) must not disclose their organisation names, acronyms, logos, nor names of personnel in Part B of their first stage

	application (see General Annex E).
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must apply the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Technology Readiness Level	Activities are expected to achieve TRL 6-7 by the end of the project – see General Annex B.
Procedure	The procedure is described in General Annex F. The following exceptions apply: This topic is part of the blind evaluation pilot under which first stage proposals will be evaluated blindly.

Expected Outcome: A successful proposal will support the farm to fork strategy for a transition to fair, healthy and environmentally-friendly food systems from primary production to consumption, notably the objective to reduce the use and risk of chemical pesticides by 2030. Activities will support Regulation (EU) 2016/2031[209] on protective measures against pests of plants.

Project results are expected to contribute to all of the following expected outcomes:

- Enlarged availability and accessibility to cost-efficient and user-friendly tools and methods for the detection of plant pests to assist plant health inspectors during import controls;
- Increased the effectiveness of detection of plant pests at import points, by decreasing time and overall costs;
- Knowledge exchange and uptake of the innovative tools are promoted;
- Support plant health inspections and import controls.

Scope: Plant health is of global importance for agriculture, forestry, natural ecosystems, ecosystem services and biodiversity. Plant health is threatened by species injurious to plants and plant products, which now present a greater risk of being introduced into the Union territory owing to globalisation of trade and climate change. The current EU plant health legislative landscape aims at a proactive approach ensuring safe trade and mitigating the impacts of climate change on the health of the crops and forests in Europe.

Research activities should support these measures by contributing to the development of more rapid, reliable and economic innovative solutions and devices that can assist plant health inspectors at the borders. Technologies such as e-noses, acoustic devices, scanners, and

[209] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32016R2031

portable devices for molecular identification of plant pests[210] within hours/minutes of the specimen's sampling often using limited amounts of plant or plant product material, and other relevant solutions, are included within the scope of this topic.

Proposals should:

- Deliver more rapid, robust, and innovative solutions appropriate for detecting and identifying plant pests during import controls;
- Make use of innovative technologies for the detection of a broader spectrum of plant pests;
- Prove cost-benefits of the innovative solutions;
- Promote a wider use of new detection technologies for plant health diagnostics.

Proposals must implement the 'multi-actor approach' including a range of actors to ensure that knowledge and needs from various sectors such as research, plant health services, industry including SMEs are brought together. Proposals should take due account of dissemination to relevant stakeholders to facilitate the uptake of results.

Proposals should specify how they plan to collaborate with other proposals selected under this and other relevant topics, e.g., by undertaking joint activities, workshops or common communication and dissemination activities. Proposals should allocate the necessary resources to cover these activities.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

HORIZON-CL6-2024-FARM2FORK-02-4-two-stage: Tackling outbreaks of plant pests

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 6.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 13.00 million.
Type of Action	Research and Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: Applicants submitting a proposal under the blind evaluation pilot (see

[210] A pest is defined here as any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products (EU legislation, Regulation 2016/2031)

	General Annex F) must not disclose their organisation names, acronyms, logos, nor names of personnel in Part B of their first stage application (see General Annex E).
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must apply the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part. The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Procedure	The procedure is described in General Annex F. The following exceptions apply: This topic is part of the blind evaluation pilot under which first stage proposals will be evaluated blindly.

Expected Outcome: A successful proposal should support the farm to fork strategy to transition to fair, healthy and environmentally-friendly food systems from primary production to consumption, notably the target to reduce by 50% the overall use and risk of chemical pesticides and reduce the use by 50% of the more hazardous pesticides. Activities will support Regulation (EU) 2016/2031[211] on protective measures against pests of plants.

Project results are expected to contribute to all of the following expected outcomes:

- Find adequate responses for EU quarantine plant pests;
- Enhance capacities to prevent, monitor and (bio)control plant pests following under the scope of this topic;
- Support to relevant EU and Associated Countries' plant health policies.

Scope: Plant health is of global importance for agriculture, forestry, natural ecosystems, ecosystem services and biodiversity. Plant health is threatened by species injurious to plants and plant products, which present a greater risk of being introduced into the Union territory due to globalisation, trade and climate change. The current EU Plant Health legislative landscape helps protect the EU against the introduction of new plant pests as well as tackling existing plant pests more effectively. The prevention of entry and, if arrived within the EU territory, early detection and eradication are part of the plant health policies to avoid significant impacts in agriculture, forestry and environment by plant pests.

211 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32016R2031

Proposals should target one or more plant pest(s)[212] that are either Union quarantine plant pests[213] present in the EU or Union quarantine pests which are priority pests [214] in the EU, and that are of concern for agriculture and/or forestry[215], with the exception of plant pests targeted in Horizon Europe [216] . Research activities should improve methods for an effective implementation of the principles of integrated pest management (IPM), whilst reflecting the move towards innovative biological and other non-chemical control and resistance breeding.

Proposals should:

- Contribute to the understanding of the drivers of plant pest introduction, spread and establishment including the biology of the pest and its interaction with host plants and antagonists, the influence of climate change, ecosystem degradation, and globalisation;
- Develop efficient surveillance methods and strategies for early-detection and (bio)control of the pest(s);
- Extend the range of tools and technologies available for the development of economically and environmentally sound solutions for an effective pest prevention and outbreak management, and if relevant pursue in line with the principles of integrated pest management and taking into account the use of non-chemical or biological control methods;
- Analyse the social and economic implications for farmers, foresters and other economic operators affected by the outbreaks of the plant pest(s) and developing approaches whereby those affected can best cope with the situation;
- If relevant, analyse the ecological impact of plant pest(s) spread and establishment based on the experience obtained from existing outbreaks.

International cooperation with countries affected or threatened by the same pest(s) is strongly encouraged in particular to capitalise on existing knowledge. Proposals must implement the 'multi-actor approach' including a range of actors to ensure that knowledge and needs from various sectors such as research, plant health services, farming/forestry sectors, advisory services, and industry are brought together. Results of activities should benefit both conventional and organic farming.

Proposals should specify how they plan to collaborate with other proposals selected under this and other relevant topics[217], for example by undertaking joint activities, workshops or

212 A pest is defined here as any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products (EU legislation, Regulation 2016/2031)

213 See part B of Annex II to Commission Implementing Regulation 2019/2072 for pests known to occur in the Union territory

214 See Annex to Commission Delegated Regulation (EU) 2019/1702 for priority pests.

215 Applicants are expected to explain and justify the choice.

216 Plant pests of the topic HORIZON-CL6-2021-FARM2FORK-01-04: Tackling outbreaks of plant pests

217 For example, HORIZON-CL6-2023-GOVERNANCE-01-16: Digital technologies supporting plant health early detection, territory surveillance and phytosanitary measures and HORIZON-CL6-2024-

common communication and dissemination activities. Proposals should allocate the necessary resources to cover these activities.

The possible participation of the JRC in the project will consist of supporting the analysis of social and economic implications for farmers, foresters and other economic operators affected by the plant pest(s) and developing approaches whereby those affected can best cope with the situation.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

HORIZON-CL6-2024-FARM2FORK-02-5-two-stage: Animal nutritional requirements and nutritional value of feed under different production management conditions

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 7.00 million.
Type of Action	Research and Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: Applicants submitting a proposal under the blind evaluation pilot (see General Annex F) must not disclose their organisation names, acronyms, logos, nor names of personnel in Part B of their first stage application (see General Annex E).
Procedure	The procedure is described in General Annex F. The following exceptions apply: This topic is part of the blind evaluation pilot under which first stage proposals will be evaluated blindly.

Expected Outcome: A successful proposal will support the objective of the farm to fork strategy to transition to a fair, healthy and environmentally-friendly European agriculture, and contribute to strengthen the resilience and sustainability of specific farming sectors and preserve biodiversity. It is expected to contribute to limit the reliance of the European agricultural sector to imported feed materials.

FARM2FORK-02-3-two-stage: Tools to increase the effectiveness of EU import controls for plant health

The proposed project will enhance the use of locally produced and more climate-friendly solutions for animal feed without compromising animal performance and productivity. It will focus on existing or alternative source of nutrients using value chain approaches to maximize feed production and feed use efficiency, supporting the local environment and farm circularity.

Activities under this topic will contribute to all of the following expected outcomes:

- Guidelines for processes and policies for improved resource-efficient production, use, and diversification of safe feedstuffs;
- Optimised use of feedstuffs, new plants, forage species and associations at local level;
- Uptake by farmers of practices to diversify sources of feedstuffs and use of natural resources on rangeland, where appropriate;
- (Alternative) Feed production/supply strategies that facilitate self-sufficiency and ensure safety of feed; closed nutrient cycle at local level and diminished environmental and climate footprint;
- Improved systems for facilitating the planning and calculation of the rations/diets of feed adjusted to specific livestock and individual/group animal requirements, and for mitigating the risk of anti-nutritional factors or contaminants in feedstuffs.

Scope: Feed resources are important components of livestock production systems, and their efficient use is the primary determinant of animal performance and productivity. The availability and use of local feedstuffs, including new and underused sources, including alternative protein sources, is a challenge in many livestock farming systems and it has several implications in terms of farm economics, product quality and safety, animal health and welfare. Furthermore, there is the need to design more precise and resilient feeding systems while ensuring requirements of biodiversity protection and restoration.

The aim is to optimise the use of local feedstuffs, shorten supply chains and rely more on local resources. It is important to investigate content, availability and digestibility of nutrients in locally available feedstuffs in different pedo-climatic regions and livestock systems, without compromising feed safety and efficiency.

The following elements should be incorporated:

- Determine and adjust net energy-based nutritional requirements (macro and micronutrients) for local breeds and different management conditions, addressing both conventional and organic livestock farming;
- Assess on-farm practices and equipment to use feedstuffs more efficiently (post-harvest technologies, crops mixture, foraging strategies, rangeland management);
- Take advantage of between and within breed genetic diversity to optimize the use (acceptance and feed efficiency) of local feedstuffs;

- Evaluate the impacts of processing technologies on the efficiency of local feedstuffs
- Improved knowledge on the effects of functional additives (enzymes, gut flora stabilisers, natural plants, vitamins, etc.) on farm-scale animal performance, health and welfare;
- Assess and minimize the risk of anti-nutritional factors or contaminants such as biotoxins in feedstuffs,
- Analyse and monitor the performance of the animal production systems and the quality of animal-based products under novel feeding strategies;
- Determine better indicators of animal nutritional requirements and the nutritional value of locally produced feedstuffs
- Assess the economic sustainability and environmental impact of identified resilient feeding systems and related structural changes (at local level)

If necessary, proposals should include a dedicated task, appropriate resources and a plan on how they will collaborate with other projects funded under other topics and ensure synergy with relevant activities carried out under other initiatives in Horizon Europe.

Due to the scope of this topic, international cooperation is strongly encouraged, in particular with China. This topic is within the scope of the Administrative Arrangement between the European Commission and the Ministry of Science and Technology of the People's Republic of China on a Co-funding Mechanism for the period 2021-2024 to support collaborative research projects under the Food, Agriculture and Biotechnologies (FAB) and the Climate Change and Biodiversity (CCB) flagship initiatives.

Actions will contribute to implementing the EU-China Food, Agriculture and Biotechnology (FAB) flagship initiative, which aims to ensure sustainability of agri-food systems, catering for the needs of a growing population, the reduction of food and agricultural losses and waste, and the provision of safe and healthy foodstuffs. Interaction with other actions developed under the EU-China Climate Change and Biodiversity (CCB) Research Flagship and the Flagship on Food, Agriculture and Biotechnologies (FAB) is encouraged if relevant.

Enabling sustainable fisheries and aquaculture

Proposals are invited against the following topic(s):

HORIZON-CL6-2024-FARM2FORK-02-6-two-stage: Minimising climate impact on fisheries: mitigation and adaptation solutions for future climate regimes

Specific conditions	
Expected EU contribution per	The Commission estimates that an EU contribution of around EUR 4.50 million would allow these outcomes to be addressed appropriately.

project	Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 9.00 million.
Type of Action	Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: Applicants submitting a proposal under the blind evaluation pilot (see General Annex F) must not disclose their organisation names, acronyms, logos, nor names of personnel in Part B of their first stage application (see General Annex E).
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Technology Readiness Level	Activities are expected to achieve TRL 6-7 by the end of the project – see General Annex B.
Procedure	The procedure is described in General Annex F. The following exceptions apply: This topic is part of the blind evaluation pilot under which first stage proposals will be evaluated blindly.

Expected Outcome: Selected proposals are expected to contribute to all the following outcomes:

- Contribution to sustainable fisheries for fair, healthy, climate-resilient and environment-friendly food systems with low impact on aquatic ecosystems, supporting the EU common fisheries policy, the European Green Deal and in particular the EU biodiversity strategy for 2030 and the farm to fork strategy;
- Transformation of fisheries to make a significant contribution to climate-neutrality;
- Contribution to more precise, technologically advanced data collection (notably through the use of techniques such as artificial intelligence, sensors and robotics) which encompasses the natural and social ecosystem context;
- Understanding of the resilience potential to climate change of exploited resources and build up the adaptive capacity for fisheries management;
- Preparation of the seafood sector to seize opportunities to harvest shifting stocks in the most sustainable manner, taking into account environmental, social and economic considerations.

Scope: Proposals are expected to investigate the impacts of climate change on biological and ecological processes such as shifts in stocks distribution, abundance and density, fish health, stock productivity, habitats, regime shifts in ecosystems and altered growth, reproduction rates, seafood safety and overall changes in the ecosystem potential production. They should also explore and test innovative measures to mitigate climate change (such as new designs of fishing gears or new fishing strategies that do not resuspend carbon from the seabed or new fishing strategies which improve energy use efficiency or strengthen circularity aspects) and adaptive solutions (such as valorisation of new catches or building resilience actions).

Proposals should include studies representing the whole spectrum of European fisheries, including small-scale fisheries, and the related biotic, abiotic, social and economic conditions. They should follow an interdisciplinary approach and cover both scientific and socioeconomic aspects.

They should build on the work of Horizon 2020 projects ClimeFish and CERES and others and provide applicable approaches and tools to the fishing sector. They should also build on the work of initiatives such as the EMFF-funded studies on "*Climate change and the Common Fisheries Policy: adaptation and building resilience to the effects of climate change on fisheries and reducing emissions of greenhouse gases from fishing"*, and "*Adapting postharvest activities in the value chain of fisheries and aquaculture to the effects of climate change and mitigating their climate footprint through the reduction of greenhouse gases emissions".*

Also importantly, proposals should build synergies with the projects funded under the topics HORIZON-CL6-2023-BIODIV-01-5: Understanding and reducing bycatch of protected species in Destination "Biodiversity and ecosystem services" and 'HORIZON-CL6-2022-CLIMATE-01-02: Understanding the oceanic carbon cycle' as well as with work done under other organisations such as the OECD Committee for Fisheries. Selected proposals should collaborate with each other.

Proposals are encouraged to cooperate with actors such as the European Commission's Joint Research Centre (JRC). The possible participation of the JRC in the project would consist in providing and analysing fisheries.

This topic should involve the effective contribution of SSH disciplines.

HORIZON-CL6-2024-FARM2FORK-02-7-two-stage: Minimising climate impact on aquaculture: mitigation and adaptation solutions for future climate regimes

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Indicative budget	The total indicative budget for the topic is EUR 9.00 million.
Type of Action	Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: Applicants submitting a proposal under the blind evaluation pilot (see General Annex F) must not disclose their organisation names, acronyms, logos, nor names of personnel in Part B of their first stage application (see General Annex E).
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Technology Readiness Level	Activities are expected to achieve TRL 6-7 by the end of the project – see General Annex B.
Procedure	The procedure is described in General Annex F. The following exceptions apply: This topic is part of the blind evaluation pilot under which first stage proposals will be evaluated blindly.

Expected Outcome: Selected proposals are expected to contribute to all of the following expected outcomes:

- Contribution to sustainable aquaculture systems (in marine and/or transitional, and/or fresh waters) for fair, safe, healthy, climate-resilient and environment-friendly food systems with low impact on aquatic ecosystems, supporting the European Green Deal and the farm to fork strategy, the "*Strategic guidelines for a more sustainable and competitive EU aquaculture for the period 2021 to 2030*[218]", and the "*Action plan for the development of organic production*"[219];

- Implementation of innovations, such as dietary shifts and aspects of circularity, for a more sustainable and competitive European aquaculture enhancing aquaculture resilience to adverse consequences of climate change;

- Positioning of European aquaculture production as the global reference for sustainability and quality, increase its competitiveness, reduce EU dependence on imports of fisheries and aquaculture products and create more jobs, especially in rural and coastal regions;

- Contribution to aquaculture production with a reduced environmental footprint, advancing towards climate-neutrality;

218 COM(2021)236 final
219 COM(2021)141 final

- Contribution to technologically-advanced aquaculture production (indicatively through the use of techniques such as artificial intelligence, sensors, internet-of-things and robotics), fully embedded in natural, social, ethical and economic sustainability.

Scope: Proposals are expected to enhance knowledge of the impacts of climate change on aquaculture production at environmental, social and economic levels. They should identify, forecast and assess the main effects of climate change on different aquaculture production systems and on their ecological carrying capacity.

They should consider impacts of climate change such as water availability (e.g., rise in evaporation, decrease in rainfall, extreme weather events like droughts or floods), water quality (e.g., acidification, eutrophication, pollution, contamination), temperature rise, sea level rise, spread of diseases (e.g. recrudescence of endemic and emerging diseases in traditional and recirculating aquaculture systems), reduced fish welfare, invasive species, and other climate related risks.

They should also investigate adaptation and mitigation solutions and opportunities such as technological, social, economic, and biological/ecological aspects, selection of suitable sites, culture methods (including the contribution of organic production and integrated multi-trophic aquaculture), species plasticity and adaptability to changing environments as well as breeding and selection techniques for a more sustainable, productive and resilient production.

Furthermore, they should address aspects of circularity in terms of more efficient use of resources and less negative impacts on marine environment, including reduction, valorisation, and reuse of waste. Indicative aspects could include Life Cycle Assessment approaches such as of feeding systems and valorisation of non-food biomass for feeds and fertilisers.

Proposals should build on the work of Horizon 2020 and EMFF projects, such as ClimeFish and CERES, and provide applicable approaches and tools to the aquaculture sector.

Selected proposals should collaborate with each other.

This topic should involve the effective contribution of SSH disciplines.

Proposals are encouraged to cooperate with actors such as the European Commission’s Joint Research Centre (JRC). The possible participation of the JRC in the project would consist in providing and analysing aquaculture data.

Destination - Circular economy and bioeconomy sectors

This destination and its topics target climate-neutrality, zero pollution[220], fair and just circular and bioeconomy transitions[221]. These cover safe, integrated circular solutions at territorial and sectoral levels, for important material flows and product value chains, such as i) textiles, ii) electronics, iii) chemicals, iv) packaging, v) tourism, vi) plastics and construction, and vii) key bioeconomy sectors such as a) sustainable bio-based systems[222], b) sustainable forestry, c) small-scale rural bio-based solutions, d) environmental services and e) aquatic (including marine and freshwater) value chains[223].

The destination supports the European Green Deal, and in particular:

- the new EU Circular Economy Action Plan (CEAP), adopted in March 2020, and the subsequent initiatives along the entire life cycle of products[224];
- the EU strategy on adaptation to climate change adopted in February 2021[225];
- the EU zero pollution action plan[226], adopted in May 2021, with the chemicals strategy for sustainability[227] from October 2020 and the new approach for a sustainable blue economy[228] adopted in May 2021;
- the EU forest strategy for 2030[229]: research and innovation will be key drivers in achieving the ambitious goals of this strategy;

220 See also Destination 4 'Clean environment and Zero pollution' of Horizon Europe Cluster 6.

221 Synergies ensured with Horizon Europe Clusters 4 and 5 (including their European public private partnerships), while Cluster 4 targets the industrial dimension (including digitalisation, circularity and climate-neutrality / low GHGs emissions industry transition, including developing bio-integrated manufacturing). Cluster 5 covers cost-efficient, net zero-GHGs energy systems, centred on renewables (including the R&I needed to reduce CO_2 emissions from the power and energy-intensive industry sectors, such as solutions for capturing, utilising and storage of CO_2 (CCUS), bioenergy/biofuels and other industrial sectors) Cluster 6 covers the research and innovation based on sustainable biological resources (bioeconomy sectors), in particular for new sustainable feedstock development and valorisation through the development of integrated bio-refineries).

222 In synergy and complementarity with the EU public-private partnership for a 'Circular Bio-based Europe' (CBE JU), (especially as related to the size of actions – IAs and RIAs, and Technology Readiness Level and the industrial-focus of activities, with the first CBE calls expected in 2022).

223 In synergy and complementarity with the EU partnership for a climate-neutral, sustainable and productive blue economy and with the EU mission 'Restore our Ocean and Waters by 2030'.

224 It targets how products are designed, promotes circular economy processes, encourages sustainable consumption, and aims to ensure that waste is prevented and the resources used are kept in the economy for as long as possible. This plan also aims to ensure that the circular economy works for people, regions and cities, fully contributes to climate-neutrality, zero pollution and resource use decoupling and harnesses the potential of research, innovation and digitalisation

225 COM(2021)82 final "Forging a climate-resilient Europe - the new EU Strategy on Adaptation to Climate".

226 COM(2021)400 final 'Pathway to a Healthy Planet for All EU Action Plan: "Towards Zero Pollution for Air, Water and Soil'.

227 COM(2020) 667 final 'Chemicals Strategy for Sustainability Towards a Toxic-Free Environment'.

228 COM(2021)240 final 'On a new approach for a sustainable blue economy in the EU Transforming the EU's Blue Economy for a Sustainable Future'.

229 COM(2021)572 final 'New EU Forest Strategy for 2030'.

- the EU climate law targeting climate-neutrality by 2050 and AFOLU [230] climate-neutrality by 2035, which supports increased focus on bio-based circular consumption, as part of the Fit for 55 package proposed on 14 July 2021[231];

- the new European Bauhaus initiative[232] and the renovation wave[233].

Furthermore, the Horizon Europe work programme for 2023-2024 of will play a critical role in implementing the EU strategy for sustainable textiles[234], which highlights the strategic role Horizon Europe initiatives play in R&I in the textile ecosystem. Textiles are the fourth highest category as regards pressure on the use of primary raw materials and water and fifth for GHG emissions, and are a major source of microplastic pollution in production and use phases. They are also a key material and product stream in the circular economy action plan. Improvements in the circularity of the textile value chains will help reduce GHG emissions and environmental pressure. The framework is established in the strategy for sustainable textiles, The transition pathway is a multistakeholder process, that could support implementation Attention should be paid to ensuring a circular, safe and sustainable design and the use of new sustainable biobased materials, as well as to collection, sorting and upcycling. Automated processes and digital solutions should help increase reuse and recycling. The safe-and sustainable-by-design concept aligns circular, safety and bioeconomy approaches with zero pollution. R&I can link various EU policies, namely those related to the green and digital transition, resilience and competitiveness. Under the proposed Ecodesign Sustainable Product Regulation (SPI)[235] the Commission will set out ecodesign requirements on design in order to reduce the environmental footprint of products, striving for products to be kept in circular use for as long as possible.

The wide range of EU initiatives supported by this destination includes:

- the industrial strategy;

- the EU chemicals strategy for sustainability;

- the SME strategy;

- the revised (2018) bioeconomy strategy[236] and its action plan;

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230 AFOLU: “Agriculture, Forestry and Other Land Use”.

231 COM(2021)550 final “'Fit for 55': delivering the EU's 2030 Climate Target on the way to climate neutrality”.

232 COM(2021)573 final “New European Bauhaus Beautiful, Sustainable, Together”.

233 COM(2020)662 final “A Renovation Wave for Europe - greening our buildings, creating jobs, improving lives”.

234 COM(2022)141 final “EU Strategy for Sustainable and Circular Textiles”.

235 COM(2022)142 final Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EC .

236 European Commission, Directorate-General for Research and Innovation, European bioeconomy policy: stocktaking and future developments: report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Publications Office of the European Union, 2022, https://data.europa.eu/doi/10.2777/997651.

- the communication on sustainable carbon cycles;
- the sustainable blue economy approach and its offshoot initiatives;
- the EU biodiversity strategy for 2030;
- the farm to fork strategy;
- the upcoming EU agenda for tourism;
- the plastics strategy and the action plan on critical raw materials.

In addition, this destination will contribute to the transition pathways of energy-intensive industries, textiles, construction and agri-food industrial ecosystems.

Where appropriate, proposals are encouraged to cooperate with the European Commission Knowledge Centre for Bioeconomy, also for the purpose of dissemination and exploitation of results.

Expected impact

Proposals for topics under this destination should set out a credible pathway to:

- develop the circular economy and bioeconomy sectors;
- ensure natural resources are used and managed in sustainable and circular manner;
- prevent and remove pollution;
- unlock the full potential and benefits of the circular economy and the bioeconomy, with clean secondary raw materials, ensuring competitiveness and guaranteeing healthy soil, air, fresh and marine water for all, through better understanding of planetary boundaries and wide deployment and market uptake of innovative technologies and other solutions, notably in primary production (forestry) and bio-based systems.

More specifically, the proposed topics should contribute to one or more of the following impacts:

- **Regional, rural, local/urban and consumer-based transitions are accelerated** towards a sustainable, regenerative, inclusive, just and clean circular economy and bioeconomy across all regions of Europe. Special attention should be paid to the most sensitive/vulnerable [237] and greenhouse gas-intensive regions, based on **better knowledge and understanding of science**, and improved capacity to design, implement and monitor policies and instruments for circular and bio-based transitions.

[237] Taking into account all aspects of sustainability, i.e. social, economic and environmental, and in particular sensitivity/vulnerability to the effects of the climate change, as well as due to the current social dependency on fossil resources, especially in remote, rural and low-income regions and cities.

- **European industrial sustainability, competitiveness and resource independence are strengthened** by reducing the use of primary non-renewable raw materials and greenhouse gases emissions and other pollutants, achieving an improved environmental footprint (including on biodiversity), enabling climate-neutrality, zero pollution[238] and higher resource efficiency. This will also be supported by increasing circular and bio-based practices in textiles, plastics, electronics and construction, developing further on industrial symbiosis as well as circularity and sustainability by design, cascading use of biomass and, clean secondary raw materials, along and across value chains.

- **Innovative and sustainable value-chains are developed in the bio-based sectors** replacing fossil-based value chains, increasing circular bio-based systems from sustainably sourced biological resources, and replacing carbon-intensive and fossil-based systems. Such a development will be supported through R&I in **biotechnology** and other enabling technologies, which is a prerequisite and driver of future solutions for a circular economy and the bioeconomy transition. This will involve with inclusive engagement with all stakeholders, including policymakers and will increase access to finance and technical support along whole supply chains for bioeconomy projects.

- **The benefit for consumers and citizens, including those in rural areas, are improved** by establishing circular and bio-based systems based on sustainability, inclusiveness, zero pollution[239], health and safety. All value chain actors (manufacturers, retailers, service industry, consumers, public administration, including on regional level, primary biomass producers etc.) are involved to a significantly higher degree.

- **Multi-functionality and management of forests in Europe are safeguarded** based on the three pillars of sustainability (economic, environmental and social), in particular to optimise the contribution of forests and the forest-based sector in mitigating and adapting to climate change.

- **Potential of marine and freshwater biological resources and blue biotechnology is enlarged** to i) deliver greener (climate-neutral and circular) industrial products and processes, ii) help characterise, monitor and sustain the health of aquatic ecosystems for a healthy planet and people, and iii) help in the drafting of proposals for accompanying changes in regulation where necessary.

The following call(s) in this work programme contribute to this destination:

Call	Budgets (EUR million)		Deadline(s)
	2023	2024	
HORIZON-CL6-2023-CIRCBIO-01	98.50		28 Mar 2023

238 See also Destination 4 ‘Clean environment and Zero pollution’ of this Cluster.
239 See also Destination 4 ‘Clean environment and Zero pollution’ of this Cluster.

HORIZON-CL6-2023-CIRCBIO-02	80.00		28 Mar 2023 (First Stage) 26 Sep 2023 (Second Stage)
HORIZON-CL6-2024-CIRCBIO-01		74.50	22 Feb 2024
HORIZON-CL6-2024-CIRCBIO-02		73.00	22 Feb 2024 (First Stage) 17 Sep 2024 (Second Stage)
Overall indicative budget	178.50	147.50	

Call - Circular economy and bioeconomy sectors

HORIZON-CL6-2023-CIRCBIO-01

Conditions for the Call

Indicative budget(s)[240]

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million)[241]	Indicative number of projects expected to be funded
		2023		
Opening: 22 Dec 2022 Deadline(s): 28 Mar 2023				
HORIZON-CL6-2023-CircBio-01-1	CSA	2.50	Around 2.50	1
HORIZON-CL6-2023-CircBio-01-10	CSA	2.00	Around 2.00	1
HORIZON-CL6-2023-CircBio-01-11	RIA	8.00	Around 4.00	2
HORIZON-CL6-2023-CircBio-01-12	RIA	12.00	Around 6.00	2
HORIZON-CL6-2023-CircBio-01-13	RIA	12.00	Around 6.00	2
HORIZON-CL6-2023-CircBio-01-14	RIA	4.00	Around 4.00	1
HORIZON-CL6-2023-CircBio-01-2	IA	18.00	Around 6.00	3
HORIZON-CL6-2023-CircBio-01-3	CSA	2.00	Around 2.00	1
HORIZON-CL6-2023-CircBio-01-4	RIA	4.00	Around 4.00	1
HORIZON-CL6-2023-CircBio-01-5	IA	10.00	Around 5.00	2
HORIZON-CL6-2023-CircBio-01-6	CSA	3.00	Around 1.50	2

240 The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2023 and 2024.

241 Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

HORIZON-CL6-2023-CircBio-01-7	CSA	3.00	Around 1.50	2
HORIZON-CL6-2023-CircBio-01-8	IA	10.00	Around 5.00	2
HORIZON-CL6-2023-CircBio-01-9	RIA	8.00	Around 4.00	2
Overall indicative budget		98.50		

General conditions relating to this call	
Admissibility conditions	The conditions are described in General Annex A.
Eligibility conditions	The conditions are described in General Annex B.
Financial and operational capacity and exclusion	The criteria are described in General Annex C.
Award criteria	The criteria are described in General Annex D.
Documents	The documents are described in General Annex E.
Procedure	The procedure is described in General Annex F.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G.

Enabling a circular economy transition

Proposals are invited against the following topic(s):

HORIZON-CL6-2023-CircBio-01-1: Enhancing collaboration between Circular Cities and Regions Initiative's (CCRI) supporting organisations

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 2.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 2.50 million.

Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: Proposals funded under this topic must form part of the instruments for the implementation of the European Commission's Circular Cities and Regions Initiative (CCRI). This means that: • Proposals must cooperate with CCRI and its Coordination and Support Office (CCRI-CSO) by means of sharing with this initiative knowledge and experiences gained through the implementation of the CSA, as well as participating in the CCRI's main events (e.g. general conferences and coordination meetings). • Proposals must ensure the proposed activities are complementary to those of the CCRI Coordination and Support Office. • Proposals must clearly specify how the CSA will ensure synergies and complementarities with other circular economy projects and initiatives (incl. those recognised as CCRI projects and CCRI Associated Partners). Applicants must integrate explicitly these obligations into their proposal's work plan.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [242].

Expected Outcome: Successful proposal will support the delivery of solutions to implement the European Green Deal, the EU circular economy action plan (CEAP) and the EU bioeconomy strategy. The topic will support the transition towards a sustainable, regenerative, inclusive and just circular economy at local and regional scale across the EU and Associated Countries.

Proposals results are expected to contribute to all of the following expected outcomes:

[242] This decision is available on the Funding and Tenders Portal, in the reference documents section for Horizon Europe, under 'Simplified costs decisions' or through this link: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/ls-decision_he_en.pdf

- Strengthened collaboration and complementarity between various relevant initiatives and organisations that support circular economy at the local and regional scale;

- Enhanced support to the implementation of circular systemic solutions in cities and regions through the streamlining and creation of synergies with/between the activities of other relevant initiatives and organisations;

- Increased capacity, efficiency and efficacy of organisations that support circular economy at the local and regional scale, e.g. research and technology organisations, associations of cities and regions, other support organisations providing technical assistance to urban and regional circular economy initiatives and projects;

- Enhanced knowledge transfer and exchange of best practices between organisations that support circular economy at the local and regional scale;

- More widespread dissemination of circular innovation, including technological, business, governance and social innovation, which lead to an uptake and easier replication, scalability and visibility of circular systemic solutions and hence multiplication of their economic, social and environmental benefits at the local and regional scale;

- Increased contribution of the Circular Cities and Regions Initiative (CCRI) scheme to the policy targets of the European Green Deal, particularly the circular economy action plan, the industrial strategy and the bioeconomy strategy at local, regional, national, European and international levels.

Scope: As part of the EU circular economy action plan, the Circular Cities and Regions Initiative (CCRI)[243] supports the implementation of circular systemic solutions at the local and regional levels by providing financial and technical assistance to cities and regions in the EU and Associated Countries. The CCRI Coordination and Support Office (CCRI-CSO) is responsible for facilitating the implementation of the CCRI and supporting the cooperation, synergies and complementarities between the CCRI Pilot Group and Fellows, CCRI Projects and Associated Partners. In particular, the CCRI-CSO is responsible for providing practical and tailor-made support to the Pilot Group. The CCRI-CSO also helps to identify and analyse the main R&I gaps as well as the (technical, regulatory and financial) barriers and drivers to a local circular economy.

There is a wide range of organisations in Europe that focus on circular economy at the local and regional scale and have the potential to contribute to CCRI, by implementing activities ranging from political engagement, networking, dissemination, research, support to the development and implementation of circular economy action plans and other circular innovative solutions on the ground.

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

The objective of this topic is to strengthen the collaboration between various relevant initiatives and organisations that support circular economy at the local and regional scale, enhance their capacity to contribute to CCRI, while avoiding overlaps and duplications in their activities. Proposals should build on the activities of the CCRI-CSO, and ensure the proposed activities are complementary. Proposals should set out a clear plan on how they plan to collaborate with the CCRI-CSO, CCRI Pilots and Fellows, CCRI Projects and Associated Partners, for example by undertaking joint activities, workshops or common communication and dissemination activities and/or providing additional technical expertise through dedicated support activities. Selected proposal will thus need to work together with the above-mentioned CCRI counterparts and, if needed, refine their work plan together with the Commission. All the proposals' activities must be coordinated and implemented in close cooperation and coordination with the CCRI-CSO, as well as explore the possibilities to further build on and make use of outputs produced, in order to ensure complementarities.

Proposals should:

- Ensure close cooperation with CCRI and its Coordination and Support Office (CSO), and contribute to CCRI´s goals and activities, for instance by participating in relevant activities and sharing knowledge that can be transferred to the Pilot Group and Fellows and beyond;

- In cooperation with the CCRI-CSO, facilitate exchange of knowledge and best practices on circular economy innovation, including innovative technologies, business models and governance as well as methodologies for supporting local and regional initiatives based on the latest knowledge in management, behavioural science and other relevant areas;

- In collaboration with the CCRI-CSO, provide technical support to local and regional circular economy initiatives in order to increase the chance of success of circular systemic solutions. The projects should complement the support provided by CCRI-CSO to Pilot Group and Fellows, either by targeting cities and regions not already included in the list of CCRI Pilot Group and Fellows supported by the CSO and/or covering additional circular economy topics and dimensions not already addressed by the CCRI-CSO;

- Organise workshops, webinars, trainings, capacity-building and/or peer-learning activities in coordination with the CCRI-CSO, in order to support the development and implementation of circular systemic solutions as well as facilitate knowledge and experience transfer for further outreach and replication in European territories;

- Develop in cooperation with the CCRI-CSO relevant case studies of local and regional circular economy measures, activities and policies, identifying and presenting the respective strengths and weaknesses. These case studies could be used for their replication and dissemination across the EU and Associated Countries;

- Support the CCRI-CSO in the development of guidance and policy recommendations for local and regional authorities on how to address identified technical, regulatory, and

financial obstacles to the transition to the circular economy as well as on the development and the implementation of circular economy initiatives at a local and regional scale;

- Promote in collaboration with the CCRI-CSO the concept of circular economy to cities and regions that are in the early stage of circular economy transition to help them build their understanding of the concept and the opportunities and chances of a circular system.

The target group of this topic includes organisations that support circular economy at the local and regional scale. These may include: research and technology organisations, associations of cities and regions, other organisations providing technical assistance to local and regional circular economy initiatives and projects. Proposals should ensure that all evidence, information and project outcomes will be accessible through the CCRI website.

Among other entities, organisations that have already received funding from Horizon 2020 or Horizon Europe under CCRI demonstration and project development assistance topics (LC-GD-3-2-2020; HORIZON-CL6-2021-CIRCBIO-01-01; HORIZON-CL6-2021-CIRCBIO-01-02) and/or are currently officially one of the CCRI Associated Partners can be eligible for this topic.

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

HORIZON-CL6-2023-CircBio-01-2: One hundred circular model households: making European households sustainable through inclusive circular practices

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 18.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.

Expected Outcome: A successful proposal will contribute to the following Destination impacts: i) accelerate regional, rural, local/urban and consumer-based transitions, and ii) improve on consumer and citizen benefits.

Project results are expected to contribute to all the following outcomes:

- Significant, well-documented increase in material efficiency in participating households;

- Significant reduction of emissions of GHG and other pollutants, including micro- and nanoplastic fibres from covered households, and increase of carbon removals;
- Improvement of living conditions in participating households;
- Multiplier effect regarding the replication of the approach and its benefits; leading by example;
- Lessons learnt for a European rollout strategy and integration with sectoral strategies such as Circular Cities and Regions Initiative (CCRI).

Scope: The transition from a take-make-waste society to sustainability, resource-efficiency and circularity will have to happen on the ground in the living environment, i.e. at the consumers' homes, or it will not happen at all. We therefore should reduce the environmental footprint of households, and think about an ambitious GHG reduction target for households that could be tested at large scale via research and innovation funding. Areas to be addressed are e.g., household electronics, textiles, food, packaging and the respective waste, furniture, housing, modes of consumption in general, at the level of individual behavioural decisions. The feasibility of this approach should be demonstrated in pilots with NGOs and CSOs that directly target transformation in a certain number of individual households.

Although technology can contribute, the overall goal can only be achieved through behavioural change. Social and gender aspects are relevant. Proposals should demonstrate how sustainable products and/or services can better meet the real needs of citizens with regard to entertainment, communication, mobility, housing, etc., and how in return this will positively influence consumer behaviour.

This initiative complements the envisaged circular and biobased transition activities in cities and regions at a micro level, as it aims to target individual households. In this way, it will also target social disparity. It will experiment with different behavioural approaches in a scheme of 100 circular households. This R&I initiative will also support the Commission's commitment in the 2020 circular economy action plan (CEAP) to present measures to make circularity work for people, regions and cities, to develop a sustainable product policy framework, to empower consumers and public buyers, and to focus on areas where the potential for circularity is high.

Through this initiative, a cost-free circular economy advisory service shall be provided to selected households. As a first step, all available knowledge on the measurement and calculation of greenhouse gas emissions and other environmental impacts from households, with particular attention to the above-mentioned consumption areas, will be screened and consolidated. A simple and robust method for a quick comparison of environmental impacts, using in particular PEF expertise, will be established.

Proposals shall define the exact scope of demonstration projects, e.g., to transform X households in Y Member States into model circularity/sustainability cells, with a focus on a limited number of material flows, and set reduction benchmarks that are ambitious and

plausible, and that can be validated using the above-mentioned knowledge. In a second step, a support service directly targeted at citizens will be established. Similar to energy advisory services, material efficiency advisors will contact households and identify individual needs and optimisation potential. This can build on the infrastructure of the upcoming Circular Cities and Regions Initiative and other projects that operate at macro level, and on ongoing environmental NGO advisory activities. While the focus is on material flows, trade-offs between material and energy efficiency are to be avoided. All proposed measures have to respect the principles of non-toxicity and zero-pollution. The impact of all measures should be assessed from a lifecycle perspective.

The advisors will be the link between retailers/service providers, insurances etc., where necessary also public services and administration, and households. All proposed measures need to be easy to implement and at least cost-neutral for households. Measures will range from environmentally friendly purchasing, shared product use, swaps to optimised maintenance, upgrade, repair, down to waste disposal. Financing of significant expenses that can be a barrier to transition at household level, and amortisation issues need to be addressed in the context of the advisory service. The aim is also to debunk the notion that sustainable living is a privilege of the wealthy.

In a third step, results will be analysed and presented in a robust way that allows multiplication both through media initiatives and on the ground, via public authorities or directly by individual actors who want to replicate and implement successful circular measures in their remit. With regard to the territorial aspects of all proposed solutions, proposals should seek to contribute to the goals and cooperate with the services of the European Commission's Circular Cities and Regions Initiative (CCRI)[244]. Joint activities with CCRI projects are encouraged.

The targeted TRL at the end of the projects is 6 to 8.

HORIZON-CL6-2023-CircBio-01-3: Harnessing the innovation potential and market uptake of successful circular economy water related projects

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 2.00 million.
Type of Action	Coordination and Support Actions
Legal and financial set-up of the Grant	The rules are described in General Annex G. The following exceptions apply:

244 https://circular-cities-and-regions.eu/.

Agreements	Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [245].

Expected Outcome: In support of the European Green Deal and EU water-related policies, successful proposals will contribute achieving sustainable and circular management and use of water resources, as well as prevention and removal of pollution, in particular the expected impact of the Destination 'Circular economy and bioeconomy sectors' to 'Accelerate transitions towards a sustainable, regenerative, inclusive, just and clean circular economy based on enhanced knowledge and understanding of science'.

Projects results are expected to contribute to all of the following expected outcomes:

- Boost the uptake of the most promising systemic solutions, innovative recovered products and related business models for sustainable wastewater treatment, recovery and reuse, removing relevant barriers and create a level playing field for innovative companies;
- Change perception and behaviour of European citizens, removing social barriers with regard to wastewater management, recovery and the reuse of resources and energy
- Enhance collaboration and knowledge sharing on water reuse and recovery, education, awareness, and professional skills development;
- Support the implementation of relevant EU policies (e.g., water and marine related policies, water reuse regulation, sludge and industrial emissions directive, climate change adaptation strategy, circular economy action plan, EU bioeconomy strategy and its action plan, EU zero pollution action plan).

Scope: The water sector is facing important transformations in order to ensure resource efficiency, food and water security and meet relevant targets of the EGD. Transitioning to a circular economy and bioeconomy present a big opportunity for that.

Past and ongoing EU funded projects demonstrated the benefits of applying circular economy and bioeconomy principles to water systems and provided interesting case studies on various circular water management approaches and business models, and insights on how materials, water, energy, products and components can be managed in such a way, they can maintain their highest possible intrinsic value. However, the uptake of innovative circular water solutions (e.g., recovered products) is hindered by the lack of a common understanding of

[245] This decision is available on the Funding and Tenders Portal, in the reference documents section for Horizon Europe, under 'Simplified costs decisions' or through this link: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/ls-decision_he_en.pdf

benefits of systemic solutions and the lack of a systematic analysis of the various, technological, regulatory and social barriers. Raising, for instance, public awareness, stakeholder and business engagement on the use of recovered products (water, nutrients, other resources) is crucial for overcoming social barriers and other regulatory ones as well as for enabling policy developments.

There is therefore the need to create a critical mass for knowledge exchange, to further promote the dissemination and exploitation of EU funded research results, to remove social barriers, facilitate their use by various stakeholders, reduce unnecessary duplication of efforts, ensure/demonstrate public and stakeholders engagement in developing business opportunities of circular use of water and identify wider policy implementation opportunities as well as, opportunities to accelerate and scale-up various scientific and technological advances that support greater water efficiency and reuse in various sectors and promote innovation and business development.

This action should bring together relevant business representatives, investors water utilities, policy makers, researchers, technology providers, water utilities, and other water users and citizens from past and ongoing successful EU funded R&I projects on the circular use of water, to take stock of the outcomes of major results with regards to technologies, eco-innovative solutions and related business models for sustainable treatment and practices of stakeholders and water managers involvement, recovery and reuse of relevant resources from wastewater and sewage sludge (e.g., nutrients, metals, energy, etc.). The involvement of relevant EU water EU associations and supporting platforms should be encouraged, as they play an important role in bringing together different stakeholders (industry, science, regulators, consumers and downstream users) and different sectors (recycling technologies, waste industry, user industries and agriculture) for knowledge transfer, dialogue and confidence building utility associations. The inclusion of relevant SSH expertise would be also needed to help achieving the social related expected outcomes of this action.

For achieving these objectives the action should analyse relevant results and experiences and provide guidance related to the transition pathways that would enable water management authorities and utilities to navigate through water, material and energy pathways. Various business models for future replication, use, policy and market uptake of project results, should be also analysed, as well as related regulatory and/or market barriers. Recommendations for best practices to engaging the public and user industries (such as the food industry for nutrients or the biobased industry for biomasses) in co-design and co-creation processes that can speed up the market uptake of the solutions should be provided, as well as recommendations for future research needs.

The action should:

- Assess how digital business models can further support water reuse, energy and resource recovery along the water cycle and help to increase awareness of the water sector operators concerning the water-energy-carbon nexus and longer-term impact of their day-by-day activity and promote actions for their market uptake.

- Assess the social, environmental and economic impacts of various project results and their contribution the aims of various related EU policies. The full cost of service should be considered within the water sector. This includes the capital and operating expenses, cost savings from recovered products, the environmental and social aspects of water cycle management.

- Propose a roadmap, recommendations and guidance on the standardisation of water products, in relation to secondary raw materials from wastewater treatment plants, including standardized key performance indicators and product certification schemes. In this context it would be also useful to assess to what extent, the development of niche markets and decentralised logistics/business models could further support the market uptake of recovered products.

- Propose a roadmap and action plan to address the social perception and related biases of water reclamation and reuse with a view to increasing awareness among various water users and citizens in general.

- Develop new education and training programmes to upskill young professionals in relevant sectors in relation to the circular use of water along the water cycle.

- Define and propose national and EU-harmonized end-of-waste criteria for the recovered materials.

Innovating for sustainable bio-based systems, biotechnology and the bioeconomy

Proposals are invited against the following topic(s):

HORIZON-CL6-2023-CircBio-01-4: Land-based bioprospecting and production of bioactive compounds and functional materials for multiple bio-based value chains

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 4.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 3-5 by the end of the project – see General Annex B.

Expected Outcome: A successful proposal will contribute to all Destination 'Circular economy and bioeconomy sectors' impacts related to consumers and industry, in particular to development of innovative and sustainable value-chains in the bio-based sectors and of

European industrial sustainability, competitiveness and EU resource independence / strategic autonomy. It will also contribute via research on biotechnology and other enabling technologies, as a prerequisite and driver of future solutions for the bioeconomy transition.

Project results are expected to contribute to all of the following outcomes:

- Enhanced understanding of terrestrial biodiversity and the limits and potentials of its valorisation;
- Addressing the need of sustainable sourcing and development of novel natural, sustainable and 'eco-friendly' (including 'climate-friendly') materials and product ingredients for various sectors and applications. These will eventually deliver clear-cut benefits for consumers by being more effective and/or eco-friendly, cheaper, better for climate, and more readily accessible than existing fossil-based alternatives;
- Improved sustainable exploitation, cultivation and processing methods based on promising species/organisms (including complex inter-species communities), and chosen production routes; leading to a diminished pressure on the natural resources (especially biodiversity) in situ.
- Increased competitiveness of European biotechnology, in particular the SMEs sector.
- Increased public knowledge and awareness of connections between biodiversity and biotechnology and its potentials, leading to increased trust in the scientific approaches based on informed and robust communication and mutual-learning efforts.

Scope: Global terrestrial biodiversity remains a largely untapped source of natural bioactive molecules and compounds, often combined with interesting potential functional properties of high economic and social value. Such chemical diversity and structural complexity may be matched with biological potency and selectivity. While some of the natural biochemical diversity has been studied[246], the potential for developing new applications and products is far from exhausted[247]. There are still significant opportunities to improve the biodiscovery process as well as understanding of specific biochemical pathways leading to high-value applications, especially with those with a reduced Green House Gas (GHG) emissions, in various sectors, based on novel biochemicals and functional bio-based materials.

This will increase capacity in the European biotechnology sector and other industries to respond to society's needs. The challenge is to match sustainable sourcing and processing with efficient and cost-effective use. This calls for close cooperation between industrial and academic partners, with due consideration for health/safety and environmental legislation, and informed public engagement.

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246 E.g., Horizon 2020 topic FNR-11-2020. Prospecting aquatic and terrestrial natural biological resources for biologically active compounds, ongoing project InnCoCells.

247 European Commission, Directorate-General for Research and Innovation, Wydra, S., Hüsing, B., Aichinger, H., et al, Life and biological sciences and technologies as engines for bio-based innovation, Publications Office, 2021, https://data.europa.eu/doi/10.2777/046454.

Activities should address:

- Technical improvements of the bioprospecting of any land-based organisms for potential bioactive compounds and functional materials, based on identified suitable sources of feedstock. The bioprospecting may be "bio-guided" by the study of chemical ecology interspecific interactions (symbiotic/defence) such as, for instance, plant-insects, or microbial-insect/plant/fungus interactions.

- Addressing sustainable biodiscovery, including by advanced detection methods, such as in silico database analysis, microfluidics/lab-on-chip, high-throughput screening, machine learning, etc, overcoming the issues of low concentrations of target molecules, and their general scarcity, and use of natural biological resources from diverse terrestrial environments and ecosystems, allowing better assessment of the selected bioactivity/functional property potential.

- Defining and assessing the optimal further production routes via innovative approaches and systems/platforms (e.g., biotechnology, hydroponics, bioreactors), as well as economic feasibility assessment of these options for resulting bioactive compounds and functional materials, ensuring full valorisation of biomass and all by-products in the production routes, and biomass' sustainable supply, and, if appropriate, proposing an outline of continuation of the end-product development beyond the project timeline and its present resources.

- Assessing and clearly communicating, by inclusive communication and dissemination strategies, the environmental and climate benefits (e.g., by lowering the pressure on the natural habitats (decrease of harvesting *in situ*), supporting nature conservation, and increase overall resource efficiency and sustainability), while expanding the range of natural ingredients for the new applications in industrial sectors.

- Covering the environmental, climate and safety/health impacts of the developed ingredients or processes, using Life-Cycle Assessment (LCA) methodologies based on available standards, certification, and accepted and validated approaches. Estimate of possible negative environmental impacts and trade-offs should be provided. The need to guarantee biodiversity preservation and compliance with relevant international rules on access to biological resources, their sustainable use and the fair and equitable sharing of benefits from their utilisation, with the national regulations in the source countries and with the Convention on Biological Diversity and its Nagoya Protocol.

- Food, biofuel and bioenergy applications are not in scope. Agricultural crop protection products (chemical pesticide substitutes) are also not in scope, to avoid overlaps with a parallel topic[248]. Marine and aquatic ecosystems are also out of scope to avoid overlap with parallel topics[249] and projects funded under the recent call[250]. For any health-related

[248] HORIZON-CL6-2023-FARM2FORK-01-7: Innovations in plant protection: alternatives to reduce the use of pesticides focusing on candidates for substitution.

[249] Topics under the present Destination, Heading 3 – Innovating for blue bioeconomy and biotechnology value chains.

applications, complementarities with Horizon Europe Cluster 1 'Health' should be carefully explored, to avoid duplications, and seek synergies.

Where relevant, and to increase impact, proposals should seek links and synergies as well as capitalise on the results of past and ongoing research projects[251] (including under the Bio-based Industries Joint Undertaking (BBI JU) / Circular Bio-based Europe Joint Undertaking (CBE JU)).

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

HORIZON-CL6-2023-CircBio-01-5: Broadening the spectrum of robust enzymes and microbial hosts in industrial biotechnology

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 6-7 by the end of the project – see General Annex B.

Expected Outcome: A successful proposal will contribute to Destination 'Circular economy and bioeconomy sectors' impacts, in line with the European Green Deal, the EU bioeconomy strategy & its action plan as well as the EU industrial strategy. A proposal is expected to address in particular: i) developing innovative and sustainable value-chains in the bio-based sectors and ii) enhancing European industrial sustainability, competitiveness and resource independence. Expected impacts will be achieved via research and innovation on industrial biotechnology and other enabling technologies, as a prerequisite and driver of future solutions for the bioeconomy transition.

Project results are expected to contribute to all of the following outcomes:

- Enhanced EU bio-based sector competitiveness, sustainability and resource independence, including SMEs. More specifically, successful projects will contribute to a paradigm shift from enzymes and industrial microbial-hosts dependent processes to

250 Horizon 2020 topic FNR-11-2020-(B). Prospecting aquatic and terrestrial natural biological resources for biologically active compounds, projects MARBLES, SECRETed, ALGAE4IBD.

251 Horizon 2020 topic FNR-11-2020-(A). Prospecting aquatic and terrestrial natural biological resources for biologically active compounds, project InnCoCells.

evolved microbial hosts and enzymes, for improved (bio-based) process/production robustness and flexibility.

- Enabling environmental performance improvements of bio-based processes (encompassing climate-neutrality, circularity and zero pollution) through resource efficient valorisation of sustainable biomass feedstock, while addressing pollution issues in production processes.

- Long-term benefits to the bio-based sector, consumers and end-users, by more environmentally-friendly as well as more technically and economically feasible applications in diverse value chains, also underpinned by progress in industrial biotechnology.

Scope: The overall scope focuses on widening the range of known robust enzymatic catalysts and industrial microbial hosts,[252] as well as on the potential of scaling up their deployment and thus exploring their potential to offer significant gains in bio-based processes and their flexibility against variable process parameters, namely: resource efficiency, energy efficiency and other process metrics. These efforts will then eventually aim for development of novel, or significantly optimised, sustainable (bio-based) processes and products (e.g. chemicals, materials).

Proposals should address:

- Identification and bioprospecting of novel natural enzymes and/or microbial hosts, including though the use of existing sequencing data, from all types of environments (especially terrestrial but also marine).[253] The identified solutions must especially address extreme habitats (relevant to bio-based processes conditions/ challenges-*see next point*).

- Optimisation of enzymes' and/or microbial hosts' properties for industrial use, addressing (bio-based) process conditions barriers. Such barriers comprise of physical parameters (e.g., temperature, pH) and chemical parameters/stressors (e.g., solvents, variable biomass feedstock composition, contaminants etc.). Optimisation efforts may include understanding, modification and control of microbial hosts and enzymes, (e.g. via Synthetic Biology methodologies).

- Testing and demonstrating of novel concepts for industrial enzyme-catalysed or microbial host-based processes (e.g., engineering of enzyme cascades/multi-enzyme reactions, co-factor regeneration, broader range of functional activity etc.) to valorise biomass and produce high-value bio-based products.

- Demonstrating optimised process design, development and control aspects, with considerations for implementation of automation, integration of unit operations, robust

252 Microbial-hosts: both prokaryotic and eukaryotic organisms such as fungi.

253 For marine environments, please consider any relevant past or ongoing topics under heading 'Innovating for blue bioeconomy and biotechnology value chains (e.g. HORIZON-CL6-2024-CircBio-01-10: Targeting aquatic extremophiles for sourcing novel enzymes, drugs, metabolites and chemicals

and precise process analytical technologies (PAT), and the horizontal incorporation of enabling digital technologies, where necessary for improving process efficiency but also achieving environmental performance improvements.

- Assessment of the tested, optimized enzyme-catalysed or microbial host-based processes with respect to biotechnological, economic, environmental performance (lifecycle assessment) as well as safety parameters and standards.
- Linking to the ongoing work on sustainability improvements via industrial biotechnology[254], if underpinned by the thematic focus on enzymes.
- Beneficiaries should pay attention to the delivery of FAIR data, results and methodologies.

Where relevant, proposals should overall seek links and synergies as well as capitalise on the results of past and ongoing EU research projects[255] of Horizon 2020, LIFE, Horizon Europe (including the Bio-based Industries Joint Undertaking (BBI JU) /Circular Bio-based Europe Joint Undertaking (CBE JU)).

Proposals should also include a dedicated task, appropriate resources and a plan on how they will collaborate with other projects funded under this topic and other relevant topics.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

HORIZON-CL6-2023-CircBio-01-6: Bio-based solutions for humanitarian applications

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 1.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 3.00 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply:

254 See parallel topic HORIZON-CL6-2023-ZEROPOLLUTION-01-5: Industrial biotechnology approaches for improved sustainability and output of industrial bio-based processes.

255 In particular Horizon 2020 call FNR-16-2020 topic 'Enzymes for more environment-friendly consumer products', H2020-FNR-16-2020 projects, such as: EnXylaScope – 'Mining Microbes and Developing Advanced Production Platforms for Novel Enzymes To Rapidly Unleash Xylans' Potential In a Scope Of Products For the Consumer Market; FuturEnzyme - Technologies of the Future for Low-Cost Enzymes for Environment-Friendly Products, RADICALZ 'Rapid discovery and development of enzymes for novel and greener consumer products'.

	Due to the scope of the topic, legal entities established in low- and middle-income countries (see General Annexes) may exceptionally participate in this Coordination and support action as beneficiaries or affiliated entities. The following additional eligibility criteria apply: the proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [256].

Expected Outcome: Successful proposals will contribute to Destination 'Circular economy and bioeconomy sectors' impacts, including: i) accelerating transitions towards a sustainable, regenerative, inclusive, just and clean circular economy and bioeconomy, ii) developing innovative and sustainable value-chains in the bio-based sectors as well as iii) improving citizen benefits by establishing circular and bio-based systems based on sustainability, inclusiveness, zero pollution.

More precisely, successful proposals will provide humanitarian aid operators and bio-based sector stakeholders, with science-based information on the application potential, sustainable performances and circularity of bio-based solutions and options, suitable for humanitarian purposes. Projects' results will thus contribute to further improve on the social benefits of bio-based systems, in line with the European Green Deal, the bioeconomy strategy, the EU circular economy action plan and the EU zero pollution action plan.

Projects results are expected to contribute to the following expected outcomes:

- Identification of sustainable bio-based solutions of applicable performance under humanitarian aid contexts, addressing the technical challenges posed by diverse environmental, social and economic conditions.
- Improved way to address waste management and waste-related challenges in humanitarian aid contexts.

[256] This decision is available on the Funding and Tenders Portal, in the reference documents section for Horizon Europe, under 'Simplified costs decisions' or through this link: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/ls-decision_he_en.pdf

- Significant reduction/minimisation of waste (e.g., plastic or fibres waste) littered in the environment.

Scope: The global solid waste management crisis (and any related pollution) is increasingly urgent to address and it can disproportionately affect countries that commonly receive humanitarian assistance. Humanitarian aid, including EU-funded aid, is delivered both within EU boundaries and beyond, including to remote areas, posing logistics challenges of waste management. This call would contribute by examining on how bio-based products and systems could contribute to managing environmental challenges relevant to waste in humanitarian contexts. For example, based on existing assessment studies[257], issues pertain with durability of materials compared to the timeframe needed for their integrity to guarantee necessary quality, cost effectiveness of managing waste, prevention of littering, safety to end-users and operators as well reuse, recycling, or biodegradability and composting of waste materials in humanitarian settings.

Proposals should:

- Assess the scope for which bio-based innovative technological solutions as well as bio-based systems have more environmentally sound applicability (including zero pollution and climate change considerations) for different and relevant applications,[258] under humanitarian contexts (scoping exercise).

- Evaluate socio-economic/governance aspects, including the replication potential of appropriate solutions.

- Include appropriate lifecycle assessment methodologies to examine the potential to reduce the environmental impact (accounting also for biodiversity, ecosystems preservation and enhancement, zero pollution as well as greenhouse gas emissions) of proposed solutions, under relevant humanitarian aid conditions (variable environmental, social and economic conditions).

- Develop guidelines and recommendations to policy makers, bio-based sector actors as well as humanitarian aid operators/practitioners (e.g., NGOs). Such guidelines can address further R&D&I needs and socioeconomic considerations, detailing on the potential of bio-based products and bio-based systems for uptake, based on the scoping exercise and a SWOT analysis. For all aforementioned aspects, humanitarian context specificity is crucial and must be taken into account for the analysis.

- Implement multi-actor approach (MAA) by involving a wide range of bio-based sector actors, humanitarian aid actors as well as other relevant stakeholders, accounting also for trans- and inter-disciplinary research.

257 E.g., World Food Programme Environmental Sustainability Unit.
258 E.g. plastic products and packaging, logistic assets, textiles, waste treatment, water treatment etc.

Where relevant, proposals should seek links and synergies as well as capitalise on the results of past and ongoing EU research projects[259] (Horizon 2020, LIFE, Horizon Europe, including the Bio-based Industries Joint Undertaking (BBI JU) / Circular Bio-based Europe Joint Undertaking (CBE JU)).

International cooperation and the consideration of gender-related aspects are highly encouraged. Social Innovation and social science and humanities (SSH) aspects should form an essential part of the funded projects.

HORIZON-CL6-2023-CircBio-01-7: Symbiosis in the bio-based industrial ecosystems

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 1.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 3.00 million.
Type of Action	Coordination and Support Actions
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [260].

Expected Outcome: Successful proposals will enable the bio-based industries in the Union to contribute to the enhancement of European industrial sustainability, competitiveness and resource independence, developing industrial symbiosis and circularity by design and to the development of innovative and sustainable value-chains in the bio-based sectors as a prerequisite and driver of future solutions for a circular economy and the bioeconomy transitions. Projects results will contribute to deliver bio-based solutions with reduced environmental impacts on soil, water, and air quality, biodiversity and climate, in line with the EGD objectives, the EU circular economy action plan, the bioeconomy strategy and the implementation of the transition pathway for the EU chemicals industry.

259 E.g., see also parallel topic HORIZON_CL6-2024-CircBio-01-05 Programmed biodegradation capability of bio-based materials and products, validated in specific environments.

260 This decision is available on the Funding and Tenders Portal, in the reference documents section for Horizon Europe, under 'Simplified costs decisions' or through this link: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/ls-decision_he_en.pdf

Projects results are expected to contribute to all of the following expected outcomes:

- Innovative processes and industrial symbiosis approaches in the bio-based industrial value chains, enabling local security of supply chains and the maximum valorisation of biological resources while minimizing the use of hazardous substances and waste streams;

- Monitoring systems of the industrial symbiosis in the bio-based industrial value chains.

Scope: In the transition towards an effective circularity and zero pollution within the industrial ecosystems in the Union, the production of goods and services must optimize the use of any resource. Industrial symbiosis is instrumental to this goal, as it is based on the sharing of resources between facilities when wastes or by-products from an industry or industrial process becomes the raw material for another. A well-developed symbiosis across bio-based facilities aims at zero-waste value chains, ensuring more local supply chains, minimizing the use of input material resources, while reducing all the environmental impacts on soil, water, and air quality, biodiversity and climate, of all the processes involved. This should also bring an increase in the economic value of final products and a better distribution of economic and social benefits among the stakeholders. Industrial bio-based facilities within the scope of this topic include those producing bio-based materials and products (e.g., paints, coatings, inks and dyes, polymers, construction materials, fibres, personal care products, plasticisers, adhesive, lubricants, platform chemicals, solvents, surfactants, etc.).

To improve the knowledge for the implementation and scaling up of industrial symbiosis in the bio-based industries proposals should:

- Analyse the applicability of existing methods and approaches individuating and assessing technical solutions enabling the symbiosis to specific sectors/facilities within the bio-based industrial ecosystems (but also their symbiosis with non-bio-based industrial assets), including supported by digital innovation and AI, based on existing studies [261] and on the knowledge collected and elaborated under the European Community of Practice[262] (ECoP);

- Improve existing and/or develop new methods to assess the circularity and symbiosis of bio-based industrial ecosystems, taking into considerations specific KPIs developed in the above-mentioned ECoP;

- Assess and optimize the environmental sustainability of symbiotic processes in terms of (decreased) impacts on soil, water, and air quality, biodiversity and climate;

- Evaluate the economic and social benefits of the industrial symbiosis assets in terms of increased economic value of final industrial products, better distribution of economic

[261] See for example the study "Study and portfolio review of the projects on industrial symbiosis in DG Research and Innovation" https://op.europa.eu/en/publication-detail/-/publication/f26dfd11-6288-11ea-b735-01aa75ed71a1.

[262] See the CSA funded under the topic HORIZON-CL4-2021-TWIN-TRANSITION-01-16: Hubs for Circularity European Community of Practice (ECoP) platform (Processes4Planet Partnership).

and social benefits among the stakeholders, improved utilisation of local supply chains, and integration in local (national and regional) strategies supporting circular approaches;

- Individuate high-potential regions/areas, or specific industrial hubs for the demonstration of the developed symbiotic approach. Criteria for the individuation of such sites should focus on process level, symbiosis process implementation, commitment level of the local authorities and communities, regional specificities (business/industrial policy and strategies), additional funding, potential private investors, etc., also taking stock from the EU Hubs for Circularity (H4C) experiences[263];

- Engage with stakeholders, including local authorities and communities to disseminate the social and economic benefits from innovation in industrial symbiosis, bio-based industries, universities or other educational institutions to facilitate the training of circular practitioners;

- Develop a targeted reporting system of the effectiveness of the technical solutions, based on ad-hoc monitoring capacity along the bio-based value chains working in symbiosis.

Projects are expected to contribute to the New European Bauhaus (NEB) initiative by interacting with the NEB Community, NEB Lab and other relevant actions of the NEB initiative through sharing information, best practices, and, where relevant, results.

Where relevant, proposals should seek links with and capitalise on the results of past and ongoing EU funded projects, including under the Circular Bio-based Europe JU and other partnerships of Horizon Europe and beyond.

This topic requires the effective contribution of SSH disciplines and the involvement of SSH experts, institutions as well as the inclusion of relevant SSH expertise, in order to produce meaningful and significant effects enhancing the societal impact of the related research activities.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

HORIZON-CL6-2023-CircBio-01-8: Eco-friendly consumer products – low-toxicity/zero pollution construction bio-based materials

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.

263 Hubs for circularity - Publications Office of the EU (europa.eu)

Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.

Expected Outcome: A successful proposal will contribute to all Destination 'Circular economy and bioeconomy sectors' impacts related to consumers and industry, in particular to development of innovative and sustainable value-chains in the bio-based sectors and of European industrial sustainability, competitiveness and resource independence, including via research on biotechnology and other enabling technologies, as a prerequisite and driver of future solutions for a circular economy and the bioeconomy transitions.

Project results are expected to contribute to all of the following outcomes:

- Higher environmental sustainability, including on the climate targets (primarily reduction of greenhouse gas emissions, and accessorily increase of carbon removals), and zero pollution demonstrated by LCA approaches of bio-based materials and products for construction applications, allowing their intensified sustainable use, under the New European Bauhaus Initiative[264] and the Renovation Wave[265];

- Demonstrated non-toxic and zero-pollution properties of the construction materials, as well as their recyclability and/or reusability, to respond to the higher societal demand and the objectives of the European Green Deal;

- Increased competitiveness of European industry, including SME sector, and involving various actors of bio-based value chains; while ensuring affordable and sustainable end-products for the consumers and society, including via integration of digital solutions;

- Improved innovation potential in regard to biotechnology, and its potential contribution to the sustainable, circular bio-based materials and biochemicals, with safe, environmentally-friendly and functionally performing applications;

- Improved societal innovation and creativity, with inclusive engagement of all societal actors, especially professional bodies, policymakers, designers, architects, consumers and end-users, for the bio-based construction product segments. This is expected to contribute, e.g., by developing recommendations or guidelines, or public engagement/dialogue, to the policy-feedback on innovative construction materials, and to resolving related regulatory bottlenecks.

Scope: Bio-based construction materials offer major opportunities to contribute to the climate-neutral and zero-pollution objectives of the European Green Deal, replacing fossil-based

264 COM(2021)573 final "New European Bauhaus Beautiful, Sustainable, Together". Projects are expected to contribute to the New European Bauhaus (NEB) initiative (https://europa.eu/new-european-bauhaus/index_en) by interacting with the NEB Community, NEB Lab and other relevant actions of the NEB initiative through sharing information, best practice, and, where relevant, results.

265 COM(2020)662 final "A Renovation Wave for Europe - greening our buildings, creating jobs, improving lives".

alternatives, and so, reducing the environmental footprint, while offering economic benefits to the actors involved. However, care needs to be taken to ensure sustainability of sourcing and production process, while guaranteeing safety and positive user experience. This calls for high level of innovation and creativity, ensuring full inclusiveness of participation for all actors.

Proposals will focus on:

- Identification and upscaling of bio-based materials suitable for the construction sector, understood as bio-based feedstocks, e.g. agro-forestry [266] residues, fibres, recycled organic materials, industrial by-products etc, obtained especially by higher circularity of available biomass, under the cascading use of biomass principle. However, the selected materials can also be found in other bio-based resources that, due to their specific genetic / physiological / biochemical backgrounds have functional properties, which can be further improved or upgraded by fermentation, biomanufacturing, or biotechnology approaches. Also, the hybrid integration of living organisms into traditional or bio-based construction materials (e.g., plants, algae, fungi) might be considered, if leading to higher quality and improved environmental impact. The range of final construction materials is broad and may cover composites, insulation materials, interior or exterior elements, adhesives, etc., depending on the construction value chain selected.

- Innovating in terms of bio-based production improvements (e.g., additive bio-based manufacturing, nature-based solutions, or composite materials with added functionalities), leading to new construction-oriented consumer applications. This effort should benefit from innovation developed both from the technical angle, but also from social innovation and from inclusive participation of all actors, including development of recommendations for pre-normative or/and regulatory actions, related to new (recyclable/reusable) bio-based construction materials, as appropriate.

- The safety and user experience aspects should be duly considered and included in the developed solutions.

- Communication and dissemination will form an essential part of the projects, especially as related to the sustainability, ‘reconnection with nature’ and inclusiveness aspects.

- Proposals should include a dedicated task, appropriate resources and a plan on how they will collaborate with other projects funded under this topic and other relevant topics.

- International cooperation is encouraged to benefit from exchange of best practices, while taking care of European (industrial) competitiveness.

- SSH aspects should be considered and covered, as well as the contribution from digital solutions.

[266] Synergies with R&D on traditional bio-based feedstocks such as wood may be sought, e.g., see topic HORIZON-CL6-2024-CLIMATE-01-5: Climate-smart use of wood in the construction sector, or activities under the Circular Bio-based Europe (CBE) JU.

HORIZON-CL6-2023-CircBio-01-9: Business models that balance the share of power and profit in the bioeconomy

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 8.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: the proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties. The support to third parties can only be provided in the form of grants. The maximum amount to be granted to each third party is EUR 60 000. Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [267].

Expected Outcome: This topic is supporting the bioeconomy strategy and the common agriculture policy (CAP) by promoting diverse forms of cooperation among primary producers to create value-added bio-based products in fair value chains via advanced biorefineries.

Project results are expected to contribute to all of the following outcomes:

- Revitalisation and resilience of rural economies by creating new green jobs and investments.

[267] This decision is available on the Funding and Tenders Portal, in the reference documents section for Horizon Europe, under 'Simplified costs decisions' or through this link: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/ls-decision_he_en.pdf

- Development and validation of replicable, scalable production and business models for the operation of biorefineries that offer economic opportunities in rural areas and contribute to a fair distribution of benefits in bio-based value chains.
- Enhanced joint investment in R&D and demonstration plants.
- Linking of underutilised feedstock types with available technologies and market information, improved logistics and quality standards.
- Identification of factors for success and policy recommendations in view of robust contracts and agreements, training and capacity building, shared business plans, marketing strategies for bio-based products as well as financial and legal aspects.
- Climate-neutral land sector by 2035 and climate-neutral economy by 2050.
- Diversification and enhancement of agricultural incomes (organic and conventional farming) and transition towards sustainable food systems in line with the farm to fork strategy.
- Enhanced cooperation between primary producers and other key actors along the value chain in the bio-based economy.

Scope: The circular use of waste, by-products and residues from agriculture, forestry, and the agri-food industry can lead to the creation of new economic opportunities in rural areas. However, primary producers are often not fully integrated in bio-based value chains, and thus, benefits are not sufficiently distributed among value chain actors.

This topic addresses diverse forms of cooperation among primary producers and suitable business models to create high-value bio-based products in vertically integrated value chains via advanced biorefineries.

Proposals will:

- Examine the potential of contractual agreements or fully developed shareholder/ownership concepts (e.g., cooperatives) to create sustainable and competitive innovations in the bio-based economy through the conversion of by-products, residues and wastes from agriculture and forestry.
- Develop and promote business models for different primary production sectors in the EU that build on existing rural infrastructures, support the economies of scale, and contribute to a fair distribution of costs, benefits, and risks amongst the economic operators.
- Contribute to a better understanding of sustainable and fair biobased supply chains, synergetic points along and across agricultural, forestry and industrial value chains as well as industrial symbiosis opportunities.

- Explore existing investment options, including non-traditional sources (e.g., cross-sectoral collaborations, etc.) and identify barriers and enablers for sustainable long-term operations.
- Contribute to restoring carbon content in soil, increasing nutrients, revitalising marginal lands and ensuring food security.
- Consider further socio-economic factors, influencing farmers' behaviour and develop indicators to assess the economic, environmental and social impacts for farmers, foresters and rural areas through increased cooperation.
- Connect with a wide range of stakeholders (farmers, foresters, industry, processors, advisors, clusters, etc.) and develop together a portfolio of research and innovation priorities that can be implemented in Horizon Europe and relevant European partnerships such as the Circular Biobased Europe.
- Promote bioeconomy-related interventions in the new CAP and provide advice and technical guidance for Member States.

Proposals shall apply the concept of the 'multi-actor approach' and ensure adequate involvement of the farming sector, SMEs and other actors active in rural areas.

Proposals may involve financial support to third parties e.g. to primary producers, academic researchers, start-ups, SMEs, and other multidisciplinary actors, to, for instance, develop, test or validate developed applications. Consortia need to define the selection process of organisations, for which financial support may be granted. Maximum 20% of the EU funding can be allocated to this purpose.

Cooperation with other selected projects under this topic is strongly encouraged.

HORIZON-CL6-2023-CircBio-01-10: Supporting the fair and just transition from GHG-intensive economies facing challenges towards circular bioeconomy model regions

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 2.00 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: the proposals must

	use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [268].

Expected Outcome: Successful proposal will contribute to the expected impacts of Destination 'Innovative governance, environmental observations and digital solutions in support of the Green Deal', and the European policies it supports, by supporting the establishment of the innovative governance models notably to achieve better-informed decision-making processes, social engagement and innovation.

In line with the European Green Deal priorities, the EU's climate targets for 2030 and 2050, the objectives of the EU biodiversity strategy for 2030, the farm to fork strategy and the vision of a society that acts within environmental and social boundaries as defined in the bioeconomy strategy, the successful proposal will guide and facilitate the green transition towards a circular bioeconomy model, in regions that lag behind in this process.

Projects results are expected to contribute to all following expected outcomes:

- Outline widespread best practices showing the economic, social and environmental opportunities and the challenges of transforming GHG-intensive economies, such as coal mining, intensive agriculture such as livestock or crop production, forestry, and fisheries, and peat production, towards circular bioeconomy model regions;
- Strengthened interactions and coordination between affected European / Associated Countries regions.

Scope:

- Identify just and fair bioeconomy solutions in regions that face difficulties in the green transition to leave no person and no place behind.
- Establish a network structure for European / Associated Countries regions to exchange views, best practices and align their work to overcome common challenges.

[268] This decision is available on the Funding and Tenders Portal, in the reference documents section for Horizon Europe, under 'Simplified costs decisions' or through this link: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/ls-decision_he_en.pdf

- Identify new bioeconomy structures that generate local green growth in regions currently relying on carbon-intensive economic activities that would be utilised by the IA project funded under HORIZON-CL6-2024-CircBio-01-07: Demonstrating the fair and just transition from GHG-intensive economies facing challenges towards circular bioeconomy model regions.
- Provide logistical support to the IA project funded under HORIZON-CL6-2024-CircBio-01-07: Demonstrating the fair and just transition from GHG-intensive economies facing challenges towards circular bioeconomy model regions.
- Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.
- Implement the required multi-actor approach by involving a wide diversity of bioeconomy actors and conducting trans-disciplinary research.
- Where relevant, activities should build and expand on the results of past and ongoing research projects.
- This topic requires the effective contribution of SSH disciplines and the involvement of SSH experts, institutions as well as the inclusion of relevant SSH expertise, in order to produce meaningful and significant effects enhancing the societal impact of the related research activities.

Innovating for blue bioeconomy and biotechnology value chains

Proposals are invited against the following topic(s):

HORIZON-CL6-2023-CircBio-01-11: Novel culturing of aquatic organisms for blue biotechnology applications

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 8.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 3-5 by the end of the project – see General Annex B.

Expected Outcome: The selected proposals are expected to contribute to all of the following outcomes:

- Expansion of the potential offered by marine or other aquatic biological resources through advances based on the greater knowledge of the functioning, processes and ecological interactions of marine and other aquatic organisms;

- Development of aquatic biotechnology solutions in cultivation and optimisation of production yield;

- Increased bio discovery of products through sustainable methods for robust aquatic bio-based production, including possibly production of chassis cells, as an alternative to wild harvesting;

- Support to green industrial bioprocessing and more sustainable bio-based products through new biotechnology processes and applications;

- Contribution to the development of circular processing.

Scope: The biotechnological exploitation of both pelagic and benthic marine and other aquatic (such as the ones living in fresh waters, transitional waters and ice ecosystems) organisms often requires their cultivation and the optimisation of production yield for the compounds of interest. Aquatic biota, and in particular marine ones (bacteria, algae, fungi or invertebrates such as sponges, corals and molluscs), cannot be easily cultured. It is believed that just a fraction of 1% of marine bacteria can be cultured using existing methods, and viruses and bacterial and viral phages, present even greater challenges. The culturing of aquatic organisms offers a sustainable alternative to wild harvesting. The potential environmental footprint and impact on health, sustainability and biodiversity aspects need, nevertheless, to be thoroughly assessed and safety established, through risks analysis linked to possible dissemination of newly developed organisms in nature. Culturing methods should be developed in sealed conditions, such completely in vitro or in aquaria and mesocosms, with particular attention to avoid spread of non-indigenous species in the natural aquatic environment.

Proposals under this topic should:

- Develop culturing methods (including for mixed cultures) for vertebrate and invertebrate cell lines for the production of active compounds particularly based on co-metabolism between community members that represent a radical change from the conventional “isolate and enrich” approach to cell culture;

- Develop bio-engineering tools for the use of marine and other aquatic model organisms to improve the availability of metabolites for industrial applications;

- Optimise culturing conditions so that the relevant metabolites are appropriately expressed and can be recovered with selective downstream processing techniques.

Selected projects should collaborate with each other. In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

Safeguarding and sustainably innovating the multiple functions of EU forests

Proposals are invited against the following topic(s):

HORIZON-CL6-2023-CircBio-01-12: Optimising the sustainable production of wood and non-wood products in small forest properties and development of new forest-based value chains

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 12.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: the proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties. The support to third parties can only be provided in the form of grants. The maximum amount to be granted to each third party is EUR 60 000.

Expected Outcome: This topic supports the EU forest strategy for 2030 by securing and promoting small-scale forest management for the sustainable use of wood and non-wood products, while fully respecting the cascading use principle and contributing to biodiversity and climate objectives, including forest ecosystem restoration and protection.

Project results are expected to contribute to all of the following outcomes:

- Development of regional and local management models for small-scale forest holdings in support of the EU forest strategy for 2030, adapted to the wide variety of contexts found in the EU.

- Better understanding of knowledge, skills, motivation and needs of small-scale forest owners, and development of targeted and innovative approaches for effective support structures and instruments for the various ownership types.

- Contribution to forest-related policy goals of the European Green Deal, including the development of a forest-based bioeconomy, the reduction of greenhouse gas emissions, the increase of carbon removals, the protection of ecosystem services and the restoration and conservation of forest biodiversity.

- Improved guidelines on carbon farming and PES (Payment for Ecosystem Services) design and implementation in Europe formulated and implemented.

- Development of lively, prosperous and resilient rural areas and integration of small-scale forests owners in the bioeconomy value chains.

- Improvement of the quantity and quality of EU forests, their multifunctional role and resilience needs under climate change and contribution to halting and reversing biodiversity loss.

Scope: European forests belong to around 16 million owners, whereby about 60% of the forest area is privately owned, the majority being small properties, often lacking proper attention by their owners mainly due to fragmentation and non-profitability. Knowledge on small-scale private forest owners' expertise, skills, motivations and needs to manage forests sustainably, including both traditional and non-traditional owner types, is limited.

Genuinely trans-disciplinary approaches in research and innovation are needed that combine the environmental and socio-economic dimensions and closely engage with broader stakeholder communities.

This topic addresses sustainable production potentials with a view to securing and promoting small-scale forest management for the sustainable use of wood and non-wood products, while fully respecting the cascading use principle and contributing to biodiversity objectives, including forest ecosystem restoration and protection.

Proposals will:

- Create a better understanding of the circumstances of small forest property owners and behaviour for both traditional and non-traditional owner types.

- Explore, analyse, and develop innovative forest management approaches, including silvicultural practices, carbon farming, digital tools (for example blockchain, robotics, AI or IoT/sensors), organisational, cooperation and business models, advisory services, education and training concepts, policy frameworks and social and institutional models that take into account different ownership types.

- Assess and develop innovative and tailored support structures, programmes and instruments, covering traditional and non-traditional owner types, considering size, geographical, professional and personal backgrounds, value orientations, age, gender, etc.

- Collect, analyse, and develop targeted approaches for activating and mobilising forest owners, particularly non-traditional, non-farm, absentee, urban or women as forest owners taking into consideration existing good practice guidance and examples.
- Define sustainable production potentials for wood and non-wood forest products through improved integrated management approaches.
- Develop new business models to promote the sustainable and value-added utilisation of damaged (burnt, broken, degraded conditions etc.) or infected wood (e.g., by bark-beetle, etc.) within strictly defined ecological thresholds and in line with the cascading use principle, forestry side streams and non-wood forest products (e.g., cork, etc.).
- Contribute positively to the UN and EU sustainability goals (climate, biodiversity, risks, income streams, ecosystem services etc.).
- Explore the role of social, economic, political, and institutional factors to improve political-institutional frameworks on different administrative levels.
- Engage small forest property owner types and all relevant actors in co-creation processes for developing viable measures and tools at local and European scale that contribute to increased awareness and motivation for ensuring sustainable use, restoration, and conservation of resilient small-scale private forest properties.
- Involve rural communities with a view to optimising the mobilisation of forest resources, improving land management practices, and reducing land abandonment in full respect of climate mitigation and adaptation, biodiversity protection and restoration objectives.
- Foster knowledge exchange and capacity-building.

The project must implement the multi-actor approach and ensure an adequate involvement of the primary production sector and the wider forest-based value chain.

Proposals may involve financial support to third parties e.g. to primary producers, academic researchers, start-ups, SMEs, and other multidisciplinary actors, to, for instance, develop, test or validate developed applications. A maximum of € 60 000 per third party might be granted. Conditions for third parties support are set out in Part B of the General Annexes. Consortia need to define the selection process of organisations, for which financial support may be granted. Maximum 20% of the EU funding can be allocated to this purpose. The financial support to third parties can only be provided in the form of grants.

HORIZON-CL6-2023-CircBio-01-13: Capturing market trends and societal perceptions for tailor-made forest services

Specific conditions	
Expected EU contribution per	The Commission estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately.

project	Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 12.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: the proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: This topic contributes to the new EU forest strategy for 2030 by addressing new opportunities for primary producers to diversify income and employment opportunities and developing new sustainable business models.

Project results are expected to contribute to all of the following outcomes:

- Improved integrated management concepts with a focus on market-oriented approaches to meet the growing demand for ecosystem services, including carbon removals through carbon farming.
- Development of decision support and management tools (including digital technologies such as AI, sensors or robotics) that will facilitate the joint delivery of multiple ecosystem services.
- Increased long-term resilience of forest production and use systems and associated value chains.
- Improved guidelines on carbon farming and PES (Payment for Ecosystem Services) design and implementation in Europe formulated and implemented.
- Accelerated uptake of sustainable business models in the primary production sector.

Scope: Forests provide invaluable benefits to people and the planet. They are biodiversity hubs and habitats, vital for climate and water regulation, soil stabilisation and the purification of air and water. Their carbon sequestration and storage capacity make them an important alley in the fight against climate change. Also, forests and the forest-based sector provide multiple socio-economic functions and benefits, including jobs and development possibilities in rural areas. Their role in providing food, medicines and materials and their value for recreation and learning from nature is indispensable for the transition to a circular bioeconomy and a healthy society.

However, there is an increasing demand on European forests to provide a high diversity of goods and ecosystem services at the same time. The choice of forest management can produce different outcomes for ecosystem services and productivity in the short and the long-term.

Forest owners should consider possible trade-offs and synergies with regards to the multifunctional role of forests, their interaction with climate change and their role for biodiversity. Therefore, there is a need for balanced and integrative approaches to ensure ecosystem services in the long-term and to provide sufficient resources for a sustainable and circular bioeconomy, while at the same time, contributing to GHG emissions reductions and carbon removals to contribute to 2030 and 2050 EU climate targets.

This topic addresses new opportunities for primary producers to diversify the income by developing new sustainable business models.

Proposals will:

- Set-up a transdisciplinary forum at the science-policy-society interface to regularly disseminate research results, discuss options for upscaling promising approaches (including technological needs and possible solutions) and collaborate with relevant policy makers, stakeholders and the wider public.

- Explore the evolving societal demands under changing climate conditions for different forest goods and services in an interdisciplinary and integrative approach to improve the knowledge that will help to balance the demands while safeguarding forest's capacities to deliver them in the best possible way.

- Based on previous research results (.e.g., InnoForest[269], Sincere[270], etc.), improve the understanding of ecosystem service interactions at different temporal scales both short-term and long-term and consider relevant social, environmental and economic interdependencies and path dependencies.

- Identify region and national specific market-driven approaches to create new or reactivate value chains and business models based on co-operation between forest owners, policymakers and users of ecosystem services with a view to develop tailor-made solutions and strengthen interdisciplinary and cross-sectoral cooperation.

- Select a set of representative European PES cases, including carbon farming cases, with sufficient implementation length and data availability for a holistic impact evaluation.

- Analyse and compare the data for contextualizing results vis-a-vis the existing literature on PES design and implementation, including carbon farming.

- Improve existing and develop new business models to determine the value and possible funding of sustainable forest management, including through the valuation of ecosystem services such as biodiversity, non-wood products, carbon sequestration and storage, clean water supply, soil protection, recreation, health amenities etc.; and develop standardized methods for their valuation where needed with the goal to maximise sustainable benefit across ecosystem services.

269 https://cordis.europa.eu/project/id/763899.
270 https://cordis.europa.eu/project/id/773702.

- Propose standards for measuring, assessing and valuating ecosystem services in different regional settings, which could lead to more efficient market mechanisms across Europe in support of forest management practices ensuring sustainable use and biodiversity conservation and restoration.

- Promote and provide advice for the set-up of adequate payment schemes through private and public funding instruments at national and EU-level (including the CAP).

The project must implement the multi-actor approach and ensure an adequate involvement of the primary production sector and the wider forest-based value chain.

This topic should involve the effective contribution of SSH disciplines.

HORIZON-CL6-2023-CircBio-01-14: Monitoring the multi-functionality of European forests

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 4.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: the proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part. The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties. The support to third parties can only be provided in the form of grants. The maximum amount to be granted to each third party is EUR 60 000.

Expected Outcome: This topic supports the implementation of the new EU forest strategy for 2030 by addressing the design of a comprehensive forest information system that align information on forest and soil state, the provision of ecosystem services (including biomass, biodiversity and carbon removals) and socio-economic demands on ecosystem services.

Project results are expected to contribute to all of the following outcomes:

- Development of a comprehensive information base for all stakeholders involved in forest matters, from policy making, through forest restoration and conservation planning and funding of such activities, to practical forest management.
- Successful implementation of forest-related policy objectives under the European Green Deal, including the building of a forest-based bioeconomy, the reduction of greenhouse gas emissions, the increase of carbon removals, the contribution to climate change adaptation, the provision of ecosystem services and the conservation and restoration of forest biodiversity.
- Better understanding of the quantity and quality of European forests, their multifunctional role and resilience needs under climate change and contribution to halting the loss of biodiversity.
- Efficient implementation of possible certification schemes in relation to forest multifunctionality (e.g., closer-to-nature forest management practices, carbon farming).

Scope: In the context of climate change impacts, accelerated biodiversity loss and the need to adjust our socio-economic system to a more sustainable alternative, forests play increasingly a double role as victim and part of the solution. While their resilience and potential are under threat, they help to mitigate climate change (e.g., through carbon sequestration), and contribute to climate change adaptation (buffering thermal variations or variations in water flows), harbour large parts of terrestrial biodiversity and provide feasible solutions to support the transition to a bioeconomy.

To adequately manage forests and the services they provide, reliable, up-to-date, and coherent European forest information is more important. However, one of the challenges remain how to integrate information from different sources on the many functions that forests fulfil and the benefits they provide to society. Currently, data are scattered and often focusing on a limited set of indicators, which do not adequately represent the multi-functionality of forests.

This topic addresses the design of a comprehensive forest information system that aligns information on forest state, ecosystem services (including biomass) provision and socio-economic ecosystem services demand.

Proposals will:

- Develop a list of parameters relevant for monitoring of a range of ecosystems services provided by forests.
- Consider the latest scientific knowledge and technology (e.g., through the use of AI, IoT/sensors, robotics and blockchain) for the development, combination, and utilization of reliable data from multiple sources (e.g., national forest inventories, remote sensing, environmental monitoring, large scale societal surveys, national or smaller-scale economic data etc.)

- Assess and propose suitable solutions to make these data available, also by considering issues related to the governance and funding of a fully harmonised monitoring system at EU-level.

- Engage in a structured dialogue with institutions and stakeholders, including the European Commission, national competent authorities, representatives of the forest-sector, as well as data providers to align the needs and possibilities of data collection, provision, and use.

The project must implement the multi-actor approach and ensure an adequate involvement of the primary production sector and the wider forest-based value chain.

Proposals may involve financial support to third parties e.g. to primary producers, academic researchers, start-ups, SMEs, data providers, national administrations, and other multidisciplinary actors, to, for instance, develop, test or validate developed applications. A maximum of € 60 000 per third party might be granted. Conditions for third parties support are set out in Part B of the General Annexes. Consortia need to define the selection process of organisations, for which financial support may be granted. Maximum 20% of the EU funding can be allocated to this purpose. The financial support to third parties can only be provided in the form of grants.

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

Cross-articulation with the other data spaces, and notably with the European Open Science Cloud should be foreseen, exploiting synergies and complementarities of the different approaches. Efforts should be made to increase the data availability in the appropriate data-infrastructures for further uses.

JRC is available for sharing and taking up results and findings on the monitoring of the forest ecosystem multifunctionality in the EU Observatory for Deforestation, Forest Degradation and Associated Drivers and JRC Big Data Analytics Platform.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

Call - Circular economy and bioeconomy sectors

HORIZON-CL6-2023-CIRCBIO-02

Conditions for the Call

Indicative budget(s)[271]

[271] The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million)[272]	Indicative number of projects expected to be funded
		2023		
Opening: 22 Dec 2022 Deadline(s): 28 Mar 2023 (First Stage), 26 Sep 2023 (Second Stage)				
HORIZON-CL6-2023-CircBio-02-1-two-stage	IA	58.00	9.00 to 10.00	6
HORIZON-CL6-2023-CircBio-02-2-two-stage	IA	14.00	Around 7.00	2
HORIZON-CL6-2023-CircBio-02-3-two-stage	RIA	8.00	Around 4.00	2
Overall indicative budget		80.00		

General conditions relating to this call	
Admissibility conditions	The conditions are described in General Annex A.
Eligibility conditions	The conditions are described in General Annex B.
Financial and operational capacity and exclusion	The criteria are described in General Annex C.
Award criteria	The criteria are described in General Annex D.
Documents	The documents are described in General Annex E.
Procedure	The procedure is described in General Annex F.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G.

[272] The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2023 and 2024.
Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Enabling a circular economy transition

Proposals are invited against the following topic(s):

HORIZON-CL6-2023-CircBio-02-1-two-stage: Circular Cities and Regions Initiative (CCRI)'s circular systemic solutions

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 9.00 and 10.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 58.00 million.
Type of Action	Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: Applicants submitting a proposal under the blind evaluation pilot (see General Annex F) must not disclose their organisation names, acronyms, logos, nor names of personnel in Part B of their first stage application (see General Annex E).
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following exceptions to the conditions described in General Annex B apply: Proposals funded under this topic, and their circular systemic solutions, must form part of the demonstration projects for the implementation of the European Commission's Circular Cities and Regions Initiative (CCRI). This means: (i) that proposals must cooperate with CCRI and its Coordination and Support Office by means of sharing with this initiative knowledge and experiences developed during the implementation and demonstration of the circular systemic solutions; (ii) proposals must participate in the CCRI's events. Applicants must integrate explicitly these obligations into their proposal's work plan.
Technology Readiness Level	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.
Procedure	The procedure is described in General Annex F. The following exceptions apply:

	This topic is part of the blind evaluation pilot under which first stage proposals will be evaluated blindly.

Expected Outcome: Successful proposals will support the delivery of solutions to implement the European Green Deal, the EU circular economy action plan (CEAP) and the bioeconomy strategy. The topic will support the transition towards a sustainable, regenerative, inclusive and just circular economy at local and regional scale across regions of Europe, boosting interregional and cross border cooperation.

Proposals funded under this topic will form part of the demonstration projects for the implementation of the European Commission's Circular Cities and Regions Initiative (CCRI)[273]. Proposals are expected to provide policymakers, public and private investors and local communities with concrete and demonstrated examples of circular systemic solutions.

Projects results are expected to contribute to all the following expected outcomes:

- Significantly increased circularity, reduced GHG emissions, and where relevant increased carbon removals, in product value chains, and efficient valorisation of local resources in cities, regions or their groupings.
- Creation of business opportunities and jobs in the circular economy at urban and/or regional scale.
- Increased uptake and participation of citizens in circular and climate-neutral practices.
- Enhanced knowledge transfer between the cities, regions or their groupings involved in the proposals financed under this topic and other cities and regions in EU Member States and Associated Countries.
- More effective widespread uptake and easier replication, scalability and visibility of circular systemic solutions and hence multiplication of their economic, social and environmental benefits.
- Contribution to achieving the policy targets of the European Green Deal, circular economy action plan, EU bioeconomy strategy and the European industrial strategy at local, regional, national, European and international levels.

Scope: In the context of this topic, a circular systemic solution is defined as demonstration project for deploying a circular and climate-neutral economy at urban and/or regional scale, involving key stakeholders and, ideally, addressing more than one product value chain. Proposals are expected to implement and demonstrate at large scale circular systemic solutions for the deployment of the circular economy (including the circular bioeconomy) in cities and regions or their groupings. They should form part of the implementation of the European Commission's Circular Cities and Regions Initiative (CCRI) and they should be

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

carried out in close coordination and cooperation with the CCRI Coordination and Support Office (CCRI-CSO).

The implemented circular systemic solutions should address economic, social and environmental dimensions of the transition towards a circular economy and include science, technology and governance components. They should demonstrate circular innovative technologies, novel governance and business models and support the active participation of all relevant actors in cities, regions or their groupings. Examples of relevant actors are: public administrations (national/regional/local authorities) and utilities (public/private companies); private sector services and industries, including start-ups and small and medium enterprises (SMEs); research infrastructures, scientific and innovator communities including incubators and accelerators; financial intermediaries with a focus on environmental and social impact; venture capitalists and business angels; civil society, including citizens; and non-governmental organisations and philanthropy.

The implemented circular systemic solutions can address ideally more than one of the key product value chains set out in the new circular economy action plan, i.e.: batteries and vehicles, electronics and ICT, packaging, plastics, textiles, construction and buildings, food, water and nutrients.[274] The circular systemic solutions may also include nature-based solutions. Circular systemic solutions and the economic sectors involved in them should be selected and based on a detailed analysis of the cities, regions or their grouping's socio-economic and environmental needs to be addressed, circular potential to be exploited and challenges to be tackled.

Circular systemic solutions should identify, analyse and, when feasible, quantify the economic, social and environmental benefits and trade-offs/challenges related to their implementation and demonstration. They should include the monitoring and evaluation of the transition towards a circular economy, identify their strengths and weaknesses as well as causes. They should analyse the encountered regulatory obstacles and drivers and provide clear and precise policy recommendations to improve circular economy. Each circular systemic solution should address environmental externalities and contribute to preserving and, where possible, increasing the well-being and the health conditions of the local communities involved in the transition towards a circular economy.

It is crucial that the circular systemic solutions implemented and their business models have a high replicability and scalability potential. This is fundamental to facilitate that circular systemic solutions demonstrated in specific areas should be replicated in others. During their implementation and by the end of their life cycle, the selected proposals are expected to share with all stakeholders clear and comprehensive guidelines on the circular systemic solutions adopted, including their strengths and challenges. They should also provide information on key barriers identified to avoid their emergence at early stages of replicating existing solutions. Proposals should ensure that all evidence, information and project outcomes will be accessible through the CCRI website (incl. business models and other studies).

274 https://ec.europa.eu/environment/circular-economy/.

It is essential that proposals also ensure complementarity and cooperation with existing and future relevant European projects on the circular economy and the circular bioeconomy, with special reference to those on local and regional scale and avoid overlaps and repetition[275].

Citizen science could be appropriate mode of research to increased practices and participation of citizens in circular systemic solutions.

Where relevant, SSH and social innovation aspects should be considered.

HORIZON-CL6-2023-CircBio-02-2-two-stage: Novel, sustainable and circular bio-based textiles

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 14.00 million.
Type of Action	Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: Applicants submitting a proposal under the blind evaluation pilot (see General Annex F) must not disclose their organisation names, acronyms, logos, nor names of personnel in Part B of their first stage application (see General Annex E).
Technology Readiness Level	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.
Procedure	The procedure is described in General Annex F. The following exceptions apply: This topic is part of the blind evaluation pilot under which first stage proposals will be evaluated blindly.

Expected Outcome: A successful proposal will contribute to expected impacts under the Destination 'Circular economy and bioeconomy sectors', in line with the European Green Deal, the EU bioeconomy strategy and its action plan, the EU biodiversity strategy for 2030, the circular economy action plan (CEAP), the chemicals strategy for sustainability, the EU

[275] Such as, projects under the Horizon Europe topic HORIZON-CL6-2021-CIRCBIO-01-01: Circular Cities and Regions Initiative (CCRI)'s circular systemic solutions, and Horizon 2020 European Green Deal call's topic LC-GD-3-2-2020: Demonstration of systemic solutions for the territorial deployment of the circular economy.

textiles strategy, the EU zero pollution action plan as well as the New European Bauhaus initiative and the EU industrial strategy.

In particular, expected impacts to be addressed by successful proposals include: i) enhancing European industrial sustainability, competitiveness and resource independence; ii) accelerating regional, rural, local, urban and consumer-based transitions towards a sustainable, regenerative, inclusive, just and clean circular economy and bioeconomy as well as iii) the development of innovative and sustainable value-chains in the bio-based sectors, substituting fossil-based ones.

Proposal results are expected to contribute to all of the following outcomes:

- Significantly reduce the negative environmental impact of textiles throughout their lifecycle. This impact encompasses primary raw materials and water consumption, land use and indirect land use change, as well as GHGs and other pollutants emissions (zero pollution), via addressing circularity-by-design and sustainable production aspects (the latter including thus also resource efficiency and circularity of resources improvements).

- Significantly increase recyclability and circularity of textiles; it is estimated that currently there is a very low rate of recyclability of textiles into new textiles, worldwide[276].

- Increase the use of EU (locally/regionally-sourced) alternative, bio-based fibres (including the reuse of bio-based textiles in their present form and in novel forms of use).

- Address social impacts (e.g., HS&E and working conditions), in addition to environmental effects; projects should ensure sustainable, circular and socially just textile production and consumption at EU level, while international cooperation is strongly encouraged. The latter will allow for enhancing further on the sustainable production and consumption of textiles while improving on the replication potential of the proposed innovations.

- Empower and increase SMEs participation and improve academia/industry/feedstock &fibres suppliers' interactions and collaboration.

- Establish new and innovative circular bio-based value chains with a positive impact on EU competitiveness and jobs creation at regional, rural and local levels.

Scope: Overall, the call addresses the design, demonstration and scale-up of production of sustainable and circular, bio-based textiles for one or more applications: e.g., technical textiles, garments, industrial textiles, home textiles; including also innovative smart textiles and those providing additional functionalities (e.g., antimicrobial or fire resistance properties). Blended, but only bio-based compositions, are included hereby.

More specifically, the overall scope should be addressed by the projects via:

276 See EU Strategy for textiles.

- Valorisation of secondary biomass, residues and under-utilised (primary or secondary) biomass (sustainable biomass sourcing, land use, land-use change and forestry (LULUCF) and biodiversity considerations should be addressed/showcased) for bio-based textiles. Moreover, the reuse of fibres from bio-based textiles to produce circular bio-based textiles is in scope;

- Design for circularity, enabling thus material design for durability, end-of-life recyclability, re-use and upcycling (including usability of waste fibres), with attention to the final application(s)/end use of textiles;

- Design for end-product quality, safety, and durability, with consideration of the sustainability and circularity of textiles value chains and the final application/end-use; this does include preventing micro- and nano- plastics/fibres release throughout the lifecycle of textiles;

- Development, demonstration and scale-up of novel processes by deploying appropriate enabling technologies[277] to significantly reduce the environmental footprint of textiles, across their production steps (pre-treatment, mordanting, dyeing, and finishing steps), improving notably on climate neutrality and against zero pollution. Moreover, apply industrial, industrial-urban and other symbiosis concepts, where necessary to achieve and enhance targeted outcomes and impacts;

- Assess the environmental and social sustainability performance of the proposed innovations (textiles production and textiles lifecycle), while including technoeconomic feasibility assessment as well. The methodologies of assessment should follow existing EU standards;

- Integrate the Safe-and-Sustainable-by-Design (SSbD) framework, developed by the Commission, for assessing the safety and sustainability of chemicals and materials.[278] Contribute with and develop recommendations that can advance further the application of the SSbD framework. More specifically, provide thresholds that can support the criteria definition and improvements for the assessment SSbD methodologies, including any specificities related with bio-based textiles. Recommendations can also include identification of data gaps, especially safety, environmental, but also socio-economic factors, as well as priorities for data collection.

- Address, consumer behaviour, acceptance and demand aspects for circular and sustainable bio-based textiles;

- Assess existing barriers to implementing circular economy business models for textiles; on this basis create innovative, sustainable and circular business models for the (EU and

[277] Including deploying enabling technologies e.g. industrial biotechnology, enabling digital technologies etc. (examples are non-exhaustive).

[278] See documents defining the SSbD framework and criteria on: https://research-and-innovation.ec.europa.eu/research-area/industry/key-enabling-technologies/advanced-materials-and-chemicals_en.

local) production and consumption of circular bio-based textiles. The participation of industry and particularly SMEs is strongly encouraged.

Projects are also expected to contribute to the New European Bauhaus (NEB) initiative by interacting with the NEB Community, NEB Lab and other relevant actions of the NEB initiative through sharing information, best practice, and, where relevant, results.

Where relevant, proposals should seek links with and capitalise on the results of past and ongoing EU funded research projects, (Horizon 2020, LIFE, Horizon Europe) including the ones under the Circular Bio-based Europe JU (CBE JU) and other partnerships of Horizon Europe.[279,280]

Proposals should also include a dedicated task, appropriate resources and a plan on how they will collaborate with other projects funded under this topic and other relevant topics.

Social Science and Humanities (SSH), social innovation and international cooperation aspects are also applicable to this topic and it is highly encouraged to address them as cross-cutting issues.

Innovating for sustainable bio-based systems, biotechnology and the bioeconomy

Proposals are invited against the following topic(s):

HORIZON-CL6-2023-CircBio-02-3-two-stage: Non-plant biomass feedstock for industrial applications: technologies and processes to convert non-lignocellulosic biomass and waste into bio-based chemicals, materials and products, improving the cascading valorisation of biomass

Specific conditions	
Expected EU contribution per	The Commission estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately.

279 E.g., see Horizon 2020, CE-FNR-14-2020 call: Innovative textiles – reinventing fashion - IA (projects HEREWEAR, MY-FI and New Cotton), as relevant. HEREWEAR: Bio-based local sustainable circular wear (ID: 101000632); MY-FI: Reinventing a smart, circular and competitive textile industry with advanced myco-fibres (ID: 101000719); New Cotton: Demonstration and launch of high performance, biodegradable, regenerated new Cotton textiles to consumer markets through an innovative, circular supply chain using Infinited Fiber technology (ID: 101000559). Also BBI JU past and ongoing projects: GRETE H2020-BBI-JTI-2018- 'Green chemicals and technologies for the wood-to-textile value chain', GLAUKOS H2020-BBI-JTI-2019- 'Sustainable clothing and fishing gear'. NEOCEL H2020-BBI-JTI-2015 'Novel processes for sustainable cellulose-based materials', EFFECTIVE H2020-BBI-JTI-2017 'Advanced Eco-designed Fibres and Films for large consumer products from biobased polyamides and polyesters in a Circular Economy perspective', UNLOCK H2020-BBI-JTI-2020 Unlocking a feather bioeconomy for keratin-based agricultural products, AllThingsBio H2020-BBI-JTI-2019 (for the fashion and textile aspects – consumers awareness and participation).

280 See also: HORIZON-CL6-2024-CIRCBIO-01-2: 'Circular solutions for textile value chains based on extended producer responsibility', HORIZON-CL6-2024-CIRCBIO-02-1-two-stage: 'Circular solutions for textile value chains through innovative sorting, recycling, and design for recycling' and HORIZON-CL6-2023-ZEROPOLLUTION-02-2-two-stage: 'Safe-and-sustainable-by-design bio-based platform chemicals, additives, materials or products as alternatives'.

project	Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 8.00 million.
Type of Action	Research and Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: Applicants submitting a proposal under the blind evaluation pilot (see General Annex F) must not disclose their organisation names, acronyms, logos, nor names of personnel in Part B of their first stage application (see General Annex E).
Technology Readiness Level	Activities are expected to achieve TRL 5 by the end of the project – see General Annex B.
Procedure	The procedure is described in General Annex F. The following exceptions apply: This topic is part of the blind evaluation pilot under which first stage proposals will be evaluated blindly.

Expected Outcome: A successful proposal will contribute to expected impacts under Destination 'Circular economy and bioeconomy sectors', related to consumers and industry, and in line with: the European Green Deal, the circular economy action plan, EU biodiversity strategy for 2030, the EU bioeconomy strategy & its action plan, the Waste Framework Directive and the EU industrial strategy.

In particular, expected impacts to be addressed by successful proposals include: i) developing innovative and sustainable value-chains in the bio-based sectors and ii) enhancing European industrial sustainability, competitiveness and resource independence.

Project results are expected to contribute to all of the following outcomes:

- Increased sustainability of biomass resources valorised in industrial applications, lowering land dependence and Indirect Land Use Change (ILUC) impacts, protecting biodiversity and respecting ecosystems integrity;

- Contribution to climate-neutrality (primarily via reduction of greenhouse gas emissions, and accessorily via increase of carbon removals),[281] zero pollution and resource efficiency via practical application of the circular (bio)economy concept;

- Improved industrial competitiveness, strategic autonomy and resource independence of bio-based value chains of EU Member States and/or Associated Countries, due to more sustainable industrial products and practices.

[281] Sustainable Carbon Cycles communication.

- Environmental, economic and social benefits on territorial and municipal level, due to increased circularity and upcycling of low-value, Non-Lignocellulosic Biomass (NLBM) (waste), of terrestrial or aquatic origin, including its upcycling into high-value applications.

- SMEs engagement, including the regional dimension, for skilled jobs creation.

- Increased cooperation and awareness across circular bio-based value chains, including waste managers, biomass feedstock providers, bio-based (process) industry, end-users and the civil society.

Scope: Circular bioeconomy will rely on the availability of diversified and low/no-ILUC (Indirect Land Use Change) sources of biomass but also on the ability to design, develop and scale-up processes to valorise such feedstock towards high-value, sustainable bio-based products. Non-Lignocellulosic Biomass (NLBM),[282] and related residual non-lignocellulosic biomass', provide options beyond plant biomass. However, NLBM from aquatic and terrestrial sources, often face challenges to reach economies of scale and biorefining production intensification, driven also by a complex and varying feedstock composition.

Project activities should address:

- Identification and optimization of suitable NLBM feedstock, with focus on higher resources efficiency and circularity, while respecting the waste hierarchy principles. Such feedstock to be deployed in adequate production systems, including upcycling approaches. More specifically, design and develop innovative upstream and conversion processes at pilot scale (e.g., via application of enzymes, industrial microbial hosts, microbiomes from natural ecosystems and diverse industrial biotech or other appropriate enabling technologies);

- Develop downstream conversion processes, building towards a targeted portfolio of high-value bio-based process outputs / bio-based products that can be later obtained in NLBM integrated biorefineries (of appropriate scale);

- Assessment of the proposed/developed innovative processes against techno-economic feasibility to valorise NLBM (waste) (at different potential biorefinery scales), showcasing/ensuring process flexibility to cope with the composition heterogeneity of the chosen NLBM feedstock(s);

[282] For non-lignocellulosic (NLBM), non-plant biomass & NLBM waste in scope, main examples include: Agri-food residues and waste (incl. food waste), marine and aquaculture residues and waste chitinous biomass; municipal solid waste (organic fraction); livestock waste by-products (such as feathers and bones).
Note 1: For waste or mixed feedstock (e.g. food waste) where lignocellulose can be a minor/small fraction, this can be in scope. Note 2: micro- and macro-algae are excluded, as this type of feedstock is dealt under Destination 3 - Heading 3: 'Innovating for blue bioeconomy and biotechnology value chains'. Manure and sewage sludge are also out of scope of this topic (please see Destination – Clean environment and zero pollution, Destination – Fair, healthy and environment-friendly food systems from primary production to consumption and Destination – Clean environment and zero pollution).

- Application of ex ante life-cycle assessment methodologies to ensure gains in environmental performance (including biodiversity), but also socio-economic aspects, as well ensuring safety for the consumers and operators;

- Enable participatory approaches and knowledge sharing across circular bio-based value chains. This includes feedstock providers (rural, coastal, urban and peri-urban dimensions, as appropriate), bio-based (process) industry, end-users and the civil society, aiming for a comprehensive scoping of challenges (multiple dimensions) and opportunities of valorising NLBM and NLBM waste.

- Production of biofuels and bioenergy, as the main production focus, falls outside the scope of this topic (their co-production, while following the cascading biomass use principles, is not excluded though). Food/feed ingredients, cosmetics-related compounds and especially those with health-promoting properties (nutraceuticals), may be in scope, provided their toxicological and nutritional safety has been assessed and guaranteed at EU level.

Where relevant, proposals should seek links and synergies as well as capitalise on the results of past and ongoing EU research projects under Horizon 2020, LIFE and Horizon Europe (especially under the Bio-based Industries Joint Undertaking (BBI JU) / Circular Bio-based Europe Joint Undertaking (CBE JU))[283].

Proposals should also include a dedicated task, appropriate resources and a plan on how they will collaborate with other projects funded under this topic and other relevant topics.

Social sciences and humanities (SSH) and social innovation aspects should be considered for this topic.

Call - Circular economy and bioeconomy sectors

HORIZON-CL6-2024-CIRCBIO-01

Conditions for the Call

Indicative budget(s)[284]

Topics	Type of	Budgets (EUR	Expected EU contribution per	Indicative number

[283] See also complementary topic HORIZON-CL6-2023-CIRCBIO-01-4: 'Land-based bioprospecting and production of the bioactive compounds and functional materials for multiple bio-based value chains' and also HORIZON-CL6-2023-CIRCBIO-01-05: Broadening the spectrum of robust enzymes and microbial hosts in industrial biotechnology.

[284] The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2023 and 2024.

	Action	million) 2024	project (EUR million)[285]	of projects expected to be funded
Opening: 17 Oct 2023 Deadline(s): 22 Feb 2024				
HORIZON-CL6-2024-CircBio-01-1	CSA	6.00	Around 2.00	3
HORIZON-CL6-2024-CircBio-01-10	RIA	9.00	Around 4.50	2
HORIZON-CL6-2024-CircBio-01-2	IA	14.00	Around 7.00	2
HORIZON-CL6-2024-CircBio-01-3	IA	10.00	Around 5.00	2
HORIZON-CL6-2024-CircBio-01-4	IA	10.00	Around 5.00	2
HORIZON-CL6-2024-CircBio-01-5	RIA	8.00	Around 4.00	2
HORIZON-CL6-2024-CircBio-01-6	RIA	6.00	Around 3.00	2
HORIZON-CL6-2024-CircBio-01-7	IA	6.00	Around 6.00	1
HORIZON-CL6-2024-CircBio-01-8	CSA	3.00	Around 3.00	1
HORIZON-CL6-2024-CircBio-01-9	CSA	2.50	Around 0.80	3
Overall indicative budget		74.50		

General conditions relating to this call	
Admissibility conditions	The conditions are described in General Annex A.
Eligibility conditions	The conditions are described in General Annex B.
Financial and operational capacity and exclusion	The criteria are described in General Annex C.
Award criteria	The criteria are described in General Annex D.
Documents	The documents are described in General

[285] Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

	Annex E.
Procedure	The procedure is described in General Annex F.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G.

Enabling a circular economy transition

Proposals are invited against the following topic(s):

HORIZON-CL6-2024-CircBio-01-1: Circular Cities and Regions Initiative's project development assistance (CCRI-PDA)

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 6.00 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: Proposals funded under this topic, and their circular systemic solutions, must form part of the demonstration projects for the implementation of the European Commission's Circular Cities and Regions Initiative (CCRI). This means that: • Proposals must cooperate with CCRI and its Coordination and Support Office by means of sharing with this initiative knowledge and experiences developed during the implementation of the project; these must be included in the Work Plan; • Proposals must participate in the CCRI's events; these must be included in the Work Plan; Applicants must integrate explicitly these obligations into their proposal's work plan.
Legal and	The rules are described in General Annex G. The following exceptions

financial set-up of the Grant Agreements	apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [286].

Expected Outcome: The successful proposal will support the delivery of solutions to implement the European Green Deal, the circular economy action plan (CEAP) and the bioeconomy strategy. The topic will support the transition towards a sustainable, regenerative, inclusive and just circular economy across regions of Europe at local and regional scale.

The Circular Cities and Regions Initiative's Project Development Assistance (CCRI-PDA) projects are part of the implementation of the European Commission's Circular Cities and Regions Initiative (CCRI)[287]. They will be carried out in close coordination and cooperation with the CCRI Coordination and Support Office (CCRI-CSO).

Investors and lenders need to gain more confidence in investment projects in the field of circular economy which are still seen as risky. European added value can be achieved, for example, where projects introduce innovation to the market regarding financing solutions minimising transaction costs and engaging the private finance community. European added value could also be achieved where projects demonstrably address legal, administrative and other market opportunities and challenges for innovative and sustainable circular economy investment schemes.

Projects results are expected to contribute to all the following expected outcomes:

- Delivery of a series of sustainable circular economy projects;
- Roll-out of innovative financing solutions/schemes at local and regional scale across Europe.

Scope: The CCRI-PDA service targets public and private project promoters such as local and regional authorities or their groupings, public/private infrastructure operators and bodies, utilities and services, industry (including SMEs).

The purpose of the CCRI-PDA is to help project promoters develop their circular economy proposals at local and regional scale by bringing together the technical, economic and legal expertise.

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[286] This decision is available on the Funding and Tenders Portal, in the reference documents section for Horizon Europe, under 'Simplified costs decisions' or through this link: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/ls-decision_he_en.pdf

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

The CCRI-PDA should provide support for those activities necessary to prepare and mobilise finance for investment projects, such as feasibility studies, stakeholder and community mobilisation, business plans and preparation for tendering procedures or setting up a specific financing scheme/financial engineering.

The CCRI-PDA should focus on activities aimed at increasing circularity in product value chains that are relevant for the transition towards a sustainable circular economy at local and/or regional scale. The economic sectors and investment proposals involved in each CCRI-PDA service should be clearly specified and selected according to local and/or regional circular economy needs, resources and potential. This selection should be clearly justified and explained.

Ideally, the proposed investments should be launched before the end of the project, which means that proposals should result in signed contracts with investors for circular economy investments at local and regional scale to that effect. Furthermore, the proposals should provide tangible showcases that trigger further market replication.

In addition, proposals should also include an exemplary/showcase to increase circularity in specific sector(s) at local and regional scale and/or in the size of the expected investments and leverage factors[288];

In addition, all proposals should demonstrate a high degree of replicability and include a clear action plan to communicate experiences and results to potential replicators across EU Member States and Associated Countries.

Indicatively, the CCRI-PDA focuses on small and medium-sized circular economy investments of up to EUR 20 million[289] (for a single proposal or a portfolio of proposals).

The EU contribution per proposal should not exceed 10% of the related investment.

Proposals should justify the budget for the project development assistance needed based on the expected investment portfolio to be set up. This includes the amount of investments that is expected to be triggered and the respective leverage factors to be achieved.

Proposals are expected to ensure synergies and complementarities with other EU financial schemes for circular economy projects. Proposals should ensure that all evidence, information and project outcomes will be accessible through the CCRI website (incl. business models and other studies).

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

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288 i.e. amount of investments in the circular economy triggered per each EUR of Horizon Europe support.

289 The Circular Economy Technical Assistance Facility (CETAF) will focus on projects and programmes with a minimum total investment volume of EUR 20 million.

HORIZON-CL6-2024-CircBio-01-2: Circular solutions for textile value chains based on extended producer responsibility

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 14.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.

Expected Outcome: A successful proposal will contribute to the following Destination impacts: i) enhance European industrial sustainability, competitiveness and resource independence, and ii) improve on consumer and citizen benefits.

Proposal results are expected to contribute to all the following outcomes:

- Recommendations on best innovative solutions for the identification of material composition of used textiles/textile waste embedded in the design of textile products;
- Recommendations on design for recycling for textile products that allows the use of targeted Extended Producer Responsibility (EPR) schemes;
- Recommendations on policy tools to reach EU greenhouse gas reduction targets till 2050 (climate neutrality), including the 2030 target.

Scope: Textiles are the fourth highest-pressure category for the use of primary raw materials and water and fifth for greenhouse gas emissions and a major source of microplastic pollution in production and use phases. They are also a key material and product stream in the circular economy action plan. Improvements in the circularity of the textile value chains will help reduce GHG emissions and environmental pressure. EPR schemes are a lever for circularity. The purpose of this topic is to enable the optimal functioning of EPR schemes for textiles within the EU and to take into account the commitments of the textile strategy on EPR. The circular economy action plan establishes the policy objective to make the textiles sector more sustainable by boosting the circularity of textile consumption i.a. through reuse, separate collection, sorting and recycling of textiles. It also wants to limit textile waste generation and restrict exports of waste that have harmful environmental and health impacts in third countries or that can be treated within the EU. Furthermore, increased amounts of separately collected textile waste are expected because of the Waste Framework Directive's obligation to separately collect textiles as of 2025.

Extended Producer Responsibility (EPR) schemes have proven to be an effective tool for improving the treatment of other waste streams and therefore are being considered as necessary in recent consultations by the stakeholders of the textile sector. In view of that, the Commission is assessing the feasibility of introducing EPR for textiles into EU legislation. Proposals should aim to support the high-quality separate collection, preparation for treatment and treatment of used textiles and textile waste, thereby enabling the optimal functioning of EPR schemes in this sector. It will do so by providing recommendations on improving the ease of identification of material composition in a wide range of used textile products/waste to inform the different actors in the use and end-of-life stages of textiles (consumers for use and disposal, social enterprises to enable reuse, waste management operators to enable preliminary treatment and treatment operations). To do so, it will inter alia identify, develop and test innovative labelling of textile products (including through the use of technologies such as AI, blockchain or Internet of Things) to ease separate collection for re-use or end-of-life treatment that leads to high quality secondary raw materials.

Proposals should bring together different stakeholders active in the sector along the value chain, such as waste collectors, waste sorters, repair and reuse organisations. Proposals should also try to address historical liabilities and the impact of textiles coming from outside the EU. Proposals should analyse how EPR schemes can improve the circularity of textiles, assess the material composition in a wide range of used textile products and waste with a view to targeted EPR schemes for improved collection and recycling, and test separate collection options for reuse or end-of-life treatment that could be enforced through EPR schemes. Projects should also identify novel solutions for textile reuse. They should also consider possible rebound effects and only propose measures that will not hamper the market uptake of more sustainable novel textile materials. Projects should also recommend/identify/define tools (policy, legislation, governance, market-based, etc.) that the EU institutions (Commission, Parliament, Council of the EU) could implement or propose in order to reduce the overall greenhouse gas (GHG) emissions from the textile sector (including from final consumption, not only production) in the EU in line with the EU greenhouse gas emissions reduction targets till 2050 (climate neutrality), including the 2030 target; for this, the projects should take into account the relevant possible rebound effect.

The targeted TRL at the end of the projects is 6 to 8.

HORIZON-CL6-2024-CircBio-01-3: Innovative circular solutions for furniture

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.

Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.

Expected Outcome: A successful proposal will contribute to the following Destination impacts: i) enhance European industrial sustainability, competitiveness and resource independence, and ii) improve on consumer and citizen benefits.

Proposal results are expected to contribute to all of the following outcomes:

- Increased deployment and demonstrated benefits of advanced digital solutions (e.g., through AI, robotics, IoT, blockchain) in circular businesses including waste management and recycling
- Emergence of new value chains using upcycled, recycled and/or biobased;
- resources, e.g. through industrial symbiosis, with particular attention to SMEs;
- Increased recycling rates and upcycling to new higher-value products;
- Increased uptake of recycled and/or renewable material;
- Increased deployment and market uptake of circular design, including design for easy maintenance, repair, remanufacturing and recycling;
- Increased reuse, refurbishment and remanufacturing rates and diffusion of new circular business practices, in particular in the uptake of repair, reuse, refurbishment and remanufacturing;
- Increased resource efficiency along and across value chains, causing a measurable reduction in GHG emissions, release of microplastics, other environmental pollution, and in the use of hazardous substances, and an increase of carbon removals.

Scope: Predominantly consisting of SMEs, the EU furniture industry employs around one million European workers and manufactures approximately a quarter of the world's furniture, representing a EUR 84 billion market equating to an EU28 consumption of ~10.5 million tons of furniture per annum. Despite a notable degree of knowledge and awareness of CE principles, analyses conducted in the framework of luxury furniture show that the involvement of furniture companies in CE practices, in particular those concerning reuse and recycle actions, is still marginal, and very limited use of process and product certifications has been noted.179 According to the findings of an EU-funded project180, furniture waste in the EU accounts for more than 4% of the total municipal solid waste stream. Waste arising from commercial sources is assumed to contribute 18% of total furniture waste generation across the sector. Total annual EU furniture waste equates to 10.78 million tonnes. According to European Federation of Furniture Manufacturers statistics, 80% to 90% of the EU furniture waste in MSW is incinerated or sent to landfill, with ~10% recycled. Reuse activity in the

sector is considered low. Where reuse does occur, it is mostly through commercial second-hand shops, social enterprise companies or charities.

Six key cycles can be highlighted to make furniture more circular. All proposals should target several of these cycles:

- Maintain – using preventative maintenance to maximise product lifetime, e.g., a chair remains a chair;
- Repair – corrective maintenance, e.g., a chair remains a chair;
- Reuse – redistributing products through a change in ownership, e.g., a chair remains a chair;
- Refurbish or remanufacture products to optimize lifetime, e.g., by resizing a desk or changing the appearance of a chair through re-upholstering to extend 'fashion' service life, or resizing desks;
- Repurpose – change functionality of the product, e.g., a desk becomes a table;
- Recycle – recovering the value of components and materials for feedstock as secondary materials in new products.

Key strategies to achieve the circularity transition are circular design including the smart use of biobased materials, a shift from products to services, extended product life through design, safe and circular material choices, increased material efficiency, and modular design. It is evident that circularity concepts must be anchored in the design phase of products and aim at the user. All proposals should therefore address to some extent circular design strategies.

Projects should demonstrate and deploy at large scale innovative solutions and designs for increased quality, non-toxicity and durability of secondary and renewable materials and increased share of secondary and renewable materials in new products. Projects should demonstrate increased recovery, recycling and upcycling rates and a higher uptake of secondary materials for high value applications. Projects should also demonstrate circular business practices, in particular in the uptake of repair and reuse, remanufacture, product-service-systems, and in the full lifetime of products or services. To achieve this, targeted market size, economic feasibility, cost efficiency and social acceptance need to be addressed. To break down the barriers for this transition, it is important that proposals involve and address the different perspectives of all relevant actors, e.g., manufacturers, retailers, consumers and Civil Society Organisations (CSOs). Proposals should consider the use of digital solutions (including technologies such as AI, robotics, IoT and blockchain) in particular with a view to the implementation of the digital product passport, and demonstrate their benefits for increased circularity. They should also help produce harmonised and robust methods to assess the amount of recycled content in sectoral products, which is key for a future review of green claims through authorities and consumer organisations. Environmental, social and economic impacts should be assessed from a lifecycle perspective as product, organisation and consumption environmental footprints, using the respective methods

developed by the European Commission (Product Environmental Footprint, PEF, should be used for the assessment of the environmental impacts) and through costing methods and a dynamic LCA; relevant data should be fed into the European Platform on Life Cycle Assessment, following the specific Environmental Footprint data and format requirements. The functional performance of technologies and secondary materials can be assessed through the EU Environmental Technology Verification (ETV) scheme. Considering the microplastics and microfiber pollution and hazardous substances that are present in the targeted waste streams, their removal from the materials used for the products in concern as well as from the recovered material is crucial, in addition to applying less-polluting production and consumption procedures. Decontamination levels need to be properly addressed and accumulation prevented. Proposals should fully incorporate the Safe and Sustainable by Design (SSbD) approach. All results should be validated using quantitative indicators and targets wherever possible.

Proposals should also envisage policy recommendations for increased warranty and cascading use. They should also provide for the development of training material to endow workers in this occupational group with the right skillset in order to deploy the new technologies developed. Proposals should consider the development of learning resources for the current and future generations of employees, with the possibility to integrate them in existing curricula and modules for undergraduate level and lifelong learning programmes. The projects should provide contributions to relevant standards or best practices.

Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

To the extent that proposed solutions will address the role of the consumer, proposals should seek to contribute to the goals and cooperate with the services of the European Commission's Circular Cities and Regions Initiative (CCRI). Joint activities with CCRI projects are encouraged.

The targeted TRL at the end of the projects is 6 to 8.

HORIZON-CL6-2024-CircBio-01-4: Systemic circular solutions for a sustainable tourism

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Innovation Actions

Expected Outcome: A successful proposal will contribute to the following Destination impacts: i) accelerate regional, rural, local/urban and consumer-based transitions, ii) enhance European industrial sustainability, competitiveness and resource independence, and iii) improve on consumer and citizen benefits.

Project results are expected to contribute to all the following outcomes:

- Diffusion of circular tourism services, where the use of harmful substances and the generation of waste is minimised and the use of energy, land and water is efficient;
- Deployment of replicable systemic solutions for cities and regions, where circularity is ingrained in the service design, whether for the use of residents or visitors, taking into account the specific needs of the territory (urban, rural, peripheral);
- Increased circular, zero-pollution and climate-neutral practices among providers and users of tourism services and active participation of users in circular systemic solutions;
- Deployment of innovative solutions and new, affordable technologies (including digital technologies such as AI, robotics, IoT and blockchain) that support transformation towards circularity for all actors on different systemic levels;
- Creation of jobs that facilitate circularity for different sectors, serving those who are living in or visiting cities and regions;
- Uptake, replication and visibility of circular systemic solutions for sustainable tourism that contributes economically, socially and environmentally to the achievement of the targets of the European Green Deal, circular economy action plan, bioeconomy strategy, industrial strategy and EU agenda for tourism, at local, regional, national and European levels.

Scope: Proposals are expected to implement and demonstrate circular systemic solutions at the level of cities and regions, and include several sectors providing services for visitors and residents such as hospitality, transportation, culture, attractions, nature-based activities.

Tourism can consume large quantities of energy, water, and plastics, which degrade the environmental quality of destinations and ecosystems, affecting the lives of residents. Circular tourism should consider waste and water management, batteries and vehicles, electronics and ICT, packaging, plastics, construction and buildings, GHG emissions of local and long-distance mobility, accommodation and food services.

Proposals should address at least one of these above mentioned sectors.

The complexity of tourism ecosystem lies in the fact that industry is deeply interlinked with and dependent on multiple key resource and commodity chains. Travel and tourism actors can both act as enablers of circularity in a wider economic context, and at the same time benefit from circularity models in other industrial ecosystems. Proposals should develop and demonstrate new and circular business models and technological solutions to change the way

tourism operates, enabling businesses and destinations to be sustainable. This includes developing systemic approaches that steer the behaviour of consumers, whether residents or citizens, towards circularity and makes them participate in circular practices.

The implemented circular systemic solutions should address economic, social and environmental dimensions of the transition towards circular tourism and include science, technology, behavioural and governance components. Proposals are expected to involve the relevant actors, which include public administrations, destination management organisations, private sector services and industries, citizens (residents and visitors), non-governmental organisations and new types of actors rising from collaborative economy platforms.

The development of systemic solutions needs to consider the costs of transition from the existing models into the new ones, analysing trade-offs and challenges related to their implementation and demonstration. As the tourism ecosystem is mostly composed of small actors, micro and SMEs, systemic solutions at the level of cities and regions should develop and test innovative and collaborative ways to create common objectives, targets and processes. The implementation of technologies such as AI, robotics, IoT and blockchain could also be considered in a context-sensitive manner. Proposals should however also investigate simple, low-cost and low-tech solutions. Projects should analyse the encountered obstacles and drivers and provide clear and precise policy recommendations for local authorities on how to improve circular tourism. Each circular systemic solution should address social, economic and environmental externalities and contribute to the well-being of the local communities while improving the circularity behaviour of the visitors.

The circular systemic solutions implemented and their business models should demonstrate a high replicability and scalability potential in order to contribute to the overall transition of tourism towards more sustainable and resilient practices. During their implementation and by the end of their lifecycle, the selected proposals are expected to prepare and share clear and comprehensive guidelines on the circular systemic solutions adopted, including their strengths and weaknesses experienced, mainly for the use of economic operators in the sector.

With regard to the territorial aspects of all proposed solutions, proposals should seek to contribute to the goals and cooperate with the services of the European Commission's Circular Cities and Regions Initiative (CCRI). Joint activities with CCRI projects are encouraged.

The targeted TRL at the end of the projects is 6 to 8.

Innovating for sustainable bio-based systems, biotechnology and the bioeconomy

Proposals are invited against the following topic(s):

HORIZON-CL6-2024-CircBio-01-5: Programmed biodegradation capability of bio-based materials and products, validated in specific environments

Specific conditions

Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 8.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 4-5 by the end of the project – see General Annex B.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [290].

Expected Outcome: Successful proposals will enable the bio-based industries in the Union to contribute to the enhancement of European industrial sustainability, competitiveness and resource independence and to the development of innovative and sustainable value-chains in the bio-based sectors. Projects results will contribute to deliver bio-based solutions 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.

Projects results are expected to contribute to all of the following expected outcomes:

- Circular design of bio-based technologies and products: decreasing environmental impacts on soil, water, and air quality, biodiversity and climate, increasing durability and suitability of products to be safely re-used and re-manufactured, allowing for high-quality recycling and for biodegradability.

- Innovative manufacturing processes to enable programming the safe biodegradation of bio-based materials and products according with the environmental conditions and time frame for specific applications.

- Information and labelling of bio-based materials and products with biodegradability capacity for specific applications and end-of-life options.

[290] This decision is available on the Funding and Tenders Portal, in the reference documents section for Horizon Europe, under 'Simplified costs decisions' or through this link: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/ls-decision_he_en.pdf

Scope: The amount of waste littered in the open environment and causing pollution from harmful substances released from such waste streams, such as 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 in open environments or under controlled conditions, i.e., in composting plants and anaerobic digestors.

To deliver biodegradable bio-based solutions that address the global pollution challenges effectively, proposals should:

- Analyse those cases of uncontrolled waste littering in the open environment, particularly of plastic waste leading to pollution from nano- and micro-plastics and other contaminants released by macro-plastics, and the corresponding safe bio-based applications where biodegradation in open environments could enable safe and sustainable end-of-life options, e.g., in humanitarian contexts [291] where waste management systems for collection, sorting and recycling are not feasible.

- Select applications for biodegradable non-single-use/single-use bio-based materials and products. Such applications should include materials and products which are biodegradable in open environments in those cases of uncontrolled waste littering, as treated in the previous point, and/or other items that may bring some environmental benefits from being biodegradable, for example in cases where products and materials are contaminated from food or from other organic substances during their use;

- Develop manufacturing technologies of such bio-based materials and products with targeted performances: i) decreased carbon footprint (based on the reduction of greenhouse gas emissions and on the increase of carbon removals) and environmental impacts of the production processes; ii) improved circular life extension through predictive maintenance, suitability to be safely re-used and re-manufactured, allowing for recycling, and programmed integrity/biodegradation in specific environments, depending on the application, either in controlled environment (i.e. aerobic digestion in composting plants, anaerobic digestion producing biogas) and in open environments, including in extreme environments in terms of physical conditions; iii) safe biodegradation in the specific environments as in point ii), especially considering the eco-toxicity and any impacts on natural ecosystems from biodegraded materials and from their additives and other components;

- Use innovative and adapt existing AI-based and other digital solutions to optimise the circular lifecycle of products and make it more environmentally and economically sustainable;

[291] See the projects developed under the topic HORIZON-CL6-2023-CircBio-01-6: 'Bio-based solutions for humanitarian applications' for the scoping of the applications in humanitarian contexts.

- Validate tests of biodegradability of bio-based materials designed for specific applications both in controlled and in open environments, e.g., soil and water, under ranges of physical/chemical conditions including extreme conditions. The tests should include the monitoring of the time-frame of partial up to full biodegradation and the environmental impacts in case of biodegradation in open environments, including eco-toxicity and any impacts on biodiversity;

- Provide insights into the development of information and labelling systems to inform users on the most appropriate applications and on the correct use and end-of-life disposal options for the materials and products within the scope. Transparent information should aim at improving the societal acceptance of bio-based innovation and at supporting consumers and customers in making responsible and informed choices. Information should include the assessment of the risks and environmental impacts, including on ecosystems, from an uncontrolled disposal and from littering into the open environments;

- Assess the overall economic feasibility of the manufacturing of the materials and products within the scope.

Where relevant, proposals should seek links with and capitalise on the results of past and ongoing EU funded projects, including under the Circular Bio-based Europe JU, the Processes 4 for Planet partnership and other European partnerships of Horizon Europe.

This topic requires the effective contribution of SSH disciplines and the involvement of SSH experts, institutions as well as the inclusion of relevant SSH expertise, in order to produce meaningful and significant effects enhancing the societal impact of the related research activities.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

In order to achieve the expected outcomes of this topic, international cooperation is encouraged.

HORIZON-CL6-2024-CircBio-01-6: Digital information systems for bio-based products

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 6.00 million.
Type of Action	Research and Innovation Actions

Technology Readiness Level	Activities are expected to achieve TRL 5 – see General Annex B.

Expected Outcome: Successful proposals will support the bio-based industries and the enablers of the digital transition in the Union to contribute to the development of innovative and sustainable value-chains in the bio-based sectors. Projects' results will contribute to deliver bio-based solutions with reduced environmental impacts on soil, water, and air quality, biodiversity and climate, in line with the EGD objectives, the EU circular economy action plan and its sustainable product initiative, the EU sustainable product initiative[292]and the proposal for the Ecodesign for Sustainable Products Regulation[293] as well as the EU data strategy[294].

Projects results are expected to contribute to the following expected outcome:

- Mobilising the potential of digitalisation of bio-based sectors enabling efficient, sustainable and climate neutral production processes and transparent information.

Scope: An effective circular economy needs improved information of material flows used in all economic sectors. Information and data on products and services are key factors to improve their production's sustainability and to meet the performance demands and needs of customers. Sharing data in an accessible and simple way, according to FAIR principles, to enable easy processing, can provide information back to the society, facilitating the inclusiveness of economic activities. Digital technologies can track and report the journeys of products, components and materials and make the resulting data securely access.

The circular economy action plan's sustainable product initiative, the Ecodesign for Sustainable Products Regulation and the EU data strategy provide guidelines to build data and system architectures aiming at improving products sustainability, resources efficiency and circularity, among other goals.

To exploit the potential of digitalisation for the objectives of the EU circular economy in the bio-based sectors, proposal should:

- Design solutions for the digitalisation of information from bio-based products and their value chains, e.g., AI-based, such as digital passports, tagging and watermarks, etc. and enable their use;

- Specialize the information from bio-based products on impacts on climate , based on estimates of carbon emissions and carbon removals, environmental impacts on soil, water, and air quality and biodiversity, end-of-life options, safety control, technical

[292] COM/2020/696 final COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL New Consumer Agenda Strengthening consumer resilience for sustainable recovery.

[293] COM(2022) 142 final Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EC.

[294] https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/european-data-strategy_en.

performances, predictive maintenance, and programmed integrity/biodegradation, among other data;

- Design the information from bio-based products to improve the societal readiness adaptation in terms of acceptability, and uptake of innovations by society. The information should be easily accessible by customers and consumers and to support them in making responsible and informed choices;
- Support the harmonisation and interoperability of the digital information formats;
- Enable bio-based industries to participate in the European Dataspace for Smart Circular Applications;
- Design the interfaces between the digital information from bio-based products and other applications of digital technologies ensuring interoperability in the Union.

Where relevant, proposals should seek links with and capitalise on the results of past and ongoing EU funded projects, including under the Circular Bio-based Europe JU.

This topic requires the effective contribution of SSH disciplines and the involvement of SSH experts, institutions as well as the inclusion of relevant SSH expertise, in order to produce meaningful and significant effects enhancing the societal impact of the related research activities. Moreover, the link between digitalisation and the resilience of economies to disruptions, such as the one suffered from COVID-19 crisis, should be part of the societal impacts assessment.

HORIZON-CL6-2024-CircBio-01-7: Demonstrating the fair and just transition from GHG-intensive economies facing challenges towards circular bioeconomy model regions

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 6.00 million.
Type of Action	Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Technology Readiness Level	Activities are expected to achieve TRL 6-7 by the end of the project – see General Annex B.

Expected Outcome: Successful proposal will contribute to the expected impacts of the Destination 'Innovative governance, environmental observations and digital solutions in support of the Green Deal', and the European policies it supports, by supporting the establishment of the innovative governance models notably to achieve better-informed decision-making processes, social engagement and innovation.

In line with the European Green Deal priorities, the EU's climate ambition for 2030 and 2050, the objectives of the EU biodiversity strategy for 2030, and the vision of a society that acts within environmental and social boundaries as defined in the bioeconomy strategy, the successful proposal will guide and facilitate the green transition towards a circular bioeconomy model, in regions that lag behind in this process.

Projects results are expected to contribute to all following expected outcomes:

- Showcased solutions in 2-3 selected coal mining regions and/or intensive agriculture regions, ensuring geographical coverage of different regions.
- Development of new bioeconomy structures that generate local green growth in regions currently relying on GHG-intensive economic activities, focusing on coal mining and/or intensive livestock or crop production in agriculture;
- Strengthened interactions and coordination between affected European / Associated Countries regions.

Scope:

- Demonstrate just and fair bioeconomy solutions in regions that face difficulties in the green transition to leave no person and no place behind.
- Interact with and draw on the logistical support of the CSA "Supporting the fair and just transition from GHG-intensive economies facing challenges towards circular bioeconomy model regions" with the overall goal to demonstrate the transition to a just and fair bioeconomy for in 2-3 selected coal mining regions and/or intensive agriculture regions.
- Demonstrate the feasibility of transforming regions towards sustainable and resource-efficient bioeconomy models, while highlighting the achievement of climate targets, as well as assessing trade-offs (e.g., food security or energy-security, strategic autonomy).
- Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.
- Implement the required multi-actor approach by involving a wide diversity of bioeconomy actors and conducting trans-disciplinary research.
- Where relevant, activities should build and expand on the results of past and ongoing research projects.

- This topic requires the effective contribution of SSH disciplines and the involvement of SSH experts, institutions as well as the inclusion of relevant SSH expertise, in order to produce meaningful and significant effects enhancing the societal impact of the related research activities.

HORIZON-CL6-2024-CircBio-01-8: Bioeconomy project development assistance

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 3.00 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [295].

Expected Outcome: In line with the European Green Deal priorities, the EU's climate ambition for 2030 and 2050 and the bioeconomy strategy vision of an economic system that acts within environmental and social boundaries, the successful proposal will improve the deployment of sustainable bioeconomy business models and solutions, which will help rural and coastal areas in achieving a just, green transition.

Projects results are expected to contribute to all following expected outcomes:

[295] This decision is available on the Funding and Tenders Portal, in the reference documents section for Horizon Europe, under 'Simplified costs decisions' or through this link: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/ls-decision_he_en.pdf

- Increased access to financial, legal and technical support along all Technological Readiness Levels and whole supply chains for bioeconomy projects, leading to a higher number of successful bioeconomy flagship projects.

- Alignment of actors (primary producers, citizens, innovators, educators, SMEs, industry, national authorities and other actors) and their goals in collaborative ventures on bioeconomy related projects.

- Promotion and support of regional and national transitions from existing fossil-based socio-technical systems to bioeconomy-based systems promoting the valorisation of local biological resources and ecosystem services.

Scope:

- Provide technical assistance for bioeconomy project development and facilitate synergies and linkages between different EU and national policy instruments and funding opportunities (e.g., CBE JU, ERDF, CAP, EMFAF, Innovation Fund) and therefore support the deployment of bioeconomy through the streamlining of research, innovation and demonstration. Public, private and joint public-private projects are eligible.

- Bring together and align the goals of primary producers, SMEs, policymakers and other stakeholders in bioeconomy projects along the whole value chain in order to build collaborative partnerships with a strong technical, financial, and legal capacity.

- Provide expertise and consultancy services to promising bioeconomy projects, on small and medium-sized investments at different TRLs, in the area of business model development (including exploring supply chain options), planning, project documentation, feasibility assessment, financial assistance, including links to other EU funding instruments, and legal assistance.

- Explore the barriers faced by novel bioeconomy solutions and provide strategies how to overcome social, financial, legal and policy barriers.

- Projects benefiting from the assistance should contribute to the development of sustainable bioeconomy solutions and have their main activities in one or more of the following areas (a non-exhaustive list): circular and sustainable bio-based sector, including improvements in durability, quality, or resource-efficiency of bio-based products; activities enhancing biodiversity and land-based climate mitigation and adaptation; integration of the benefits of biodiversity and carbon-rich ecosystems in primary production; low footprint food production, processing and distribution, including novel foods; schemes for rewarding land and water managers for the provision of ecosystems services; sustainable fisheries, aquaculture and algae production; nature-based solutions.

- Assisted projects will be selected on the basis of merit. Proportionality of assisted projects across the different bioeconomy sectors as well geographical regions shall be

ensured. Special focus should be given to projects from Member States where bioeconomy in underdeveloped.

- The technical support facility is expected to carry out the project assistance activities for the minimum duration of 5 years and be open to projects from all EU Member States and Associated Countries.
- Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.
- The proposals must use the multi-actor approach by involving a wide diversity of bioeconomy actors.
- Where relevant, activities should build and expand on the results of past and ongoing research projects.

HORIZON-CL6-2024-CircBio-01-9: Circular bioeconomy start-up villages

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 0.80 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 2.50 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Procedure	The procedure is described in General Annex F. The following exceptions apply: To ensure a balanced portfolio, grants will be awarded to applications not only in order of ranking but at least also to one project within the area A that is the highest ranked, one project highest ranked within the area B, and one project highest ranked within the area C, provided that the applications attain all thresholds. Proposals shall clearly indicate the area they are applying to.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions

	under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [296].

Expected Outcome: In line with the European Green Deal priorities, the EU's climate ambition for 2030 and 2050, the long-term vision for the EU's rural areas and its flagship initiative on research and innovation for rural communities, the European innovation agenda, the EU biodiversity strategy for 2030, the bioeconomy strategy and its vision of an economic system that acts within planetary boundaries and fosters a just transition, the successful proposal will support the development of circular systemic bioeconomy solutions in start-up villages across Europe. The proposal will contribute to the expected impacts of Destination 3 'Circular economy and bioeconomy sectors', by accelerating rural fair and just transitions, developing innovative and sustainable value-chains and sharing platforms (e.g. Startup Village Forum[297]).

Project results are expected to contribute to all of the following expected outcomes:

- Development and transfer of the concept of sustainable circular bioeconomy solutions in start-up villages;
- Showcased novel governance and business models for circular systemic bioeconomy solutions in start-up villages or their groupings;
- Strengthened position of bioeconomy start-ups in rural innovation ecosystems for the development of new value-added products, technologies and approaches;
- Enhanced training opportunities and knowledge exchange and cooperation among rural innovators;
- Improved rural innovation ecosystems to build a sustainable bioeconomy within ecological boundaries based on local resources, in particular contributing to climate and biodiversity policies and targets.

Scope: Applicants should demonstrate how they will provide innovative circular, sustainable and socially fair bioeconomy solutions for:

A. food systems transformation;

296 This decision is available on the Funding and Tenders Portal, in the reference documents section for Horizon Europe, under 'Simplified costs decisions' or through this link: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/ls-decision_he_en.pdf

297 The Startup Village Forum intends to promote knowledge exchange and cooperation activities and to work as an open space where institutions and stakeholders can meet, discuss and shape action for startup-driven innovation in rural areas. Besides, the Forum aims to collect the commitment of public and private organisations to support Startup Villages.

B. bio-based sectors, covering biological waste/residues and bio-based materials and products;

C. employing digital technologies and approaches.

Applicants should address only one of the thematic areas above, and clearly indicate it in their proposal.

Proposals are expected to contribute to the creation and support of a thematic network of start-up villages based on bioeconomy concepts, including all of the following activities:

- Provide assistance and advisory support for the development and linking of startup villages and raise awareness of the rural innovators on sustainable and circular systemic bioeconomy solutions.

- Develop the Start Up Village Forum initiative through a community of practice to support active engagement of all relevant actors (local and regional authorities, entrepreneurs, investors, rural cooperatives, rural communities and others) in the start-up villages and foster knowledge exchange and mutual learning between them, as well as share research, data and analytical findings.

- Develop a list of case studies of local and regional start-up villages focusing on bioeconomy including sustainable food systems and bio-based solutions, identifying and presenting the respective strengths, weaknesses, and opportunities. These case studies could be used for replication and dissemination across Europe in the context of the Startup Village Forum. Proposals should involve at least three start-up villages from three different Member States / Associated Countries, ensuring geographical coverage of different regions.

- Identify the challenges and development pathways for developing and scaling up of start-ups and small and medium-sized enterprises (SMEs) for a sustainable bioeconomy, including businesses linked to agriculture, food, forestry, bio-based innovation and non-agricultural activities in rural areas related to the community-led local development strategies.

- Address the challenges of Europe’s fragmented start-up scene and of entrepreneurship education and capacity building.

- Assess possible options and create guidelines and recommendations for policy makers, investors and rural innovators summarizing, sharing and presenting existing best practices and innovations to enable replication of successful cases across Europe.

- The proposals should build on the knowledge and tools already generated by the BioeconomyVentures[298] and Pilots4U[299] projects developed under Horizon 2020, as well

[298] https://cordis.europa.eu/project/id/101023260.
[299] https://cordis.europa.eu/project/id/745667.

as seek complementarities with related actions and existing[300] and upcoming[301] relevant projects on bioeconomy governance and ensure inclusiveness and engagement of all actors. It is also relevant to cooperate and establish links with the Circular Bio-based Europe (CBE) JU, and relevant EIT KICs.

- Seek synergies and complement the knowledge and cooperation activities of the Startup Village Forum. Cooperate with "Rural networks" (soon to become the CAP networks) including the European innovation partnership on agriculture productivity and sustainability (EIP-AGRI) and the European Network for Rural Development (ENRD), and Horizon Europe Partnership Sustainable Food Systems.

- Proposals should explore all available financing instruments on a European level, including relevant regional instruments (Cohesion Fund, CAP, ESF and others). Proposals should also describe how they plan to complement the ongoing activities of bodies such as the European Innovation Council, the Circular Bioeconomy Investment Platform, and the Enterprise Europe Network and European Institute of Technology (EIT) initiatives.

- Social innovation is relevant for this topic as it contributes to strengthened rural innovation ecosystems and to find solutions for rural communities when the solution is at the socio-technical interface and requires social and behavioural change, new social practices, social ownership or market uptake. Proposal should contribute to improve the quality of life and long-term socio-economic prospects of rural and coastal communities, including women (especially supporting women-led SMEs and start-ups), youth and the most vulnerable groups like indigenous people or minorities and refugees.

- This topic requires the effective contribution of SSH disciplines.

Innovating for blue bioeconomy and biotechnology value chains

Proposals are invited against the following topic(s):

HORIZON-CL6-2024-CircBio-01-10: Targeting aquatic extremophiles for sourcing novel enzymes, drugs, metabolites and chemicals

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a

300 BE-Rural, Power4Bio, BIOEASTsUP, SIMRA.

301 HORIZON-CL6-2023-CIRCBIO-02-1-two-stage: Circular Cities and Regions Initiative (CCRI)'s circular systemic solutions; HORIZON-CL6-2024-CIRCBIO-01-8: Bioeconomy Project Development Assistance, HORIZON-CL6-2023-GOVERNANCE-01-5: Revitalisation of European local (rural / peri-urban) communities with innovative bio-based business models and social innovation, HORIZON-CL6-2021-COMMUNITIES-01-02- Expertise and training centre on rural innovation.

	proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 9.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 3-5 by the end of the project – see General Annex B.

Expected Outcome: Selected proposals are expected to contribute to all of the following expected outcomes:

- Contribution to expanding the sustainable exploration of biodiversity hotspot regions, e.g., transitional waters, deep-sea, polar regions;
- Advances in the development of the next generation of sampling methods, technologies, as well as understanding of the legal frameworks within which the development process operates;
- Better preparedness to harvest aquatic bioactive substances in the most environmental friendly manner and support to green industrial bioprocessing with more sustainable bio-based products through bio discovery of novel sources and new biotechnology processes and applications;
- Expansion of bioprospecting from the screening for new chemicals into biological function;
- Advancement in understanding the ecology of marine or other aquatic ecosystems, including possibly the ones on water surface, in sediments, in the internal cavity of sponges etc.;
- Increased commitment to conserve and sustainably use the ocean's genetic diversity and contribution to the understanding of potential trade-offs inherent in the exploitation of ocean, and other aquatic, biodiversity.

Scope: Extreme environments with huge bio-resources still present enormous challenges for exploration and sampling operations. Challenges are often due to the depth, pH, salinity, temperature and pressure conditions, which make exploration technically difficult, risky and expensive.

Proposals under this topic should explore marine or other aquatic ecosystems with complex and extreme conditions such as temperature, pressure, alkalinity or acidity/pH level, extremely low nutrients, etc. with focus on extremophilic organisms capable of thriving/surviving in such extreme environments (e.g., deep hydrothermal vents, hypersaline lagoons, sub-seafloor sediments). They should develop or optimise tailor-made sampling methods, explore the metabolic, physiological and other adaptation mechanisms to such

extreme ecological conditions and look for novel and highly efficient metabolites, drugs, enzymes and chemicals for industrial application.

They should disseminate their results in the most efficient and transparent manner considering the risks and ethics related to science & technology in compliance with EU regulations on access to genetic resources and the fair and equitable sharing of benefits arising from their utilisation (ABS) in the EU.

Selected projects should collaborate with each other.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

Call - Circular economy and bioeconomy sectors

HORIZON-CL6-2024-CIRCBIO-02

Conditions for the Call

Indicative budget(s)[302]

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million)[303]	Indicative number of projects expected to be funded
		2024		
Opening: 17 Oct 2023 Deadline(s): 22 Feb 2024 (First Stage), 17 Sep 2024 (Second Stage)				
HORIZON-CL6-2024-CircBio-02-1-two-stage	RIA	15.00	Around 5.00	3
HORIZON-CL6-2024-CircBio-02-2-two-stage	IA	10.00	Around 5.00	2
HORIZON-CL6-2024-CircBio-02-3-two-stage	IA	10.00	Around 5.00	2
HORIZON-CL6-2024-CircBio-02-4-two-stage	IA	15.00	Around 5.00	3
HORIZON-CL6-2024-CircBio-02-5-two-stage	RIA	8.00	Around 4.00	2

302 The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2023 and 2024.

303 Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

HORIZON-CL6-2024-CircBio-02-6-two-stage	IA	15.00	Around 5.00	3
Overall indicative budget		73.00		

General conditions relating to this call	
Admissibility conditions	The conditions are described in General Annex A.
Eligibility conditions	The conditions are described in General Annex B.
Financial and operational capacity and exclusion	The criteria are described in General Annex C.
Award criteria	The criteria are described in General Annex D.
Documents	The documents are described in General Annex E.
Procedure	The procedure is described in General Annex F.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G.

Enabling a circular economy transition

Proposals are invited against the following topic(s):

HORIZON-CL6-2024-CircBio-02-1-two-stage: Circular solutions for textile value chains through innovative sorting, recycling, and design for recycling

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 15.00 million.
Type of Action	Research and Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply:

	Applicants submitting a proposal under the blind evaluation pilot (see General Annex F) must not disclose their organisation names, acronyms, logos, nor names of personnel in Part B of their first stage application (see General Annex E).
Technology Readiness Level	Activities are expected to achieve TRL 5-6 by the end of the project – see General Annex B.
Procedure	The procedure is described in General Annex F. The following exceptions apply: This topic is part of the blind evaluation pilot under which first stage proposals will be evaluated blindly.

Expected Outcome: A successful proposal will contribute to the following Destination impacts: i) enhance European industrial sustainability, competitiveness and resource independence, and ii) improve on consumer and citizen benefits.

Project results are expected to contribute to at least two of the following outcomes:

- Roll-out of systemic solutions for textile sorting, using innovative digital technologies (such as AI, robotics, IoT and blockchain);
- Roll-out of feasible solutions for facilitated disintegration to be incorporated in product design, as an enabler for recycling;
- Increased uptake of mechanical recycling solutions that deliver competitive, high-quality secondary materials;
- Roll-out of thermo-mechanical, chemical and other (e.g., enzymatic) recycling solutions that are sustainable from a zero-pollution, circular material and energy efficiency perspective.

Scope: The topic aims at improved management of the end-of-life phase of textile products. Proposals should address one or more of the following subjects and aim to combine them where relevant in a systemic way: facilitation of the disintegration of textile products through design, sorting, and recycling of textiles.

Textiles are the fourth highest-pressure category for the use of primary raw materials and water and fifth for GHG emissions and a major source of microplastic pollution in production and use phases. They are also a key material and product stream in the circular economy action plan. The purpose of this initiative is also to minimise the use of hazardous substances in processing and textile treatments. Proposals shall also demonstrate and deploy innovative solutions for increased quality, non-toxicity and durability of secondary textile materials and their processing and treatments.

Facilitation of the disintegration of textile products:

Beside the fibre composition affecting recyclability, textile products can also consist of various non-textile components or accessories, and can be coated, laminated or printed on. These hard parts, trims, coatings and laminated layers hamper recycling and are a major barrier for practically all textile fibre recycling technologies, especially chemical recycling technologies. The removal of these non-textile components requires disassembly prior to recycling, adding costs to the overall recycling process. Despite the various research projects on this topic, the implementation and uptake of these techniques is still far from reality. Proposals should address these challenges. New approaches should also be tested, involving technologies such as robotics and AI. Irrespective of the remaining technological and economical challenges, the implementation of disintegration techniques also requires a system, in which products that are fitted with any of these techniques are properly collected, recognised, and sent towards the right facility to apply the appropriate triggering mechanism.

Systemic solutions for sorting:

Over the coming years, the collected volumes of post-consumer textile waste are expected to increase by a further 65,000 to 90,000 tonnes per year due to the increased amounts of textiles placed on the market and the obligation to separately collect textile waste, which Member States have to put in place by 1 January 2025. This will further increase the need for advanced sorting for collecting organisations in order to create economic value out of this. At the moment, sorting is still mainly a manual process, having a significant contribution to the total process costs of recycled textile fibres. The cost of manual sorting is a major barrier to cost effective production of feedstock for textile fibre recycling. Automated sorting has the potential to deliver sufficient, well-defined and low-cost input to recycling processes, however, to date, this potential is not yet fulfilled. New technologies exist, but their limitations need to be addressed. Due to the limited penetration depth of NIR light, only the surface composition of textiles can be detected. RFID technology requires the textile products to carry an RFID tag and an entire system behind, adapted by all parts of the value chain. Therefore, proposals should develop systemic digital solutions that facilitate traceability and comprehensive exchange of information along the entire value chain, involving the use of technologies such as blockchain, AI and IoT. Proposals should build knowledge and competence regarding information system models, systems for data collection, provide an overview of existing standards and mapping of standardisation needs, include cost calculations and evaluation of Return On Investment (ROI), and consider implications of integrating digital information carriers in textile products.

Further development of textile recycling technologies:

In view of the huge amount of textile waste, which will have to be handled due to the soon mandatory separate collection, possible product requirements such as recycled content and the potential offered by different types of textile recycling, different ways of textile recycling remain relevant and will all be needed in the implementation of the textiles strategy. Mechanical recycling of textiles is an established technology in the market. However, the amount of spinnable fibre and the quality of the fibres should be improved. The integration of robotics, AI, or IoT components will play a role in the improvement of these processes.

Thermo-mechanical recycling is a process that is still under development and further research is needed to improve the yield of recycled content and the use of chemicals to increase the quality of the polymer. Chemical and enzymatic recycling are novel technologies. Proposals should upscale polymer recycling of cotton via a pulping process and incorporate customer feedback for optimisation of the process and continuous delivery of suitable textile waste (in terms of purity and composition) as feedstock. Other options that can be explored are the recycling of polycotton blends and the monomer recycling of PET. The application of these technologies in research and innovation should also be extended to other types of fibres.

Clustering activities with projects under "HORIZON-CL6-2024-CIRCBIO-01-2: Circular solutions for textile value chains based on extended producer responsibility" should be envisaged. A lifecycle perspective using LCA and LCC should be used when validating the technical and economic feasibility of the developed, improved, demonstrated and up-scaled processes. Proposals should also address the issue of side streams such as wastewater and the treatment and reuse. Novel value chain-based solutions through industrial symbiosis should be encouraged. For comparability reasons, LCAs should use well-established methods and be based on PEF wherever feasible. Proposals should fully incorporate the Safe and Sustainable by Design (SSbD) approach. Particular attention should also be given to the implementation of traceability solutions, also with a view to recent policy developments, e.g. the digital product passport. The participation of SMEs and industry is encouraged.

The targeted TRL at the end of the projects is 5 to 6.

HORIZON-CL6-2024-CircBio-02-2-two-stage: Increasing the circularity in plastics value chains

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: Applicants submitting a proposal under the blind evaluation pilot (see General Annex F) must not disclose their organisation names, acronyms, logos, nor names of personnel in Part B of their first stage application (see General Annex E).
Technology Readiness Level	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.

Procedure	The procedure is described in General Annex F. The following exceptions apply: This topic is part of the blind evaluation pilot under which first stage proposals will be evaluated blindly.

Expected Outcome: A successful proposal will contribute to the following Destination impacts: i) enhance European industrial sustainability, competitiveness and resource independence, and ii) improve on consumer and citizen benefits.

Proposal results are expected to contribute to all of the following outcomes:

- Increased deployment and demonstrated benefits of advanced digital solutions (e.g., through AI, robotics, IoT and blockchain) in circular businesses including waste management and recycling;
- Emergence of new value chains using upcycled and/or recycled resources, e.g. through industrial symbiosis;
- Increased upcycling and recycling rates for the targeted material streams;
- Increased uptake of recycled material and upcycling to new higher-value products;
- Increased resource efficiency along and across value chains, causing a measurable reduction in GHG emissions and other environmental pollution and an increase of carbon removals;
- Increased diffusion of new circular business practices, in particular in the uptake of repair, reuse and remanufacturing, but also practices that form part of the sharing economy.

Scope: The new circular economy action plan (CEAP) highlights plastics as one of the four particularly important material and product streams with regard to their circularity potential and their environmental footprint. The circularity deficits for these streams are mainly due to the: lack of trust in secondary raw materials; lack of control over supply chains; lacking focus on material efficiency and design for circularity; unsustainable product lifetimes; lack of repair services; price gap between primary and secondary material; lack of secondary material markets; insufficient collection and sorting systems; insufficient and unpredictable input quality for recycling; insufficient information about quality and quantity of materials, including knowledge about possible microplastics pollution and substances of concern, lack of communication along the lifecycle between manufacturers and recyclers; lack of involvement and empowerment of citizens that would allow environmentally informed purchases.

Proposals should address the priorities set in the CEAP. Beside the continuous implementation of the EU plastics strategy, the CEAP has a strong focus on microplastics, but

also calls for mandatory recycled content and the controlled use of bio-based, biodegradable plastics and alternative materials.

Proposals should demonstrate and deploy at large scale innovative solutions and designs for increased quality, non-toxicity and durability of secondary materials and increased share of secondary materials in new products. Proposals should demonstrate increased recovery, recycling and upcycling rates and a higher uptake of secondary materials for high value applications. Special attention should be given to the increased circularity of critical raw materials186. Proposals should also demonstrate circular business practices, in particular in the uptake of repair and reuse, remanufacture, product-service-systems, and in the full lifetime of products or services. To achieve this, targeted market size, economic feasibility, cost efficiency and social acceptance need to be addressed. To break down the barriers for this transition, it is important that proposals involve and address the different perspectives of all relevant actors, e.g., manufacturers, retailers, consumers and civil society organisations (CSOs). The projects should consider the use of digital solutions (including technologies such as AI, robotics, IoT and blockchain) and demonstrate their benefits for increased circularity. Proposals should aim to implement traceability solutions in support of recent policy developments, e.g. regarding the digital product passport. Projects should also help produce harmonised and robust methods to assess the amount of recycled content in sectoral products, which is key for a future review of green claims through authorities and consumer organisations. Environmental, social and economic impacts should be assessed from a lifecycle perspective as product, organisation and consumption environmental footprints, using the respective methods developed by the European Commission (Product Environmental Footprint, PEF, should be used for the assessment of the environmental impacts) and through costing methods; relevant data should be fed into the European Platform on Life Cycle Assessment, following the specific Environmental Footprint data and format requirements. The functional performance of technologies and secondary materials can be assessed through the EU Environmental Technology Verification (ETV) scheme. All project results should be validated using quantitative indicators and targets wherever possible.

Projects should also develop training material to endow workers in this occupational group with the right skillset in order to deploy the new technologies developed. Proposals should consider the development of learning resources for the current and future generations of employees, with the possibility to integrate them in existing curricula and modules for undergraduate level and lifelong learning programmes. The projects should provide contributions to relevant standards or best practices.

Proposals should build on ongoing projects funded under Horizon 2020 and Horizon Europe and envisage clustering activities with these. Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

The targeted TRL at the end of the projects is 6 to 8.

HORIZON-CL6-2024-CircBio-02-3-two-stage: Increasing the circularity in electronics value chains

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: Applicants submitting a proposal under the blind evaluation pilot (see General Annex F) must not disclose their organisation names, acronyms, logos, nor names of personnel in Part B of their first stage application (see General Annex E).
Technology Readiness Level	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.
Procedure	The procedure is described in General Annex F. The following exceptions apply: This topic is part of the blind evaluation pilot under which first stage proposals will be evaluated blindly.

Expected Outcome: A successful proposal will contribute to the following Destination impacts: i) enhance European industrial sustainability, competitiveness and resource independence, and ii) improve on consumer and citizen benefits.

Proposal results are expected to contribute to all of the following outcomes:

- Increased deployment and demonstrated benefits of advanced digital solutions (e.g., through AI, robotics, IoT and blockchain) in circular businesses including waste management and recycling;
- Emergence of new value chains using upcycled and/or recycled resources;
- Increased upcycling and recycling rates for the targeted material streams;
- Increased uptake of recycled material and upcycling to new higher-value products;
- Increased resource efficiency along and across value chains, causing a measurable reduction in GHG emissions and other environmental pollution and an increase of carbon removals;

- Increased diffusion of new circular business practices, in particular in the uptake of repair, reuse and remanufacturing, but also practices that form part of the sharing economy.

Scope: The circular economy action plan (CEAP) highlights electronics including information and communications technology (ICT) equipment as one of the four particularly important material and product streams with regard to their circularity potential and their environmental footprint. The circularity deficits for these streams are mainly due to the: lack of trust in secondary raw materials; lack of control over supply chains; lacking focus on material efficiency and design for circularity; unsustainable product lifetimes; lack of repair services; price gap between primary and secondary material; lack of secondary material markets; insufficient collection and sorting systems; insufficient and unpredictable input quality for recycling; insufficient information about quality and quantity of materials, including knowledge about possible microplastics pollution and substances of concern, lack of communication along the lifecycle between manufacturers and recyclers; lack of involvement and empowerment of citizens that would allow environmentally informed purchases.

Proposals should address the priorities set in the CEAP, which states that "electrical and electronic equipment continues to be one of the fastest growing waste streams in the EU, with current annual growth rates of 2%. It is estimated that less than 40% of electronic waste is recycled in the EU. Value is lost when fully or partially functional products are discarded because they are not reparable."

Proposals should demonstrate and deploy at large scale innovative solutions and designs for increased quality, non-toxicity and durability of secondary materials and increased share of secondary materials in new products. Proposals should demonstrate increased recovery, recycling and upcycling rates and a higher uptake of secondary materials for high value applications. Special attention should be given to the increased circularity of critical raw materials186. Proposals should also demonstrate circular business practices, in particular in the uptake of repair and reuse, remanufacture, product-service-systems, and in the full lifetime of products or services. To achieve this, targeted market size, economic feasibility, cost efficiency and social acceptance need to be addressed. To break down the barriers for this transition, it is important that proposals involve and address the different perspectives of all relevant actors, e.g., manufacturers, retailers, consumers and civil society organisations (CSOs). The projects should consider the use of digital solutions (including technologies such as AI, robotics, IoT and blockchain) and demonstrate their benefits for increased circularity, also analysing and addressing possible trade-offs. Proposals should aim to implement traceability solutions in support of recent policy developments, e.g. regarding the digital product passport. Projects should also help produce harmonised and robust methods to assess the amount of recycled content in sectoral products, which is key for a future review of green claims through authorities and consumer organisations. Environmental, social and economic impacts should be assessed from a lifecycle perspective as product, organisation and consumption environmental footprints, using the respective methods developed by the European Commission (Product Environmental Footprint, PEF, should be used for the assessment of the environmental impacts) and through costing methods; relevant data should

be fed into the European Platform on Life Cycle Assessment, following the specific Environmental Footprint data and format requirements. The functional performance of technologies and secondary materials can be assessed through the EU Environmental Technology Verification (ETV) scheme. All project results should be validated using quantitative indicators and targets wherever possible.

Projects should also develop training material to endow workers in this occupational group with the right skillset in order to deploy the new technologies developed. Proposals should consider the development of learning resources for the current and future generations of employees, with the possibility to integrate them in existing curricula and modules for undergraduate level and lifelong learning programmes. The projects should provide contributions to relevant standards or best practices.

Proposals should build on ongoing projects funded under Horizon 2020 and Horizon Europe and envisage clustering activities with these. Social innovation is recommended when the solution is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

The targeted TRL at the end of the projects is 6 to 8.

HORIZON-CL6-2024-CircBio-02-4-two-stage: New circular solutions and decentralised approaches for water and wastewater management

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 15.00 million.
Type of Action	Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: Applicants submitting a proposal under the blind evaluation pilot (see General Annex F) must not disclose their organisation names, acronyms, logos, nor names of personnel in Part B of their first stage application (see General Annex E).
Technology Readiness Level	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.
Procedure	The procedure is described in General Annex F. The following exceptions apply: This topic is part of the blind evaluation pilot under which first stage

	proposals will be evaluated blindly.

Expected Outcome: In support of the European Green Deal and EU water-related policies, successful proposals will contribute achieving sustainable and circular management and use of water resources, as well as prevention and removal of pollution, in particular Destination 'Circular economy and bioeconomy sectors' impact 'Accelerate transitions towards a sustainable, regenerative, inclusive, just and clean circular economy based on enhanced knowledge and understanding of science'.

Projects results are expected to contribute to all of the following expected outcomes:

- Demonstrate the benefits of decentralised approaches for water and wastewater treatment in various geographic, climate and economic conditions and create a decision framework to help policy makers to see where a decentralised approach can bring the most overall benefits with regards to the centralised one, as well as, how to better design their integration.

- Improve co-design and co-creation processes and synergies between all relevant stakeholders and enhance public engagement to speed up the market uptake of decentralised and/or semi-decentralised solutions.

- An enhanced systemic circular economy approach along the water, cycle by using process integration, to minimise water pollution, water consumption and the environmental footprint (including energy use) of water activities and ensure water security.

- Support the implementation of relevant EU policy needs (e.g., water and marine related policies, water reuse regulation, climate change adaptation strategy, circular economy action plan, the EU zero pollution action plan, and chemical strategy for sustainability).

Scope: With a rapidly changing urban, peri-urban and rural environments, increasing flooding and contamination of water resources, and in order to reap the benefits of circular economy approaches, adapt to climate change and support the implementation of water supply and sanitation related SDG, innovative approaches and technologies are required. Such innovative approaches should go beyond the central objective of protecting human health and environment, by enabling the overall concept of circularity and sustainability in terms of economic feasibility, social equity and acceptance, technical and institutional applicability, environmental protection, and resource recovery.

Moreover, the current COVID19 pandemic highlighted the essential role of safely managed water supply, sanitation, and hygiene services for preventing disease and protecting human health during infectious disease outbreaks and constitutes a good opportunity to revisit strategies implemented so far, and to build a more sustainable society meeting basic needs such as water and sanitation for all.

Decentralised water and wastewater systems can play an important role in delivering such an innovative approach and has the potential for a sustainability transition of the water supply and sanitation sector, by treating wastewater close to its source. However, full and appropriate exploitation of these systems, requires further developments, in order to become economically affordable, ecologically sustainable and socially accepted. In addition, the integration between centralised and local, decentralised and/or semi-decentralised solutions should be further explored.

Actions in this topic should further develop efficient and sustainable decentralised and distributed approaches and technologies for climate-neutral and zero pollution water supply and wastewater treatment to optimise circular and sustainable use of natural resources, including integrated stormwater management systems to encourage water management on site rather than to the sewer. The impact of reduced sewer flows, more concentrated sewage and waste sludge discharges from decentralised systems on sewer infrastructure should be better assessed. A thorough comparison of the overall environmental and economic performance of ongoing decentralized water and wastewater systems in different geographical and climate conditions and their potential for climate mitigation and adaptation should be undertaken, in order to assess under which conditions decentralised systems perform better than the centralised ones and help to create the right enabling environment to overcome various regulatory and technological barriers related to the implementation of these approaches. New urban sanitation models based on decentralised and integrated approaches which consider municipal organic waste and wastewater as source for recovery and recycling materials such as organic matter and nutrients that are included in the organic fraction of municipal solid waste and wastewater streams, could be also considered.

The integration of decentralised and centralised systems for water supply and sanitation is particularly needed in highly urbanised areas where centralised systems are currently used, to provide better water services, by reconciling, for instance, the need to meet an increasing water demand and new quality standards in an economic and sustainable manner, including energy efficiency and production. In this context, this action should:

- Develop an overarching risk analysis and optimization framework for the integrated design and operation of multiple source water supply systems, enhancing the application of digital technologies and solutions.

- Demonstrate the potential of the integration of decentralised with centralised systems for water supply and sanitation in different areas and scales (eg. district level, cities, river basin), to assess the potential benefits/drawbacks, strengthening public participation and engagement and public private partnerships.

- Address potential regulatory, financial and socioeconomic bottlenecks with a view of promoting long-term performance-based business models in public private partnerships for decentralised and/or integrated decentralised and centralised systems.

This action should bring together relevant researchers, technology providers, water utilities, business representatives, investors, policy makers and other water users and citizens. The

active participation and engagement of different stakeholders should span the entire project development and implementation to ensure performance and sustainability and maximise the final impact.

To reinforce the potential benefits of implementing these decentralised approaches to policy makers their social impact, notably in terms of employment generation and population settlement in decentralised territories should be demonstrated.

The inclusion of relevant SSH expertise would be also needed to ensure the proposed solutions are also socially accepted.

Decentralised approaches for water and wastewater systems provides significant opportunities for developing countries and emerging economies to establish new alternatives and more sustainable approaches to water supply and sanitation and support the implementation of related SDGs. International cooperation is therefore strongly encouraged.

Innovating for sustainable bio-based systems, biotechnology and the bioeconomy

Proposals are invited against the following topic(s):

HORIZON-CL6-2024-CircBio-02-5-two-stage: Circular design of bio-based processes and products

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 8.00 million.
Type of Action	Research and Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: Applicants submitting a proposal under the blind evaluation pilot (see General Annex F) must not disclose their organisation names, acronyms, logos, nor names of personnel in Part B of their first stage application (see General Annex E).
Technology Readiness Level	Activities are expected to achieve TRL 5 by the end of the project – see General Annex B.
Procedure	The procedure is described in General Annex F. The following exceptions apply: This topic is part of the blind evaluation pilot under which first stage

	proposals will be evaluated blindly.

Expected Outcome: Successful proposals will enable the bio-based industries in the Union, including SMEs, to contribute to the enhancement of European industrial sustainability, competitiveness and resource independence and to the deployment of innovative and sustainable value-chains in the bio-based sectors as a prerequisite and driver of future solutions for a circular economy and the bioeconomy transitions. Projects results will contribute to deliver bio-based solutions 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, the bioeconomy strategy and the communication on sustainable carbon cycles.

Projects results are expected to contribute to all of the following expected outcomes:

- Circular design of bio-based processes and products: increasing resources and energy efficiency of bio-based technologies, decreasing their environmental impacts on soil, water, and air quality, biodiversity and climate, improving durability and suitability of bio-based products to be safely re-used and re-manufactured, allowing for high-quality recycling, increasing the safe recycled content in new products;

- Product information systems enabling the circularity, safety and environmental sustainability of the bio-based manufacturing sectors and of the use of products at consumers' level.

Scope: The bio-based processes and products within the scope of this topic do not include food, feed, biofuels, bioenergy and cultural and recreation sectors. The establishment of safe, resilient, competitive and equitable production and consumption systems with reduced environmental impacts on soil, water, and air quality, biodiversity and climate, is part of the objectives of the EU circular economy.

To improve the capacity of the industrial bio-based sectors within the scope of the topic, especially the manufacturing sectors, to contributing to that objective, proposals should:

- Develop optimized design of bio-based processes and bio-based products to improve their circularity, taking into account the opportunity to re-use recycled materials in the local market. This could be achieved through increasing resources and energy efficiency of processes, improving high-quality recycling technologies, increasing the durability of products and their suitability to be safely re-used and re-manufactured, improved products end-of-life options, increasing the safe recycled content in new products, etc.;

- Assess the safety, environmental sustainability and climate neutrality of circular bio-based processes and products along their value chains, including of the biological feedstock from land and sea used in the production processes. The environmental impacts of processes and products on soil, water, and air quality, biodiversity and climate should be based on existing and validated assessment methods, also developed

and improved in past and ongoing R&I projects[304]. In particular, the climate neutrality should be assessed based both on the reduction of greenhouse gas emissions and on the increase of carbon removals and should include an assessment of the energy efficiency improvement;

- Include the assessment of economic and social aspects of the improved production and consumption bio-based systems in terms of increased economic value along the whole value chains, circular patterns of products involving consumers, i.e., durability, reuse, repair, remanufacturing and recycling patterns, improved economic value of recycled materials, job opportunities, etc.;

- Develop product information systems demonstrating the safe and sustainable use of biological resources and the resource efficiency along value chains, from the production to the extended circular product lifetimes and appropriate disposal. Transparent information should aim at improving the societal acceptance of bio-based innovation and at supporting consumers and customers in making responsible and informed choices.

In order to achieve the expected outcomes, and in line with the EU strategy for international cooperation in research and innovation, international cooperation is encouraged. Projects are expected to contribute to the New European Bauhaus (NEB) initiative by interacting with the NEB Community, NEB Lab and other relevant actions of the NEB initiative through sharing information, best practice, and, where relevant, results.

Where relevant, proposals should seek links with and capitalise on the results of past and ongoing EU funded projects, including under the Circular Bio-based Europe JU, the Processes 4 Planet partnership and other European partnerships of Horizon Europe.

This topic requires the effective contribution of SSH disciplines and the involvement of SSH experts, institutions as well as the inclusion of relevant SSH expertise, in order to produce meaningful and significant effects enhancing the societal impact of the related research activities.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

HORIZON-CL6-2024-CircBio-02-6-two-stage: From silos to diversity – small-scale bio-based demonstration pilots

Specific conditions	
Expected EU	The Commission estimates that an EU contribution of around EUR

[304] See, e.g. the project STAR-ProBIO "Sustainability Transition Assessment and Research of Bio-based Products" (H2020 Call 2016 BB-01-2016 Sustainability schemes for the bio-based economy) and the projects developed under the topics HORIZON-CL6-2021-ZEROPOLLUTION-01-05: Environmental sustainability criteria for biological resources production and trade in bio-based systems: impacts and trade-offs and HORIZON-CL6-2023-ZEROPOLLUTION-01-4: Environmental sustainability and circularity criteria for industrial bio-based systems.

contribution per project	5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 15.00 million.
Type of Action	Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: Applicants submitting a proposal under the blind evaluation pilot (see General Annex F) must not disclose their organisation names, acronyms, logos, nor names of personnel in Part B of their first stage application (see General Annex E).
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: The proposals must use the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Technology Readiness Level	Activities are expected to achieve TRL 6-7 by the end of the project – see General Annex B.
Procedure	The procedure is described in General Annex F. The following exceptions apply: This topic is part of the blind evaluation pilot under which first stage proposals will be evaluated blindly.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties. The support to third parties can only be provided in the form of grants. The maximum amount to be granted to each third party is EUR 60 000.

Expected Outcome: This topic supports the bioeconomy strategy and the common agriculture policy (CAP) by promoting new business models for the green transition in line with the European Green Deal objectives.

Project results are expected to contribute to all of the following outcomes:

- Demonstration of replicable and scalable, innovative bioeconomy-oriented production and business models with an active involvement of primary producers.

- Enhanced knowledge and awareness on feedstock availability and technology options to better valorise underutilised biomass, residues and waste streams from agriculture and forestry.
- Improved innovation capacities and product portfolio extension in primary production sectors and SMEs.
- Development of new materials, products, and services with considerably lower environmental impacts and at higher value.
- Climate-neutral land sector by 2035 and climate-neutral economy by 2050.
- Diversification and enhancement of agricultural incomes (organic and conventional farming).
- Creation of a stakeholder platform to share best-practice examples and promote new business models in the primary production sectors.
- Promotion of bioeconomy-related interventions in the new CAP and advice and technical guidance for Member States.

Scope: The current economy system is based on an intensive consumption of fossil fuels in a way that severely compromise the future of the planet due to the severe consequences in climate change. Europe's future economic growth and jobs will increasingly have to come from innovation in sustainable products based on renewable resources and in line with the climate and biodiversity objectives. This topic addresses innovative business models and technology options in primary production sectors to unlock the potential of the bioeconomy in rural areas and to efficiently use underutilised biomass, in particular side streams from agriculture and forestry, for high value applications in small-scale bio-based demonstration pilots.

Proposals will:

- Develop new business models for the economic-viable valorisation of local underutilised feedstock, such as by-products, residues, and waste, from land and livestock.
- Demonstrate suitable processes and technologies to produce high-value bio-based materials and products in rural conditions with an active role of primary producers (farmers and foresters) in the value chains.
- Build-upon existing food, feed, or bioenergy value chains to further strengthen their economic and environmental sustainability through synergistic interlinkages and in line with the cascading principle.
- Improve the knowledge on the quantitative and qualitative requirements, harvesting, logistics, pre-treatment (e.g. mechanical, thermal) and conversion of the feedstock.
- Ensure that the bio-based materials and products are based on the latest safety standards.

- Evaluate the environmental and socio-economic performance of the demonstrated value chains.
- Demonstrate the economic feasibility of seeking access to sufficient quantities of raw materials needed to set-up new supply chains and provide evidence that the feedstock streams in question are produced on land that is unsuitable for food production or represent underutilized residues from the agro-food industry.
- Closely interact with other selected projects under this topic and create a joint stakeholder platform to promote best-practice examples for primary producers and SMEs at national and EU-level.

A close cooperation with selected projects from topic HORIZON-CL6-2021-CIRCBIO-01-08 is strongly advised.

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

Proposals may involve financial support to third parties e.g. to primary producers, academic researchers, start-ups, SMEs, and other multidisciplinary actors, to, for instance, develop, test or validate developed applications. Consortia need to define the selection process of organisations, for which financial support may be granted. Maximum 20% of the EU funding can be allocated to this purpose.

Proposals are encouraged to include regions where pilot plants and demonstrational sites are missing or underrepresented.

Destination - Clean environment and zero pollution

Anthropogenic pollution undermines the integrity of Earth's ecosystems and severely affects natural resources essential for human life. Keeping our planet clean and our ecosystems healthy will not only help addressing the climate crisis but also help regenerate biodiversity, ensure the sustainability of primary production activities and safeguard the well-being of humankind. In line with the objectives of the European Green Deal and related initiatives targeting environmental challenges, particularly the EU zero pollution action plan, the 2030 climate target plan, and other relevant EU legislation[305], this destination seeks to halt and prevent pollution by focusing on:

- removing pollution from fresh and marine waters, soils, air, including from nitrogen and phosphorus emissions;
- substituting harmful chemicals;
- improving the environmental sustainability and circularity of bio-based systems;
- reducing environmental impacts of and pollution in food systems.

Synergies with other clusters (notably 1 for health issues and 5 for air pollution from urban sources), relevant destinations, missions (particularly 'A Soil Deal for Europe' and 'Restore our Ocean and Waters by 2030') and partnerships will be exploited.

Topics under the heading ***Halting pollution of air, soil and water*** aim to identify and demonstrate approaches to combat diffuse emissions of pollutants from land and other sources. In this context, keeping nitrogen (N) and phosphorus (P) cycles in balance is a major challenge. N and P flows from anthropogenic sources, mostly from excessive or inefficient input of fertilisers (manure, sewage sludge, etc.) in agriculture and from waste water treatments, currently exceed planetary boundaries. Their leaching and run-off negatively affect soil biodiversity, pH, organic matter concentration and carbon sequestration capacity, and cause the eutrophication of water bodies while ammonia and nitrous oxide emissions affect air quality and climate. As all environmental compartments are concerned, a systemic approach is needed to limit N/P emissions from different sources, and to bring N/P flows back within safe ecological boundaries, e.g. by improving the way fertilising products in agriculture are managed while taking into account regional conditions. Actions will include showcasing best practices to recover nutrients from secondary raw materials in order to produce alternative fertilisers and demonstrating pathways for regions to keep their N/P flows within ecological boundaries.

Topics under ***Protecting drinking water and managing urban water pollution*** seek to develop and demonstrate a comprehensive framework bringing together new innovative solutions and approaches to ensure drinking water is of a good quality, address urban water pollution and harmonise different policies and management approaches. Actions should

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explore solutions to increase the resilience of urban waste water systems, reducing the carbon footprint and emissions, improve resource efficiency and energy recovery, and limit risks from contaminants of emerging concern. An integrated strategy to harmonise and update monitoring with prioritisation for comprehensive control of urban water cycles should be developed by harnessing the potential of digital solutions.

Topics under ***Addressing pollution in seas and ocean*** strive to fill knowledge gaps about risks and impacts of pollution from contaminants of emerging concern in the marine environment (in particular pharmaceuticals and endocrine disruptors) including in the context of the changing marine environment due to changes in the climate system. They will further develop and test solutions for the integrated assessment and monitoring of the circulation and impacts of contaminants of emerging concern in the marine environment, in order to help implement EU policies and legislation, e.g. the Water Framework Directive and Marine Strategy Framework Directive. Actions should also explore the role of pollution in intensifying impacts related to climate change, including in the Arctic, resulting in solutions and strategies to help ecosystems and human communities adapt as regards the changes in the Arctic.

Topics under ***Increasing the environmental sustainability and circularity of bio-based processes and products*** look at developing bio-based solutions for environmental monitoring and remediation as well as the concept of integrating sustainability and circularity into bio-based systems. This concept also includes bio-based chemicals, additives and materials solutions contributing to carbon removal objectives, the chemicals strategy for sustainability (CSS strategy) and the development of safe- and -sustainable-by-design materials and products.

Furthermore, topics under the heading ***Reducing the environmental impact and pollution of food systems*** focus on increasing our knowledge of the soil, water and air pollution stemming from different food production and supply practices and providing opportunities to reduce environmental and climate impacts of food systems. This also includes preventing and reducing plastic pollution stemming from plastic food packaging.

Expected impact

Proposals for topics under this destination should set out a credible pathway that helps to halt and eliminate pollution to guarantee clean and healthy soils, air, fresh and marine water for all and ensure that natural resources are used and managed in a sustainable and circular manner. To reach this objective, it will be vital to advance the knowledge of pollution sources and pathways to enable preventive measures to be rolled out, improve sustainability and circularity, apply planetary boundaries in practice and introduce effective remediation methods. To this end, the following is required:

- move towards achieving clean, unpolluted surface water and groundwater bodies in the EU and Associated Countries by increasing understanding of diffuse and point sources of **water pollution in a global and climate change context**, enabling novel solutions to avoid degradation and restore water bodies, aquatic ecosystems and soil functionality,

and further improve the quality and management of water for safe human and ecological use, while strengthening the EU's and Associated Countries' positions and roles in the global water scene;

- balance **N/P flows within safe ecological boundaries** at regional and local level, helping restore ecosystems;
- move towards achieving **clean, unpolluted oceans and seas**, including in the Arctic, by means of successful scientific, technological, behavioural, socio-economic, governance and green-blue transitions;
- **strengthen circular bio-based systems** to operate within planetary boundaries, replacing fossil-based systems and their carbon footprint, mitigating climate change, and restoring biodiversity and protecting air, water and soil quality along the supply chain of biological feedstocks and industrial value chains within the EU and Associated Countries and across borders;
- **substitute harmful chemicals** for safer and more sustainable alternatives, notably by boosting innovative biotechnology and other sustainable technologies to create zero-pollution bio-based solutions;
- **reduce the environmental impact of food systems**, e.g. by increasing knowledge of the environmental and climate impacts stemming from the food systems and reducing pollution from plastic food packaging.

The following call(s) in this work programme contribute to this destination:

Call	Budgets (EUR million)		Deadline(s)
	2023	2024	
HORIZON-CL6-2023-ZEROPOLLUTION-01	64.50		28 Mar 2023
HORIZON-CL6-2023-ZEROPOLLUTION-02	15.00		28 Mar 2023 (First Stage) 26 Sep 2023 (Second Stage)
HORIZON-CL6-2024-ZEROPOLLUTION-01		38.00	22 Feb 2024
HORIZON-CL6-2024-ZEROPOLLUTION-02		23.00	21 Feb 2024 (First Stage) 17 Sep 2024 (Second Stage)

Overall indicative budget	79.50	61.00	

Call - Clean environment and zero pollution

HORIZON-CL6-2023-ZEROPOLLUTION-01

Conditions for the Call

Indicative budget(s)[306]

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million)[307]	Indicative number of projects expected to be funded
		2023		
Opening: 22 Dec 2022 Deadline(s): 28 Mar 2023				
HORIZON-CL6-2023-ZEROPOLLUTION-01-1	RIA	6.00	Around 6.00	1
HORIZON-CL6-2023-ZEROPOLLUTION-01-2	RIA	12.50	Around 6.25	2
HORIZON-CL6-2023-ZEROPOLLUTION-01-3	RIA	12.00	Around 6.00	2
HORIZON-CL6-2023-ZEROPOLLUTION-01-4	RIA	8.00	Around 4.00	2
HORIZON-CL6-2023-ZEROPOLLUTION-01-5	IA	10.00	Around 5.00	2
HORIZON-CL6-2023-ZEROPOLLUTION-01-6	RIA	8.00	Around 4.00	2
HORIZON-CL6-2023-ZEROPOLLUTION-01-7	RIA	8.00	Around 4.00	2

306 The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2023 and 2024.

307 Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Overall indicative budget		64.50		

General conditions relating to this call	
Admissibility conditions	The conditions are described in General Annex A.
Eligibility conditions	The conditions are described in General Annex B.
Financial and operational capacity and exclusion	The criteria are described in General Annex C.
Award criteria	The criteria are described in General Annex D.
Documents	The documents are described in General Annex E.
Procedure	The procedure is described in General Annex F.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G.

Halting pollution of air, soil and water

Proposals are invited against the following topic(s):

HORIZON-CL6-2023-ZEROPOLLUTION-01-1: Knowledge and innovative solutions in agriculture for water availability and quality

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 6.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of

	Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
Technology Readiness Level	Activities are expected to achieve TRL 3-5 by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal's farm to fork strategy and the zero pollution ambition, the Water Framework Directive, and the data provided by the European Environmental Agency (EEA), successful proposals will contribute to enhancing sustainable water management, based on increased resilience of agriculture to drought and floods, while maintaining the good functioning of the water ecosystem to ensure good status of water bodies.

Projects results are expected to contribute to all of the following expected outcomes:

- The quality and safety of irrigation water, as well as the prevention of contamination of natural habitats, including minimizing groundwater pollution and securing groundwater resources, and minimizing eutrophication of surface waters, are ensured.
- Enhanced understanding of current water, fertilizer and pesticide requirements in the agricultural sector for different systems and regions, in order to prevent surface water and groundwater contamination with pesticides, nutrients from fertilizers and other contaminants.
- Protection of surface water and groundwater quality against harmful impacts of climate change.
- Advanced understanding and prediction of the impacts to water availability and quality of climate change affecting agricultural water consumption patterns, to protect surface water and groundwater quality against harmful impacts of climate change.
- Solutions, pathways and strategies for risk assessment, mitigation and adaptation to agricultural (irrigation) practices in the event of extreme weather pressures (flooding, drought), which consider technical (such as land features/soil types) and socio-economic parameters.

Scope: Water availability (including permitting, measuring volumes and pricing) and quality is one of the most pressing issues, affecting human health, limiting food production, limiting ecological services, and hindering economic growth.

Extreme climatic events (notably droughts) are leading to increased water stress, affecting the water needs for agriculture and other uses. At the same time, water availability is itself impacted by climate change and this resource is becoming scarce in many places in the EU. The repartition of water to the users is becoming challenging. Agriculture is currently

accounting to around one fourth of the total water extraction in the EU,[308] which is leading to tensions and in some cases to conflicts, in particular where illegal abstraction takes place. It is therefore crucial to prepare agriculture to adapt to a new context where water in agriculture is more sustainably and efficiently used, without compromising the water availability for other users or undermining the good status of waterbodies.

Proposals should address the following:

- Produce tools and techniques to support farmers, special planners, policy makers and water managers with scientific and practical knowledge, including advice on appropriated price incentives and water management assistance, optimising agricultural water use, not only water for irrigation but also water used by local people and in other economic sectors, for the benefit of a healthy environment.

- Develop or improve with new scientific knowledge and practice the methodology for monitoring and prediction of water quality and quantity requirements for agricultural use, based on information provided by Earth Observation systems and in situ measurements, using digital technologies such as smart (bio)sensors[309] and artificial intelligence (AI), as well as DNA-based indicators, that integrate monitoring and modelling tools to support decisions in relation to water management.

- Assess and propose relevant adaptation of water infrastructures for irrigation, agricultural practices and land use. Consider nature-based solutions and latest technologies to address emerging needs and challenges like floods, droughts and/or salinization. Proposed measures should increase the resilience of agriculture by lowering the need for irrigation, reducing at the same time the environmental impact associated with irrigation in agriculture (e.g. salinisation and concentration of nutrients and pollutants) and therefore enhancing ecosystem protection and biodiversity preservation.

- Develop scientific and practice advice to reduce water losses in agricultural activities while considering farmer's water security and quality challenges.

- Technologies to support a significant reduction of the presence of pesticide residues and nutrients in water bodies to levels that are no longer harmful.

Proposals should earmark the necessary resources for cooperation and networking activities. Activities should build upon and link with the work done under relevant Horizon 2020 and Horizon Europe projects including as part of the Horizon 2020 art. 185 PRIMA partnership. Collaboration with the European partnership Water4all – Water security for the Planet should be explored, as needed.

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308 European Environment Agency, "Water and agriculture: towards sustainable solutions", EEA Report No 17/2020.

309 See for example the parallel topic HORIZON-CL6-2023-ZEROPOLLUTION-01-6: Biosensors and user-friendly diagnostic tools for environmental services.

Addressing pollution in seas and ocean

Proposals are invited against the following topic(s):

HORIZON-CL6-2023-ZEROPOLLUTION-01-2: Integrated assessment and monitoring of emerging pollutants in the marine environment

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 6.25 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 12.50 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used). The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Technology Readiness Level	Activities are expected to achieve TRL 3-5 by the end of the project – see General Annex B.

Expected Outcome: In line with the European Green Deal's zero pollution ambition, successful proposals will contribute to the protection of marine ecosystems and marine biodiversity from impacts of pollution, in particular from contaminants of emerging concern. They should analyse the impacts and risks of the contaminants of emerging concern on marine ecosystems and marine biodiversity and provide basis for an integrated assessment and monitoring of the pathways of these contaminants in the marine environment. This will contribute in particular to the implementation of EU zero pollution action plan for air, water and soil and of the EU biodiversity strategy for 2030.

Projects results are expected to contribute to all the following outcomes:

- Filled gaps in knowledge about the impacts and risks of contaminants of emerging concern (e.g. pharmaceuticals, endocrine disruptors, biocides, micro and nano plastics) on marine ecosystems, including in marine sediments and on deep-sea ecosystems and on marine biota and on marine biodiversity, and including in relation to climate change mitigation and adaptation;

- Provided advanced understanding of possible interactions between the changing marine environment (e.g. increased temperatures, changes in salinity and pH, etc.) due to changes in the climate system and contaminants of emerging concern in the marine environment, including marine sediments and impacts on marine ecosystems and marine biota and biodiversity;

- Designed and tested solutions for integrated assessment, monitoring, modelling and forecasting of the circulation and impacts of contaminants of emerging concern in marine environment (including marine sediments and taking into account the climate change dimension –both mitigation and adaptation-), ecosystems and on marine biota, including establishing testing methods, effect-based monitoring protocols and ensuring sustained collection and sharing of data under FAIR principles;

- Build on, and widen, the data availability in European Research Infrastructures federated under the European Open Science Cloud[310];

Developed tools and guidance to support the implementation of relevant EU policies (e.g., Water Framework Directive, EU Marine Strategy Framework Directive, and EU zero pollution action plan for air, water and soil, the EU biodiversity strategy for 2030).

Scope: Contaminants of emerging concern including pharmaceutical products, endocrine disruptors and contaminants found in personal care products, including micro plastics and nano plastics, are increasingly detected in surface and marine waters, as well as in marine sediments. There are concerns about the impact of these contaminants on the marine environment, ecosystems and biodiversity as some of these substances exhibit impacts on aquatic organisms at very low concentrations, in particular on their reproduction and development. There are also concerns about the accumulation of these contaminants in different parts of the marine environment, including sediments and deep sea marine ecosystems and biota.

Also, changes in the marine environment driven by the changing climate system (such as increases in water temperature, changes in salinity and in pH levels, increase in invasive species, etc.) may further influence the possible impacts of the contaminants of emerging concerns on the marine environment, ecosystems and biota.

The projects are expected to develop and test integrated assessment and effect-based monitoring of impacts of contaminants of emerging concern on marine environment, ecosystems and biodiversity, including testing methods that are aligned with the relevant OECD guidance[311], and where relevant develop new contaminant thresholds. The projects are expected to adopt an integrated and systemic approach to the assessment of impacts, including not only impacts on marine biota but also the circulation, accumulation, magnification, persistence and degradation of the contaminants of emerging concern in marine environment

310 https://research-and-innovation.ec.europa.eu/strategy/strategy-2020-2024/our-digital-future/open-science/european-open-science-cloud-eosc_en.

311 For instance as regards endocrine disruptors, see Revised Guidance Document 150 on Standardised Test Guidelines for Evaluating Chemicals for Endocrine Disruption | en | OECD.

and ecosystems (including marine sediments and deep-sea ecosystems) and their interaction with the changing marine environment. Projects should contribute to the improvement of understanding of the spatial and temporal distribution patterns of contaminants of emerging concern in marine environment and should close knowledge gaps as regards the characteristics, occurrence and impacts of those contaminants on marine environment and marine biodiversity. The projects should furthermore contribute to the understanding of impacts of contaminants of emerging concern on marine biota and on marine biodiversity and provide basis for the design of effective future measures for the protection of marine biodiversity from the impacts of such contaminants.

The projects should recommend best practices in monitoring of the circulation of these contaminants in the marine environment and for the measurement of their impacts and risks, for their possible future integration into EU pollution monitoring and assessment systems, in particular under the Water Framework Directive, the Marine Strategy Framework Directive, the EU zero pollution action plan and for the implementation of the EU biodiversity strategy for 2030.

The projects funded under this topic will:

- build links with the European Mission 'Restore our ocean and waters by 2030', in particular: HORIZON-MISS-OCEAN-2021-03-01: Mediterranean sea basin lighthouse: actions to prevent, minimise and remediate litter and plastic pollution, HORIZON-MISS-OCEAN-2021-03-02: Mediterranean sea basin lighthouse: coordination activities and HORIZON-MISS-OCEAN-2022-01-03: Mediterranean sea basin lighthouse: actions to prevent, minimise and remediate chemical pollution;

- build links Mission implementation monitoring system that will be part of the Mission Implementation Support Platform for reporting, monitoring and coordination of all relevant implementation activities;

- build links and support the Mission ocean and water knowledge and information system (Digital Twin Ocean), in particular by contributing to pollution monitoring, forecasting, modelling and knowledge creation and data and sharing;

- Collaboration of the projects with research infrastructures (ERICs) such as ARGO and EMSO and with accredited laboratories is encouraged.

HORIZON-CL6-2023-ZEROPOLLUTION-01-3: Tackling human and climate change induced pollution in the Arctic - building resilient socio-ecological systems

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Indicative budget	The total indicative budget for the topic is EUR 12.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Technology Readiness Level	Activities are expected to achieve TRL 3-5 by the end of the project – see General Annex B.
Procedure	The procedure is described in General Annex F. The following exceptions apply: To ensure a balanced portfolio, grants will be awarded to applications not only in order of ranking but at least also to one project within the area A that is the highest ranked, and one project highest ranked within the area B, provided that the applications attain all thresholds. Proposals shall clearly indicate the area they are applying to.

Expected Outcome: In line with the European Green Deal's zero pollution ambition, successful proposals should contribute to protecting Arctic ecosystems. They should analyse main pollution sources in a climate change context, and examine ways to prevent or eliminate pollutants, consequently protecting environmental and human health and the quality of aquatic ecosystems. This will contribute to the implementation of the new EU policy for a peaceful, sustainable and prosperous Arctic, to the follow-up of the 3rd Arctic Science ministerial meeting and to the work of the Arctic Council.

Projects results are expected to contribute to all of the following outcomes:

- Advanced scientific understanding of the impacts of pollution in the Arctic, including marine litter, emerging pollutants and plastic pollution, as well as diverse chemical discharges, and its interactions with the changing climate and thawing permafrost;
- Advanced understanding of the main ecological, socio-economic and health associated risks and challenges, following a One Health approach[312];
- Resilience and adaptation strategies identified for both ecosystems and human communities, in relation to the changes in Arctic. Design solutions and pathways for ecological and societal mitigation and adaptation;
- Contribute to making the case for the designation and, if applicable, contribute to the establishment management plans of MPAs in international Arctic waters.

312 The term "One Health" describes a multidisciplinary approach to health risks in humans, animals, plants, and the environment.

- Assessment and monitoring tools developed for pollution impacts, using participatory approaches, citizen science and involving local and indigenous communities;

- Contribute to the implementation of the EU policy for the Arctic and the follow-up of the 3rd Arctic Science Ministerial meeting.

Scope: Main environmental concerns in the Arctic stem from the loss of pristine environment and unique ecosystems. On one hand, ice melting allows for more people and economic activities to enter the area, and on the other hand, transboundary pollution brings into the Arctic contaminants whose sources are thousands of kilometres away.

Arctic economic development is associated with a high risk of air and marine pollution, particularly from oil spills, local mining, Persistent Organic Pollutants (POP), heavy metals, radioactive substances, marine litter and plastics. Pollution from Arctic shipping and tourism relying on heavy diesel fuels induce greater ice melting pack and have negative effects on marine life. Pollutants from local and distant sources are taken up by organisms and incorporated into polar food webs, jeopardizing human and environmental health.

Another threat to the Arctic environment is the growing prevalence of marine litter, and specifically plastic pollution. High concentrations of microplastic particles have been detected in Arctic ice, with a good deal of it suspected to have originated outside of the region.

Moreover, the share of MPA coverage in Arctic water (see for example the OSPAR Convention area) is particularly low.

Thawing permafrost brings in additional risks for pollution, from releasing pathogens to infrastructure degradation and failure. Combined, these drivers create a mosaic of multiple and mutually reinforcing anthropogenic stressors acting on the unique and highly vulnerable Arctic ecosystem.

Proposals should aim at developing innovative approaches to address only one of the following options:

- Area A: Local and transboundary Pollutants in the Arctic – risks and challenges in a One Health approach

Actions are expected to identify, assess, and analyse major impacts and risks of remote and local sources of pollution on the health, well-being and food security of Arctic societies and ecosystems and beyond, and propose adaptation and resilience strategies.

Actions should improve the understanding of the interactions between the changing climate system, changes in biological diversity and pollutant levels, including climate-driven ecosystem changes that are affecting natural emissions, such as wetlands (CH4), wildfires (CO2, black carbon), pollutant deposition or transfer and bioaccumulation in marine systems. They should analyse the cultural, socio-economic and health impacts on residents of the Arctic, their livelihood and food security, as well as adverse effects on the marine and terrestrial biodiversity of the region. They are expected to contribute to a better understanding

of long-distance transport of marine plastic litter in the Arctic and air transport of micro plastics, as well to the dynamics between melting ice and increasing discharges of, for example, mercury in the marine ecosystem, and their impact on ecosystems and food safety.

- Area B: Pollution and health risks linked to permafrost thaw

Rising temperatures induce thawing of permafrost, bringing an extra layer of complexity for assessing pollution and health risks in the Arctic environments. Greenhouse gases released from thawing permafrost threaten to cause irreversible changes in the Arctic and other regions. Thawing permafrost causes change in mechanical properties of soils, which in turn deteriorates stability and service-life of built infrastructure and increases coastal erosion.

Actions should address and analyse the adverse effects and pollution risks linked to permafrost thaw, infrastructure degradation and failure, and other associated risks for the environment and human health and well-being. Actions will focus on an improved quantification of these effects, as well as emerging contaminants and re-emission of legacy contaminants due to melting cryosphere or thawing permafrost.

Actions are expected to improve the understanding of the impacts of permafrost thaw on the health of humans, plants, animals, and wider environment, in a One Health approach, including critical infrastructure, water and food security aspects, and wider socio-economic, demographic and cultural impact.

Proposals should assess the impact, trends and new scenarios on ecosystem services, including exploring ecosystems management techniques with special attention to community or nature-based solutions. Potential measures should focus on developing community-oriented decision support systems, and co-design mitigation and adaptation measures.

For both options, proposals should focus on an improved quantification of these effects and explore pathways to minimise risks and should be linked with state-of-the-art climate change predictions coupled with socio-economic models; assess the ecosystems' responses to risk factors and how these responses are affecting the well-being of indigenous populations and local communities but also health of the environment, in a One Health approach; identify adaptation and mitigation strategies, aiming at building resilient Arctic socio-ecological systems.

Proposals are expected to adopt a system thinking or transdisciplinary approach, with simultaneous analysis of environmental, societal, climatic and biodiversity impacts, their relationships and interlinkages, and positive and negative feedbacks. The participation of technical sciences, social sciences and humanities disciplines is important for addressing the complex challenges of this topic, as well as engaging local communities in the research process, as appropriate.

International cooperation is encouraged, with a strong linkage with the ongoing activities under the All-Atlantic Ocean Research and Innovation Alliance and encouraging participation from countries that take part in the Arctic Science Ministerial meetings.

Actions under this topic should plan on a close collaboration among each other and with the EU Polar Cluster. Actions should build upon and link with past Horizon 2020 projects (e.g., Nunataryuk and Arctic PASSION), EU Polarnet 2, Copernicus, Sustaining Arctic Observing Networks (SAON).

Synergies and complementarities with HORIZON-CL5-2024-D1-01-02: Inland ice, including snow cover, glaciers, ice sheets and permafrost, and their interaction with climate change; HORIZON-CL6-2023-COMMUNITIES-11: Participation and empowerment of Arctic coastal, local, and indigenous communities in environmental decision-making; HORIZON-CL6-2023-ZEROPOLLUTION-01-2: Integrated assessment and monitoring of emerging pollutants, and activities under the Arctic-Atlantic Lighthouse of the EU Mission Restore our ocean and waters.

Increasing environmental performances and sustainability of bio-based processes and products

Proposals are invited against the following topic(s):

HORIZON-CL6-2023-ZEROPOLLUTION-01-4: Environmental sustainability and circularity criteria for industrial bio-based systems

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 8.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 5 by the end of the project – see General Annex B.

Expected Outcome: Successful proposals will support bio-based industries, traders and researchers and innovators, to assess and trace the environmental impacts and circularity of industrial bio-based systems in order to enable responsible production and to steer innovation in the industrial bio-based systems in the EU. Project outcomes will contribute to enhancing circular bio-based systems to operate according to planetary boundaries, replacing fossil-based systems and their carbon footprint, mitigating climate change, restoring biodiversity and protecting air, water and soil quality along supply chain of biological feedstock and industrial value chains, in line with the 2030 climate target plan, the EU zero pollution action plan and the communication on sustainable carbon cycles.

Projects results are expected to contribute to the following expected outcome:

- Standardisation of methods assessing the environmental impacts on soil, water and air quality, biodiversity and climate, and the circularity along the value chains of bio-based products for international trade at EU and global scale.

- Methods to assess the environmental sustainability and the circularity of low TRL bio-based technologies.

- Orientations for research and innovation programmes in the bio-based sectors.

Scope: The environmental sustainability and circularity assessment of industrial bio-based systems is instrumental to guarantee and monitor that they are developed in a way they can contribute to the just green transition of the EU economy away from a linear fossil-based system. On one hand, the method for such assessment, applied to high TRL bio-based solutions, would represent an instrument for policy makers and for investors, to support the deployment of and to leverage investments in the best performing bio-based sectors. On the other hand, the assessment of the environmental sustainability and circularity of low TRL, cutting-edge bio-based technologies is important to understand the potential of emerging technologies to contribute to the just green transition, also compared to the more mature technologies. Such knowledge would have an impact on the programming of R&I support initiatives, to save resources and move faster towards the scaling-up of the most promising bio-based technologies, including focussing on the potential environmental hotspots of the emerging technologies.

The assessment of the environmental sustainability and circularity should benefit to the greatest extent possible from existing methodologies and indicators, which can be adapted if needed. Methods and indicators should use the available environmental observations efficiently.

To deliver on the expected outcome, proposals should:

- Identify the range of high TRL industrial bio-based systems in the Union to be analysed in the project. Industrial bio-based systems within the scope of this topic do not include food, feed, biofuels, bioenergy and cultural and recreation sectors;

- Improve existing and/or develop new methods to assess environmental impacts of the selected industrial bio-based systems on climate, biodiversity, land use and water resources as priorities, but also on soil, water and air quality. Assessments should consider the life cycle perspective. The impact on climate should include the both the greenhouse gas emissions and the carbon removal potential of bio-based systems. The analysis should include trade-offs, for example between direct and indirect land use and land use change impacts and the carbon storage and substitution effect of bio-based products and provide an overall assessment of the environmental sustainability of the systems within the scope;

- Improve existing and/or develop new metrics of circularity of industrial bio-based systems based on the application of the cascading approach of biomass use, the resources

efficiency, and effectiveness on a life-cycle perspective (i.e. durability, reuse, repair, remanufacturing and recycling patterns of bio-based products), other circular aspects;

- Analyse trade-offs and synergies with economic and social objectives (including geographical distribution aspects, urbanization pressures, etc.) and with competing and adjacent economy sectors in the bioeconomy (e.g. food and feed, biofuels and bioenergy) as well as with the fossil-based industrial systems;

- Collect and analyse the (range of) best available industrial bio-based systems within the Union in terms of environmental and circular performances, to build a set of benchmarks or references with best performances for similar industrial systems;

- Include the environmental sustainability and circularity of bio-based products, as assessed through the methods developed under the project, in existing certification scheme at EU and global scale, to enable international trade of certified sustainable bio-based products;

- Consult stakeholders on the applicability of proposed certification schemes, also to improve the societal readiness adaptation in terms of acceptability and uptake of innovations by society;

- Develop and disseminate guidelines for targeted stakeholders on the assessment methods and the enhanced certification schemes developed in the project;

- Perform a preliminary analysis and improvement of the methods for the assessment of environmental sustainability and circularity performances of bio-based supply and value chains adapted to very low TRL bio-based technologies through: i) a review of the "prospective" LCA approaches and applications to bio-based and fossil-based technologies, with a focus on the environmental sustainability and circularity assessment approaches and tools. This task would lead to improve understanding and classifying the main challenges of prospective LCAs, e.g., comparability of results, input data availability, uncertainties/robustness, etc.; ii) the adaptation of the "prospective" LCA approaches to very low TRL bio-based technologies, including via modelling approach; iii) modelling the tests to validate the developed methods on a range of low TRL technologies and processes, including in relevant environments for future R&I projects; iv) including the analysis of potential synergies and trade-offs with economic and social objectives;

- Develop and disseminate guidelines to targeted stakeholders on the assessment of environmental sustainability and circularity performances of bio-based supply and value chains adapted to very low TRL bio-based technologies.

Consortia of applicants should involve LCA experts and researchers in the bio-based technologies, bio-based industries, trade bodies, consumers' organisations and any relevant stakeholder along the value chain of industrial bio-based systems.

Where relevant, proposals should seek links with and capitalise on the results of past[313] and ongoing EU funded projects, including under the Circular Bio-based Europe JU[314] and other partnerships of Horizon Europe.

This topic requires the effective contribution of SSH disciplines and the involvement of SSH experts, institutions as well as the inclusion of relevant SSH expertise, in order to produce meaningful and significant effects enhancing the societal impact of the related research activities.

HORIZON-CL6-2023-ZEROPOLLUTION-01-5: Industrial biotechnology approaches for improved sustainability and output of industrial bio-based processes

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 6-8 by the end of the project – see General Annex B.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [315].

Expected Outcome: A successful proposal will contribute to all Destination ‘’Zero pollution’ and in particular impacts related to enhancing circular bio-based systems to operate according to planetary boundaries, replacing fossil-based systems and their carbon footprint, mitigating climate change, restoring biodiversity and protecting air, water and soil quality along supply

313 See for example HORIZON-CL6-2021-ZEROPOLLUTION-01-07: International and EU sustainability certification schemes for bio-based systems.

314 See for example CBE JU2022.S1. Developing and validating monitoring systems of environmental sustainability and circularity: collection of best practices and benchmarks

315 This decision is available on the Funding and Tenders Portal, in the reference documents section for Horizon Europe, under ‘Simplified costs decisions’ or through this link: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/ls-decision_he_en.pdf

chain of biological feedstock and industrial value chains within the EU and Associated Countries and across borders. Furthermore, it will contribute by substituting harmful chemicals by safer, less toxic and generally more sustainable alternatives notably by boosting innovative biotechnology and other related technologies to create zero-pollution bio-based solutions.

Industrial biotechnology has a high potential to contribute to increased sustainability and in particular 'zero pollution' ambition of the European Green Deal, in respect to the (circular) industrial bio-based processes.

Project results are expected to contribute to all of the following outcomes:

- Improved environmental sustainability, especially in terms of reduced toxicity, and overall safety to live organisms and ecosystems, of industrial bio-based processes, and of chemical and materials outputs, aligned with the EU climate-goals and zero-pollution ambition of the European Green Deal, in particular by lowering the input requirements in terms of e.g., land use, (virgin) feedstocks, water and energy, and by general advancement of non-toxic / zero-pollution production processes with positive impacts on water, air and soil quality.

- Improved industrial competitiveness by developing scalable, flexible and robust multi-product manufacturing, responding to current trends in the industrial biotechnology (e.g., on-demand production, small-volume outputs, lower capital expenditure, digital / artificial intelligence (AI) solutions, lower/minimal dependence on scarce natural resources, especially in terms of biological feedstocks), ensuring links to EU / Associated Countries industrial ecosystems (SMEs, EU Partnerships such as Circular Bio-based Europe JU).

- Enhanced social engagement and understanding of advanced bio-based innovation and in particular biotechnology among broad sectors of society, with active social innovation supported via dialogue with e.g., NGOs, end-user and consumer groups, schools or science centres etc.

Enhanced market up-take linked to improved governance [316] enabled by dialogue with regulatory actors and supporting networks, and by improved public awareness.

Scope:

- The scope covers a wide array of biotechnology techniques, including targeted and specific approaches for DNA modification, including synthetic engineering at gene or genome level, in line with the binding regulatory requirements, including related necessary technical aspects in other fields, such as synthetic biology, cell sorting, automation, robotics, IT data/digital/AI innovations, or the 'biofoundry' concept[317, 318].

316 See parallel topic HORIZON-CL6-2023-GOVERNANCE-01-6: Co-creation and trust-building measures for biotechnology and bio-based innovation systems.

317 http://www.weforum.org/agenda/2019/10/biofoundries-the-new-factories-for-genetic-products/.

318 http://www.oecd-ilibrary.org/sites/bd16d851-en/index.html?itemId=/content/component/bd16d851-en

Approaches based on improved enzymatic solutions should carefully consider a parallel topic[319], to avoid overlaps, and create synergies.

- Environmental improvements, especially reduced pollution/toxicity and lowered impacts should be verified and demonstrated by established methodology of life cycle assessment, and the monitoring approaches throughout the project need to be clearly established.

- Production of biofuels and bioenergy is excluded from scope, to avoid overlaps with Horizon Europe Cluster 5. Health applications need to be carefully considered to avoid possible overlaps with activities supported under Horizon Europe Cluster 1.

- Clear communication and dissemination activities are an essential element, including awareness raising, engagement of societal actors (NGOs, consumer organisations, professional organisations). Proposals should include a dedicated task, appropriate resources and a plan on how they will collaborate with other projects funded under this topic and other relevant topics.

- International cooperation options may be considered, for win-win cooperation, and pursued if contributing to the European industrial competitiveness.

- In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

HORIZON-CL6-2023-ZEROPOLLUTION-01-6: Biosensors and user-friendly diagnostic tools for environmental services

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 8.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 3-5 by the end of the project – see General Annex B.

Expected Outcome: A successful proposal will contribute to all Destination 'Zero pollution' and in particular impacts related to enhancing circular bio-based systems to operate according to planetary boundaries, replacing fossil-based systems and their carbon footprint, mitigating

[319] HORIZON-CL6-2023-CIRCBIO-01-5: Broadening the spectrum of robust enzymes and microbial hosts in industrial biotechnology.

climate change, restoring biodiversity and protecting air, water and soil quality along supply chain of biological feedstock and industrial value chains within the EU and Associated Countries and across borders. Furthermore, it will contribute to substitute harmful chemicals by safer and more sustainable alternatives notably by boosting innovative biotechnology and other sustainable technologies to create zero-pollution bio-based solutions.

Project results are expected to contribute to all of the following outcomes:

- Improving the quality of environment (water, soil and air) by stepping up the reliable monitoring and detection, of any biotic or abiotic pollutants, by developing practical, specific, adaptable and economic tools, based on bio-based principles, for the use of consumers, inspection services and industry operators alike. This can cover the use at industrial locations, but also at ecological disaster- or accidents' sites, or at home applications;

- Contributing to the zero-pollution objective of the European Green Deal and to the European Missions such as one on 'Restoring our ocean and waters by 2030' or 'A Soil Deal for Europe' by up-scaling the application of modern biosensors underpinned by the biotechnology, across a variety of ecosystems, including marine and freshwater or soil ecosystems and real-life conditions impacted by the pollution issues;

- Increasing engagement and competitiveness of the European environmental services sector, such as the SMEs and industry operators, including the digital sector actors, supporting the convergence between bio-based and digital sectors (including the role of artificial intelligence (AI) solutions). Increasing the awareness and understanding of the underpinning technologies by the civil society, including NGOs and consumer organisations, as well as participatory approaches such as citizen engagement, including citizen science, in environmental observation and monitoring.

Scope: The scope covers the development of high-resolution biosensors for environmental monitoring and detection. The focus is on:

- (1) large scale synthesis of biosensor variants, across kingdoms (from bacteria/archaea to plants);

- (2) improved biosensor/genetic circuit designs for a multitude of sensor inputs, integrating modified microorganism (elements) with transduction/detection systems enabling to relay the information to the user, while guaranteeing environmental safety, especially related to any risk of potential release of such microorganisms into open environment, if relevant;

- (3) develop protein-based (RNA) biosensors to detect and measure metabolites and organisms of interest;

- (4) create organisms that can act as multiplexing sensors capable of canalizing multiple environmental cues and providing measurable responses or combination of responses that may be deconvoluted to determine stimuli, while guaranteeing environmental safety,

especially related to any risk of potential release of such organisms into open environment;

- (5) build more extensive and fully-sequenced metagenomics databases/libraries to enable searches for diverse functionalities across multiple gene clusters; and
- (6) better enable real-time data feeds.

The end-users targeted include consumers but also inspection services and the industry operators, as well as environmental emergency responders. Communication and inclusive participation form an essential part of the proposals. All environmental conditions and ecosystems (water, soil, air etc), may be covered.

Concrete efforts shall be made to ensure that the data produced in the context of this project is FAIR (Findable, Accessible, Interoperable and Re-usable), particularly in the context of real-time data feeds, exploring workflows that can provide "FAIR-by-design" data, i.e., data that is FAIR from its generation. Projects shall further build on, and widen, the data availability in European Research Infrastructures federated under the European Open Science Cloud.

To respect the 'Do-No-Significant-Harm' (DNSH) principle, proposals using any alive organisms need to properly assess and exclude any potential risk of their release to open environment.

The projects funded under this topic may:

- build links with the European Mission 'Restore our ocean and waters by 2030' or Soil Mission, in particular as regards stepping up the monitoring of ecosystems and their biodiversity;
- build links with Missions implementation monitoring system;
- build links and support the Missions knowledge and information system, in particular by contributing to pollution monitoring, modelling and knowledge creation and data.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

Proposals should include a dedicated task, appropriate resources and a plan on how they will collaborate with other projects funded under this topic and other relevant topics.

Reducing the environmental impact and pollution in food systems

Proposals are invited against the following topic(s):

HORIZON-CL6-2023-ZEROPOLLUTION-01-7: Strategies to prevent and reduce plastic packaging pollution from the food system

Specific conditions

Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 8.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: the proposals must apply the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: To support the implementation of the European Green Deal, the new circular economy action plan, the EU 2030 climate target plan, the farm to fork strategy, the food 2030 initiative and the Mission 'Restore our ocean and waters by 2030', successful proposals are expected to contribute to all of the following expected outcomes:

- Increased knowledge on the impacts of littered plastic food packaging on the terrestrial, freshwater and marine environments and ecosystems, including the climate change mitigation and adaptation dimensions;
- Uptake of innovative business strategies, design and production models to prevent and reduce the use of plastic food packaging;
- Adoption of increasingly sustainable, effective and efficient fit-for-purpose packaging solutions by food operators, and reduction of the dependency on fossil-based materials, thus contributing to EU climate action;
- Increased reuse and recycling of sustainable packaging;
- Increased consumer acceptance of sustainable, efficient and fit-for-purpose food packaging solutions including where appropriate the non-use of any type of packaging;
- Support to the implementation of the relevant targets as outlined in the revised packaging and packaging waste directive and the directive on single-use plastics and support to operators, especially SMEs, in meeting the requirements of the relevant EU legislation.

Scope: The use of single-use plastics in food packaging has grown significantly in the last decades, leading to increased pollution in the environment and greenhouse gas emissions. While plastic packaging is an enabler for the safety and shelf life of food products, contributing to the reduction of food waste, there is a need for improved solutions that promote the prevention and reduction of excessive packaging in the food industry. Often, the excessive food packaging results in its inappropriate disposal or littering by consumers. This

can be reduced through the application of circular models for design and production and the proper disposal and recycling of packaging waste.

Proposals are expected to:

- Provide a comprehensive and evidenced based analysis of the negative impacts and externalities of littered plastic food packaging in the different terrestrial, freshwater and marine environments and ecosystems across Europe. This analysis should provide reliable quantitative new data and fill in existing data gaps on these negative impacts and externalities through multiple sources, including citizen science tools.

- Provide an analysis of the main challenges and existing good practices of prevention and reduction of single use plastics, aiming at shifting the current packaging design and production practices. This analysis should address the availability of sustainable and innovative alternatives as well as the readiness of food packaging producers and food business operators to adopt such solutions.

- Develop innovative business strategies, design and production models that improve the prevention, reduction and reuse of plastic food packaging, whilst ensuring that they can be easily implemented in European countries. These business strategies and models should involve all relevant actors, including food SMEs and, when appropriate, policy makers. They should consider health and environmental impacts [320] of packaging, guaranteeing they do not cause any contamination of food and the environment by hazardous chemicals. Moreover, they should maintain the microbiological and chemical safety and quality of food, taking into account relevant parameters such as their contact with aqueous and fatty foods, aging, and effect on shelf life.

- Develop innovative strategies, design and production models to facilitate packaging recycling, linking developers of sustainable packaging with converters and recyclers, taking into account the recycling capacity technologies and the relevant technical specifications of the use of recycled content. These strategies should namely target collection systems, the use of mono-materials, the reduction of labelling materials and the promotion of easy to sort and clean materials.

- Develop strategies aimed at improving consumer acceptance of sustainable, efficient and fit-for-purpose packaging solutions, facilitating the use of reusable and recyclable packaging for consumers, easing the sorting and appropriate disposal of packaging, and helping them to correctly interpret labelling of packaging. These strategies should be designed based on a joint effort of developers of sustainable packaging and consumers and should aim at avoiding confusion, minimising misuse, increasing user convenience and encouraging a greater uptake of such packaging solutions.

[320] Examples of these impacts include endocrine disrupters or perfluoroalkyl substances in coatings, lack of inertness or organoleptic risks from uncoated paper, and characterising risks such as from epoxy silanes in adhesives, and from mineral oil hydrocarbons and printing ink residues in paper, aging effects of reusable materials, and the suitability for recycling (mono-material, labelling, minimum recycled content).

- Implement multi-actor approach by involving a wide range of food packaging actors and consumers and conducting inter-disciplinary research.

- Support social innovation for inclusive and long-term solutions aiming at the reduction of plastic food packaging.

The proposals may:

- build links with the European Mission 'Restore our ocean and waters by 2030', in particular with the Mission activities under objective 2 – prevent and eliminate pollution in our ocean, seas and water, and with the Mission lighthouse activities in the Mediterranean Sea basin focusing on preventing, minimising, remediating and monitoring pollution;

- build links with the Mission implementation monitoring system;

- build links and support the Mission's knowledge and information system (Digital Twin Ocean), in particular by contributing to pollution monitoring, modelling, and knowledge creation and data.

Proposals must implement the 'multi-actor approach' and ensure adequate involvement of researchers, food business operators, food packaging producers, developers of sustainable packaging, packaging converters and recyclers, consumers, local and regional authorities and other relevant actors.

This topic should involve the effective contribution of social sciences and humanities (SSH) disciplines. In order to achieve the expected outcomes, international cooperation is encouraged.

Call - Clean environment and zero pollution

HORIZON-CL6-2023-ZEROPOLLUTION-02

Conditions for the Call

Indicative budget(s)[321]

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project	Indicative number of projects
		2023		

[321] The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2023 and 2024.

			(EUR million)[322]	expected to be funded
Opening: 22 Dec 2022 Deadline(s): 28 Mar 2023 (First Stage), 26 Sep 2023 (Second Stage)				
HORIZON-CL6-2023-ZEROPOLLUTION-02-1-two-stage	RIA	7.00	Around 7.00	1
HORIZON-CL6-2023-ZEROPOLLUTION-02-2-two-stage	RIA	8.00	Around 4.00	2
Overall indicative budget		15.00		

General conditions relating to this call	
Admissibility conditions	The conditions are described in General Annex A.
Eligibility conditions	The conditions are described in General Annex B.
Financial and operational capacity and exclusion	The criteria are described in General Annex C.
Award criteria	The criteria are described in General Annex D.
Documents	The documents are described in General Annex E.
Procedure	The procedure is described in General Annex F.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G.

Halting pollution of air, soil and water

Proposals are invited against the following topic(s):

[322] Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

HORIZON-CL6-2023-ZEROPOLLUTION-02-1-two-stage: Optimisation of manure use along the management chain to mitigate GHG emissions and minimize nutrients/contaminants dispersion in the environment

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 7.00 million.
Type of Action	Research and Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: Applicants submitting a proposal under the blind evaluation pilot (see General Annex F) must not disclose their organisation names, acronyms, logos, nor names of personnel in Part B of their first stage application (see General Annex E).
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: the proposals must apply the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.
Procedure	The procedure is described in General Annex F. The following exceptions apply: This topic is part of the blind evaluation pilot under which first stage proposals will be evaluated blindly.

Expected Outcome: In line with the farm to fork strategy, the methane strategy, the EU zero pollution action plan and the UN Sustainable Development Goals, the successful proposal will support research and innovation (R&I) to help farm business reduce local and global GHG and ammonia emissions from livestock farming systems. It will contribute to support policy makers with enhanced knowledge to limit emissions and investigate further measures, inter alia under the common agricultural policy, to achieve reduction targets of 2030 and beyond.

The proposed project is expected to contribute to the reduction of the environmental and climate footprint of the livestock farming systems, through a better understanding of i) the potential of scaling up efficient and innovative manure management practices and technologies, and ii) the impact of emission abatement and contaminant reduction measures on health and environment (air, water and soil) safety.

Activities under this topic will contribute to all of the following outcomes:

- Improved cost-effective solutions to reduce greenhouse gas (GHG) emissions and atmospheric, air, water and environment pollutants produced by the livestock manure management chain, both in conventional and organic livestock farming
- Boosted uptake of improved and innovative practices and technologies to optimise manure management (while considering potential trade-offs)
- Improved capacity to better manage manure nutrients, minimizing their losses, increasing circularity and matching demand and supply
- Policy recommendation on improving manure management to mitigate GHG and ammonia emissions and minimize dispersion of undesirable manure components such as biological and chemical contaminants in the environment.

Scope: Agriculture is a sector that significantly contributes to GHG emissions in EU and to air pollution, mainly through ammonia emissions. Reducing the environmental and climate footprint of the livestock farming system is therefore of paramount importance. Several practices and technical measures to limit emissions from manure management are already available. Some other techniques are still considered experimental. Despite major advancements, there is still no widespread application of these practices and further research is needed to assess their socio-economic and environmental impacts. Furthermore, there is the need to do a comprehensive analysis of the effectiveness of mitigation strategies along the entire manure management chain and to take into account different GHGs and the pollution swapping effect, i.e. decreasing the emission of one GHG that can cause the increase of another one or the increase of the emission of the same GHG at one of the other stages of manure management.

Another important aspect of manure management is to reduce environmental pollution caused among others by ammonia emissions, excess of nitrogen and phosphorus, by nitrate leakages, and by different components of manure, including potential contaminants, on air and water quality, on soil health, on animal health, welfare and productivity and on human health.

Therefore, there is the need to develop further strategies and technologies for livestock farming systems to reduce GHG, ammonia and nitrate emissions from manure through an integrated approach for the management of manure, taking into account all steps: feeding, housing, handling, collection, treatment, storage and application. The following elements should be incorporated:

- Identify and establish inventory of up-to-date manure management practices, technologies and data originating from R&I activities (from feeding to low-emission manure storage and processing, composting, exchange of manure/slurries between livestock and crop farms, manure additives to reduce emissions, etc.) in conventional/intensive, semi-intensive, household and organic livestock farming systems;

- Improve or develop lifecycle assessment methods, models and equipment for the measurement and monitoring of GHG (CH4, N2O), atmospheric and air pollutants (NH3, NOx) at each stage of manure management practices, from feeding to field application;

- Improve knowledge on the fate and persistence in the environment (e.g., water, soil, air) of manure chemicals and biological contaminants, including pathogens antibiotic resistance genes, heavy metals and associated health/environmental risks;

- Demonstrate and test the most efficient strategies and technologies to mitigate GHG emissions and air pollutants from manure at regional/local scale. Activities should take into account relevant practices, strategies and data on GHG, atmospheric and air pollutants mitigation from several livestock farming systems, covering conventional/intensive, semi-intensive, grazing/low input or organic, in different climate/biogeographical regions;

- Cost-benefit assessment of practices/technologies used to mitigate GHG emissions, air pollutants and nitrate emissions from manure, including assessment of pollution swapping effects, trade-offs and co-benefits on animal (e.g., health and welfare, production efficiencies) and environment (e.g., ammonia emissions, nitrate leakage, nitrogen balance and P losses to water);

- Formulate technical guidelines and policy recommendation to enhance the implementation and uptake of methods, technologies or practices to limit emissions and contaminants from manure management.

The proposal should take into account other EU-funded projects, including those funded under the ERA-NETs SusAn[323] and ERA-GAS[324]. Proposals should be based on a gap analysis taking into account the existing legislation[325] and related knowledge.

Proposals must implement the 'multi-actor approach' and ensure adequate involvement of the farming sector, agricultural advisory services, manufacturers, ecology and nature conservation experts, and other relevant actors.

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

Due to the scope of this topic, international cooperation is strongly encouraged, in particular with China. This topic is within the scope of the Administrative Arrangement between the European Commission and the Ministry of Science and Technology of the People's Republic of China on a Co-funding Mechanism for the period 2021-2024 to support collaborative

323 https://era-susan.eu/.

324 https://eragas.eu/en/eragas.htm.

325 Such as Directive 2000/60/EC on the water framework directive; Directive 91/676/EEC on protection of waters against pollution caused by nitrates from agricultural sources; Directive 2010/75 on Industrial Emissions; Directive 2016/2284 on the reduction of national emissions of certain atmospheric pollutants.

research projects under the Food, Agriculture and Biotechnologies (FAB) and the Climate Change and Biodiversity (CCB) flagship initiatives.

Actions will contribute to implementing the EU-China Food, Agriculture and Biotechnology (FAB) flagship initiative, which aims to ensure sustainability of agri-food systems, catering for the needs of a growing population, the reduction of food and agricultural losses and waste, and the provision of safe and healthy foodstuffs. Interaction with other actions developed under the EU-China Climate Change and Biodiversity (CCB) Research Flagship and the Flagship on Food, Agriculture and Biotechnologies (FAB) is encouraged if relevant.

Increasing environmental performance and sustainability of processes and products

Proposals are invited against the following topic(s):

HORIZON-CL6-2023-ZEROPOLLUTION-02-2-two-stage: Safe-and-sustainable-by-design bio-based platform chemicals, additives, materials or products as alternatives

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 8.00 million.
Type of Action	Research and Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: Applicants submitting a proposal under the blind evaluation pilot (see General Annex F) must not disclose their organisation names, acronyms, logos, nor names of personnel in Part B of their first stage application (see General Annex E).
Technology Readiness Level	Activities are expected to achieve TRL 4-5 by the end of the project – see General Annex B.
Procedure	The procedure is described in General Annex F. The following exceptions apply: This topic is part of the blind evaluation pilot under which first stage proposals will be evaluated blindly.

Expected Outcome: Successful proposals will address expected impacts under the Destination 'Clean environment and zero pollution' and in line with: the European Green Deal's zero pollution ambition, the bioeconomy strategy, the chemicals strategy for sustainability, and the chemicals transition pathways, via R&I in bio-based safe-and-sustainable-by-design (SSbD)

solutions for a variety of applications. Bio-based solutions' design and assessment is expected to also go beyond compound/material-level considerations, with an additional reflection on end-use and final application(s).

Projects are expected to contribute to:

- Enable circularity(-by-design) of final products, predominantly in applications where recyclability is currently hindered or very challenging, especially due safety implications;
- In addition to fossil-feedstock substitution, reduce the dependency on or replace harmful substances, in particular in materials and formulations, leading eventually to safe(r) (low human and eco-toxicity) final bio-based products, while meeting overall environmental sustainability requirements;
- Build on a portfolio of promising bio-based solutions showing potential for scaled up production and future market uptake of alternative, safe, circular and sustainable bio-based products.

Scope: To deliver on the expected outcome, proposals should:

- Perform a wider scoping exercise, including opportunities and challenges, to propose priority areas [326] and which (optimised or novel) bio-based solutions (chemicals, materials) show 'solid' potential as safer and sustainable alternatives/substitutes. This 'exercise'/analysis should especially cover, but not only, areas where substances of very high concern (SVHC), substances of concern, persistent organic pollutants or legacy additives are currently in (end) use (e.g. textiles, plastics value chains);
- Select chemicals/group of chemicals/(advanced)materials/products and justify. Proceed then with design, (process) development and testing (to targeted TRL) of the chosen bio-based alternatives;
- Embed and assess functionality and value chain considerations for any novel solutions designed and developed, providing equivalent or improved functional performance versus existing and specified benchmarks. Functional performance should be assessed together with showcasing benefits on safety and environmental performance.
- Integrate the safe-and-sustainable-by-design (SSbD) framework, developed by the Commission, for assessing the safety and sustainability of chemicals and materials.[327]

[326] Thematic priority areas can span across one or more of the following critical areas: i) materials functionality (e.g., repelling water, grease and dirt, fire safety, plasticizing) to ii) formulation applications (e.g., preservation, solvents, and surfactants and where relevant also to iii) process applications (e.g., solvents, process regulation agents and surface protection). This list is not exhaustive.

[327] See documents defining the SSbD framework and criteria on: https://ec.europa.eu/info/research-and-innovation/research-area/industrial-research-and-innovation/key-enabling-technologies/advanced-materials-and-chemicals_en.

- Contribute with and develop recommendations that can advance further the application of the SSbD framework.[328] More specifically, provide thresholds that can support the criteria definition and improvements for the assessment SSbD methodologies, including any specificities related with bio-based chemicals and materials. Recommendations should also include identification of data gaps, especially safety, environmental, but also socio-economic factors, as well as priorities for data collection.

- Contribute with relevant data generated, along targeted value chain(s) (e.g. with regards to the bio-based substance/group of chemical substances or material). Projects have to make data, results and methodologies FAIR. They are also encouraged to link with trusted repositories for data, results and methodologies.

Where relevant, proposals should seek links and synergies and capitalise on the results of past and ongoing EU research projects (including the Bio-based Industries Joint Undertaking (BBI JU) /Circular Bio-based Europe Joint Undertaking (CBE JU)). This topic has important synergies and complementarities with Horizon Europe Cluster 4 calls (including its PPPs) as well as ongoing projects that should be taken into account.[329,330],[331].

Proposals should also include a dedicated task, appropriate resources and a plan on how they will collaborate with other projects funded under this topic and other relevant topics.

Call - Clean environment and zero pollution

HORIZON-CL6-2024-ZEROPOLLUTION-01

Conditions for the Call

Indicative budget(s)[332]

328 Idem.

329 SSbD topics in Cluster 4 WP 23-24, broader than bio-based chemicals and materials: HORIZON-CL4-2023-RESILIENCE-01-21: Innovative methods for safety and sustainability assessments of chemicals and materials (RIA), HORIZON-CL4-2023-RESILIENCE-01-22: Integrated approach for impact assessment of safe and sustainable chemicals and materials (RIA), HORIZON-CL4-2023-RESILIENCE-01-23: Computational models for the development of safe and sustainable by design chemicals and materials (RIA), HORIZON-CL4-2024-RESILIENCE-01-24: Development of safe and sustainable by design alternatives (IA) as well as European Partnership on Assessment of Risks from Chemicals (PARC).

330 Cluster 4, WP 21-22: HORIZON-CL4-2021-RESILIENCE-01-08: Establishing EU-led international community on safe-and-sustainable-by-design materials to support embedding sustainability criteria over the lifecycle of products and processes, HORIZON-CL4-2021-RESILIENCE-01-11; Safe- and sustainable-by-design polymeric materials, HORIZON-CL4-2021-RESILIENCE-2021-01-12; Safe- and sustainable-by-design metallic coatings and engineered surfaces and HORIZON-CL4-2022-RESILIENCE-01-23; Safe- and sustainable-by-design organic and hybrid coatings.

331 As appropriate, also consult the future 'EU Strategic Research and Innovation Plan for chemicals and materials'.

332 The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2023 and 2024.

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million)[333]	Indicative number of projects expected to be funded
		2024		
Opening: 17 Oct 2023 Deadline(s): 22 Feb 2024				
HORIZON-CL6-2024-ZEROPOLLUTION-01-1	IA	27.00	Around 9.00	3
HORIZON-CL6-2024-ZEROPOLLUTION-01-2	CSA	4.00	Around 2.00	2
HORIZON-CL6-2024-ZEROPOLLUTION-01-3	RIA	7.00	Around 7.00	1
Overall indicative budget		38.00		

General conditions relating to this call	
Admissibility conditions	The conditions are described in General Annex A.
Eligibility conditions	The conditions are described in General Annex B.
Financial and operational capacity and exclusion	The criteria are described in General Annex C.
Award criteria	The criteria are described in General Annex D.
Documents	The documents are described in General Annex E.
Procedure	The procedure is described in General Annex F.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G.

[333] Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Halting pollution of air, soil and water

Proposals are invited against the following topic(s):

HORIZON-CL6-2024-ZEROPOLLUTION-01-1: Demonstrating how regions can operate within safe ecological and regional nitrogen and phosphorus boundaries

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 9.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 27.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 8 by the end of the project – see General Annex B.

Expected Outcome: Successful proposals will deliver, to all actors involved in nitrogen (N) and phosphorus (P) emitting activities in a given region, a demonstrated set of measures to limit N/P emissions and re-balance N/P flows within safe ecological boundaries at regional and local scale, thereby contributing to restoring ecosystems in line with the European Green Deal and the EU zero pollution action plan.

Projects results are expected to contribute to all of the following expected outcomes:

- Best practice, including technical and governance solutions, to reduce N/P emissions into water, air and soil from all emitting sectors, in line with relevant EU limit values;
- Demonstrated environmental, economic and behavioural effects of aforementioned N/P limiting solutions while promoting local and regional sustainability and circular economy schemes;
- Comprehensive guidance on sustainable and circular practices to control regional N/P flows at regional level in the EU, and recommendations to relevant actors (policymakers, local administrations, practitioners, industries etc.).

Scope: Building on recent innovations in regional N/P budgeting and quantification methodologies to ensure good status for air, water and soil ecosystems, this Innovation Action should demonstrate how to apply optimised N/P budgets, based on maximum allowable inputs of N/P at a regional/river basin scale, and create the necessary systemic and multi-actor transition pathways to ensure a sustainable integrated N/P management in the future. The aim is to show how N/P-relevant sectors (e.g., agriculture, aquaculture, forestry, industrial sectors, food/drink sector, water supply, water/waste management, bioenergy, fossil-based energy production, mining activities, transport, unintentional losses through leaching and run-off of

agricultural nutrients etc.) in a given region can limit N/P emissions to air, water and soil from their activities by respecting pre-established regional N/P budgets and applying N/P balancing practices. N/P-balancing practices comprise activities that enhance the sustainability and circularity of N/P relevant resources and services between urban/industrial and rural/coastal environments and apply respective governance measures. Finally, it will be essential to develop comprehensive guidelines to disseminate best practices and techniques to all involved actors.

Proposals should:

- Implement a reliable N/P budgeting methodology to identify the maximum allowable input of N/P at regional/river basin scale and ensure good status for air, water and soil ecosystems. N/P budgets should stay within safe ecological and regional boundaries, i.e. by respecting limit values of N/P in air, water and soil, as specified in existing EU legislation [334] or based on recent scientific evidence [335] and complying with the precautionary principle.

- Demonstrate single or integrated region-specific practices in all relevant N/P sectors that help balance emissions from N and P-based fertilisers in agriculture, enhance soil health, reduce eutrophication and water pollution and limit harmful emissions to air.

- Showcase how innovative governance models can contribute to fostering ecologically responsible and sustainable use, recovery and exchange of N/P relevant resources, services and infrastructures between urban/industrial and rural/coastal environments while meeting overarching EU objectives (farm to fork and biodiversity strategies).

- Test innovative practices and technologies to make use of secondary raw materials and produce N and P-based fertilisers recovered from organic waste, wastewater, biological residues or by-products and promote local and regional value chains.

- Apply novel governance approaches and other incentives supporting practices to limit N/P emissions and develop respective guidelines and recommendations for all concerned stakeholders (local and regional authorities, municipalities, environmental organisations, farmers and other practitioners industry, civil society etc.), to encourage behavioural change and public acceptance of recovered products as well as more effective problem-solving mechanisms while envisaging regional twinning and mentoring schemes.

- Disseminate results and best practice to all stakeholders involved across the EU and Associated Countries, and provide recommendations on the design of harmonised, coherent and efficient regional policies and regulatory instruments that facilitate eliminating and preventing N/P pollution.

334 EU Water Framework Directive, Nitrates Directive.

335 EEA 2020, Is Europe living within the limits of our planet? An assessment of Europe's environmental footprints in relation to planetary boundaries' https://www.eea.europa.eu/publications/is-europe-living-within-the-planets-limits.

Applicants are encouraged to join different regional clusters per project and to diversify their proposed consortia by involving a wide range of relevant stakeholders, such as primary producers and practitioners, local and regional administrations, municipalities, related industries, environment organisations, academia, civil society, citizens, etc.

The projects funded under this topic are expected to build close links and exchange knowledge and information with the Horizon Europe Mission "Restore our Ocean and Waters by 2030". In particular, they should link to the Mission activities under Objective 2 – "Prevent, minimise and eliminate pollution in marine and freshwater environment", and to the Mission lighthouse activities in the Mediterranean sea basin focusing on the prevention, reduction and elimination of all kinds of pollution in marine and freshwater ecosystems, including pollution from excess nutrients (phosphorus and nitrogen).

This topic will be part of the demonstration projects for the implementation of the European Commission's Circular Cities and Regions Initiative (CCRI) and must be carried out in close cooperation with it.

SSH aspects should be included.

HORIZON-CL6-2024-ZEROPOLLUTION-01-2: Best available techniques to recover or recycle fertilising products from secondary raw materials

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 4.00 million.
Type of Action	Coordination and Support Actions
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [336].

[336] This decision is available on the Funding and Tenders Portal, in the reference documents section for Horizon Europe, under 'Simplified costs decisions' or through this link: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/ls-decision_he_en.pdf

Expected Outcome: Successful proposals will deliver recommendation to policy makers and stakeholders on the alternative fertilising products able to balance nitrogen (N) and phosphorus (P) flows within safe ecological boundaries at regional and local scale, thereby contributing to restoring ecosystems. Projects will contribute to deliver alternative fertilising products with reduced environmental impacts on soil, water, and air quality, biodiversity and climate, in line with the European Green Deal and the EU zero pollution action plan.

Projects results are expected to contribute to all of the following expected outcomes:

- Lower environmental impacts on soil, water, and air quality, biodiversity and climate from alternative fertilising products recovered from secondary raw materials;
- Circular use of alternative fertilising products recovered from secondary raw materials;
- Best available techniques for recovering/recycling fertilising products from secondary raw materials, in terms of technical feasibility, environmental performance and socio-economic aspects: collection and sharing among European and international stakeholder.

Scope: The scope of this CSA is the analysis of best available technologies for recovering/recycling fertilising products from secondary raw materials in Europe while limiting nitrogen and phosphorus pollution in soil, water and air and any other form of pollution from the use of such fertilising products and from the replacement of nitrogen- and phosphorus-based fertilisers produced from conventional processes (including mining and fossil-based processes). Examples of fertilising products within the scope are: recycled nutrients from urban and industrial waste water and sewage sludge, organic fertilising products from bio-waste, digestate and treated manure as well as other fertilising products from biological resources.

To deliver on the expected outcomes, proposals should:

- Collect data on case studies of existing installations converting secondary raw materials into fertilising products in Europe and outside. Secondary raw materials should include: urban and industrial waste water and sewage sludge, bio-waste, digestate, treated manure, others. Case studies of existing installations should range in volume and type of secondary materials treated, as well as in technologies employed in the installations;
- Analyse the technical aspects of the available technologies, such as on the characterisation of secondary raw materials, the recovery/recycling processes and their environmental impacts on soil, water and air quality, biodiversity and climate, their resources efficiency (including energy), as well as the pollution prevention operations. The analysis should also include the assessment of the costs for installation, maintenance and upgrade of both recovery/recycling and pollution prevention operations;
- Compare the environmental impacts and the resources efficiency (including energy) of the available technologies in the scope with the impacts of the conventional processes producing nitrogen- and phosphorus-based fertilisers. The comparison should be performed based on appropriate selection of the functional unit;

- Analyse the fertilising products from each case study selected at the first step: e.g., their composition (in a range of values of main components, following the current content of labelling provisions of EU fertilising products), with special focus on any potential polluting substance, including microplastics and persistent substances and their impacts on soil, water, air quality, biodiversity and climate, their suggested use and management, especially preventing the emissions of nitrogen and phosphorus to the environment but also any other pollutants, their compliance with certifications and labels, etc.;

- Analyse the market and the regulatory framework of the identified practices (according to the EU legislation, certification and standardization schemes) and their potential to enable or prevent the wider uptake of these technologies;

- Analyse the technical availability of feedstock supply and potential to upscale the identified practices and the production of fertilising products from secondary raw materials;

- Select the best available technologies based on: the analysis carried out on the whole database of case studies, the market and the regulatory framework and the availability of feedstock supply. The best techniques should meet the best performances, especially in terms of lower impacts on soil, water, and air quality, biodiversity and climate;

- Deliver specific datasheets of relevant techniques with their technical and environmental performances, as well as with economic and social analysis;

- Build links with the European Mission 'Restore our ocean and waters by 2030', in particular with the Mission activities under objective 2 – *prevent, minimise and eliminate pollution in marine and freshwater environment, and with the Mission lighthouse activities in the Mediterranean sea basin focusing on prevention, reduction and elimination of all kinds of pollution in marine and freshwater ecosystems, including pollution from excess nutrients (phosphorus and nitrogen)*;

- Build links with the European Mission 'A Soil Deal for Europe', especially with the activities under objective -*reduce soil pollution and enhance restoration*.

- Provide recommendations to policy makers and practitioners to ensure the deployment of the best available technologies preventing the emissions of nitrogen and phosphorus to soil, water and air;

- Establish a forum of stakeholders from the whole supply and value chain, in order to feed the projects with advice and discussion and share best practices eventually. The forum will be open to stakeholders from Europe and outside.

Applicants from different groups of stakeholders will cover all the technical, environmental, economic and social aspects of supply chains of secondary raw materials, installations and processes converting those materials into fertilising products and end users.

In order to achieve the expected outcomes, and in line with the EU strategy for international cooperation in research and innovation, international cooperation is encouraged.

Where relevant, proposals should seek links with and capitalise on the results of past[337] and ongoing EU funded projects[338].

The projects funded under this topic should develop their tasks in synergy, in order to select the best available technologies on the broader base of case studies, possibly covering all different conditions in Europe (i.e., different secondary raw materials available, different techniques, regulatory and market frameworks, etc.). The projects should also establish common formats of the specific datasheets of relevant techniques and of the recommendations to policy makers and practitioners, both described in the scope. Moreover, they should establish together the forum of stakeholder, which will be unique for all projects.

This topic requires the effective contribution of SSH disciplines and the involvement of SSH experts, institutions as well as the inclusion of relevant SSH expertise, in order to produce meaningful and significant effects enhancing the societal impact of the related research activities.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

Reducing the environmental impact and pollution in food systems

Proposals are invited against the following topic(s):

HORIZON-CL6-2024-ZEROPOLLUTION-01-3: Environmental impacts of food systems

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 7.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: the proposals must use

337 See for example https://sea2landproject.eu/ and projects under BBI JU https://www.bbi.europa.eu/projects/b-ferst, https://www.bbi.europa.eu/projects/newfert.

338 See for example HORIZON-CL6-2021-ZEROPOLLUTION-01-09: Environmental impacts and trade-offs of alternative fertilising products at global/local scale.

	the multi-actor approach. See definition of the multi-actor approach in the introduction to this work programme part.

Expected Outcome: The food sector contributes to food security but is also responsible for air, water and soil pollution. It can contribute to biodiversity loss, soil erosion and climate change, and it consumes excessive amounts of natural resources, including water and energy, while a significant amount of food is wasted. In supporting the implementation of the European Green Deal, the EU zero pollution action plan, the farm to fork strategy, the European climate pact, the common agricultural policy and the common fisheries policy and the Food 2030 initiative, the successful proposal should address all of the following outcomes:

- Increased overall knowledge of the environmental and climate impacts stemming from the food systems, including potential trade-offs/synergies with other sustainability aspects (environmental, social, economic).
- Robust evidence-based understanding of the impacts of food systems related to direct and indirect soil, water and air pollution that drive biodiversity losses, soil erosion, climate change and can negatively affect human health.
- Improved capacity to reduce the environmental and climate impacts of food systems, particularly in relation to pollution.
- Support to actors across the food systems through new available knowledge, shared existing data on environmental and climate impacts of food systems and identification of innovative solutions.

Scope: There is an increasing understanding of the impacts related to the green-house gas (GHG) emissions stemming from food systems. Around one third of human-caused GHG emissions worldwide originate from food systems.[339] A similar share of emissions is also recorded in Europe. Although the largest share of the GHG emissions and other relevant environmental impacts can be attributed to the primary food production (or harvesting in the case of fisheries), a significant amount of food-related environmental impacts is also generated in post-production and post-harvest processes along food supply chains. However, when considering wider environmental and climate impacts of food systems, more information is needed to understand these impacts, particularly when it comes to pollution stemming from food processing, manufacturing, packaging, distribution, trade, consumption (including emerging food consumption trends, such as products of alternative diets), food waste and end of life practices.

The relevant data covering these latter industries or practices are often less available and/ or accessible compared to the agricultural data, for example through the CAP indicators. At the same time, knowledge gaps also exist when it comes to environmental impacts of primary food production and harvesting. Therefore, the successful proposal should fill the relevant

339 Crippa, M., Solazzo, E., Guizzardi, D. et al. Food systems are responsible for a third of global anthropogenic GHG emissions. Nat Food 2, 198–209 (2021).

knowledge and data gaps. It should explain how it will deliver co-benefits to some of the Food 2030 priorities: climate, biodiversity and environment, circularity and resource efficiency, innovation and empowering communities. The data should be aligned with, and support the relevant objectives of the upcoming Sustainable food system framework initiative.[340]

Proposals are expected to:

- Collect relevant qualitative and quantitative data on environmental and climate impacts related to water, air and soil pollution stemming from the food systems, biodiversity losses, climate change and negative impacts on human health, as well as data on freshwater consumption, soil erosion, resource and energy efficiency of food production and supply practices.

- Increase the accessibility of relevant high quality life cycle inventory data according to FAIR principles and the EU's open science policy by setting up actions to develop, review and make available existing databases.

- Provide new data based on requirements for Environmental Footprint compliant datasets[341] and in line with the 2021 Recommendation on the use of the Environmental Footprint methods[342].

- Assess the environmental impacts of food systems from a life-cycle perspective, using the Environmental Footprint methods.

- Identify and map opportunities and innovative solutions, including existing good practices that address the identified impacts and promote the uptake of sustainable food production (including harvesting) and/ or food supply practices, including consumption practices, with minimum impact.

- Identify and map opportunities and innovative solutions, including existing good practices, that maximise synergies among the three dimensions of sustainability (i.e. environmental – including climate and biodiversity, economic, social - including health), different sectors, as well as actors across the food systems (from production/ harvesting to consumption), minimising trade-offs and reducing pollution as well as other environmental and climate impacts in food systems as a whole.

- Implement the multi-actor approach by involving a wide range of food system actors and conducting inter-disciplinary research.

- In order to achieve the expected outcomes, international cooperation is encouraged.

340 See f2f_legis_iia_fsfs_5902055.pdf (europa.eu)

341 See JRC Publications Repository - Guide for EF compliant data sets (europa.eu).

342 Commission Recommendation (EU) 2021/2279 of 15 December 2021 on the use of the Environmental Footprint methods to measure and communicate the life cycle environmental performance of products and organisations C/2021/9332, OJ L 471, 30.12.2021, p. 1–396 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021H2279.

- Where relevant, build on and expand the results of past and ongoing research projects and collaborate with relevant initiatives.

This topic has strong links with destinations "biodiversity and ecosystem services", "fair, healthy and environment-friendly food systems from primary production to consumption" and "circular economy and bioeconomy sectors".

Call - Clean environment and zero pollution

HORIZON-CL6-2024-ZEROPOLLUTION-02

Conditions for the Call

Indicative budget(s)[343]

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million)[344]	Indicative number of projects expected to be funded
		2024		
Opening: 17 Oct 2023 Deadline(s): 21 Feb 2024 (First Stage), 17 Sep 2024 (Second Stage)				
HORIZON-CL6-2024-ZEROPOLLUTION-02-1-two-stage	IA	15.00	Around 5.00	3
HORIZON-CL6-2024-ZEROPOLLUTION-02-2-two-stage	RIA	8.00	Around 4.00	2
Overall indicative budget		23.00		

General conditions relating to this call	
Admissibility conditions	The conditions are described in General Annex A.
Eligibility conditions	The conditions are described in General

[343] The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2023 and 2024.

[344] Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

	Annex B.
Financial and operational capacity and exclusion	The criteria are described in General Annex C.
Award criteria	The criteria are described in General Annex D.
Documents	The documents are described in General Annex E.
Procedure	The procedure is described in General Annex F.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G.

Protecting drinking water and managing urban water pollution

Proposals are invited against the following topic(s):

HORIZON-CL6-2024-ZEROPOLLUTION-02-1-two-stage: Holistic approaches for effective monitoring of water quality in urban areas

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 15.00 million.
Type of Action	Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: Applicants submitting a proposal under the blind evaluation pilot (see General Annex F) must not disclose their organisation names, acronyms, logos, nor names of personnel in Part B of their first stage application (see General Annex E).
Procedure	The procedure is described in General Annex F. The following exceptions apply: This topic is part of the blind evaluation pilot under which first stage proposals will be evaluated blindly.

Expected Outcome: In line with the European Green Deal's zero pollution ambition, successful proposals will contribute to protecting water quality by managing urban water pollution, and consequently also protecting biodiversity and the quality of aquatic ecosystems, as addressed by several impacts under the Destination 'Clean environment and zero pollution', in particular "Move towards achieving clean, unpolluted surface water and groundwater bodies in the EU by advancing the understanding of diffuse and point sources of water pollution in a global and climate change context, enabling novel solutions to avoid degradation and restore water bodies, aquatic ecosystems and soil functionality, and further enhancing water quality and its management for safe human and ecological use, while fostering the EU's and Associated Countries' position and role in the global water scene."

Projects results are expected to contribute to all of the following expected outcomes:

- Enhance urban water quality with a view of providing better guidance for policy making and prioritisation by developing integrated urban water quality monitoring management plans;
- Sound, safer and risk-based urban water quality management plans supported by enhanced holistic monitoring, advanced novel methods and digital solutions, modelling and evidence-based scenarios;
- Increase uptake of digital tools in the water sector to support water management decisions for all stakeholders.

Scope: Water management in urban areas is confronted with a wide range of water quality issues. Urban runoff, is an increasingly important source of pollution. This is going to be aggravated by an increasing frequency of extreme events, such as floods and droughts, due to the impacts of climate change, as well as the increasing sealing of surfaces and rapid growth of urban areas. Moreover, water leakages from ageing water-service infrastructure and combined sewer or storm water overflows, leads to additional pollution releases into the environment. Water quality deterioration due to trace organic pollutants such as pharmaceuticals and industrial chemicals, microbial contaminants, such as pathogens or antimicrobial resistance genes, micro-plastic, nanomaterial, and diffuse pollution from urban areas (roads, urban runoff) and from upstream agricultural areas or industries and many other pollutants often released unintentionally to the environment and finally leading to several forms of pollution of urban water sources. These issues are also exacerbated by the complex interactions between pollutions sources and pathways at the urban/catchment level interface.

In line with the ambition of the EU zero pollution action plan there is a need to develop an integrated and harmonised approach to monitor all sources of surface and groundwater pollution and their impact, including micro-pollutants, micro-plastics, pharmaceuticals and other contaminant of emerging concerns, as well as mixtures of pollutants.

This objective of this action is to develop and demonstrate a European wide 'whole system monitoring approach' to address emerging water pollution and water quality assurance in urban areas in various urban areas covering a wide number of water pollution challenges, ,

taking into consideration the interactions of pollution sources and pathways between urban areas and the surrounding river and where appropriate drainage basin, and improve the resilience of urban water systems towards pandemics and global and climate change challenges. New systemic concepts and holistic strategies to enhance urban water quality should be integrated and demonstrated in an operational environment, including decentralised systems, hybrid green-grey infrastructures or cascading use of water.

An advanced monitoring and control system, going beyond the conventional pollutants, linking drinking and wastewater urban cycles, integrating risk management approaches and exploiting upgraded digital solutions to support urban water quality management, should be developed and tested, combined with appropriate modelling tools and scenarios to assess and forecast the long-term impacts of future changing socio-economic and climatic conditions on water quality. This monitoring system should consider the overall monitoring and outlook requirements of the EU zero pollution action plan, the monitoring requirements of existing EU water policy legislation (e.g., Water Framework Directive, Drinking Water Directive , Urban Waste Water Treatment Directive, Bathing Water Directive, etc.) and relevant national and/or European water quality monitoring tools, and develop recommendations and guidance to strengthen the implementation of the EU and/or national legislation. It should allow to identify cause-effect relationships and big data management to address quality pressures For this purpose there is a need to develop better methods to access chemical data to be able to track the use or the flows of chemicals in urban areas (e.g., to support case studies using mass balance approach to clarify hotspots of pollution sources). New and refined analytical tools and monitoring methods (e.g. effect-based monitoring, biological monitoring) to analyse broad spectrum of contaminants of emerging concerns should be also developed. Recommendations for the standardisation of monitoring and identification of contaminants (including detection limit) should be also provided.

To enhance the capabilities of real-time monitoring of water quality, the potential of earth observations technologies and the use of digital technologies, such as online sensors, artificial intelligence, digital twins, digital data spaces, etc. should be further explored and consolidated.

In general, the participation of academia, research organisations, utilities, industry and regulators is strongly advised, as well as civil society engagement whenever necessary, also aiming to broaden the dissemination and exploitation routes and to better assess the innovation potential of developed solutions and strategies. The direct participation of urban and catchment/river basin managing water authorities and utilities is essential.

Where relevant, activities should create synergies with the projects funded under the protecting drinking water and managing urban water pollution topics in the work programme from WP2021-2022, namely HORIZON-CL6-2021-ZEROPOLLUTION-01-03 and HORIZON-CL6-2022- ZEROPOLLUTION-01-04.

Increasing environmental performances and sustainability of bio-based processes and products

Proposals are invited against the following topic(s):

HORIZON-CL6-2024-ZEROPOLLUTION-02-2-two-stage: Innovative technologies for zero pollution, zero-waste biorefineries

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 8.00 million.
Type of Action	Research and Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: Applicants submitting a proposal under the blind evaluation pilot (see General Annex F) must not disclose their organisation names, acronyms, logos, nor names of personnel in Part B of their first stage application (see General Annex E).
Technology Readiness Level	Activities are expected to achieve TRL 4-5 by the end of the project – see General Annex B.
Procedure	The procedure is described in General Annex F. The following exceptions apply: This topic is part of the blind evaluation pilot under which first stage proposals will be evaluated blindly.

Expected Outcome: Successful proposals will support researchers and innovators to improve the environmental performances and circularity of bio-based systems in industrial sectors. Project outcomes will contribute to enhance circular bio-based systems operating according to planetary boundaries, replacing fossil-based systems and their carbon footprint, mitigating climate change and protecting air, water and soil quality along industrial value chains, in line with the European Green Deal and the EU zero pollution action plan.

Projects results are expected to contribute to the following expected outcomes:

- Enhanced environmental performances of bio-based processes approaching the zero-waste, zero-pollution ambition.

- Integrated pollution prevention and control in bio-based systems targeting soil, water and air quality as well as noise levels.

Scope: Pollution from anthropogenic activities undermines the integrity of Earth ecosystems and severely affects the natural resources essential for human life. The EU bioeconomy strategy 2030 sets environmental protection at the basis of the modernisation of bio-based industries in the Union, to ensure a trustful green transition of EU economy away from a linear fossil-based system.

To develop solutions for preventing and controlling pollution from bio-based industries, proposals should:

- Design integrated technical solutions reducing exhaust flows from bio-based processes through innovative technologies of extraction, recirculation, fractionation and conversion of such flows, to reach the zero-pollution ambition starting from the emissions to soil, water and air. The exhaust flows considered should include the ones that are usually not considered in the common pollution prevention and control operations, such as hot water, vapours, odours etc. The reduction of impacts on climate change, based on the reduction of greenhouse gas emissions and accessorily via increase of carbon removals, and on biodiversity should be considered as well;

- Individuate replacement of hazardous substances used in the processes with safe bio-based ones;

- Design the biorefinery operations to re-circulate any process flows such as process air and water and to increase energy efficiency including heat recovery;

- Design the biorefinery operations in order to reduce noise emissions;

- Design circularity of any processes, including through symbiosis between industrial installations to share and exploit materials and carrier streams, and looking on the best practices already available or under development, including in other EU R&I programmes to reach the zero-waste ambition;

- Develop a case-study of integrated zero-pollution technical solutions in a selected biorefinery and design the adaptation of the case-study to be operational at all scales, from the large/medium to the small scale (the latter shows potentially high specific environmental impacts);

- Pilot and validate digital innovation for bio-based processes enabling the zero-pollution and zero-waste biorefinery ambition. Digital tools may include data sharing platforms for the management of supply and value chains, as well as industrial symbiosis operations between biorefineries, industrial hubs, etc.;

- Develop and validate integrated monitoring systems, operated by the industry at the level of the biorefinery, of the effective reduction of pollutant emissions, affecting soil, water and air quality, noise levels and waste production from biorefineries.

Where relevant, proposals should seek links with and capitalise on the results of past and ongoing EU funded projects, including under the Circular Bio-based Europe JU and other partnerships of Horizon Europe.

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

Destination - Land, ocean and water for climate action

Reducing greenhouse gas (GHG) emissions and increasing carbon sinks in primary production and natural systems as well as in harvested wood products and other carbon storage products are key components of the European Green Deal[345]. Achieving sustainable ocean, water and land management, and using natural resources efficiently to help mitigate climate change implies finding the right balance between productivity, climate, biodiversity and environmental goals in the agriculture and forestry sectors, with a long-term perspective. R&I activities will support **solutions for climate and environmentally friendly practices** to reduce emissions of major greenhouse gases, other pollutants and the environmental impact of ocean and land use changes and agricultural activities. R&I will rely on the application of digital technologies where relevant.

The **EU climate law**[346] states that to reach 2030 and 2050 climate targets and to restore biodiversity, the EU needs to immediately and decisively restore and increase its natural carbon sinks. In 2021, the Commission proposed to amend **Regulation (EU) 2018/841 for land use, forestry, and agriculture**[347] by setting an increased EU target for net removals of 310 MtCO2eq by 2030 and allocating targets for each Member State. The proposal also includes the aim to reach climate-neutrality in the entire land sector by 2035, namely that carbon removals should balance the greenhouse gas emissions from land use, livestock and fertiliser use. At the end of 2021, the Commission published a **communication on sustainable carbon cycles,** including **carbon farming** and **certification of carbon removals**[348]. R&I, new technologies and business models are expected to unlock the full potential of land use, land-use change and forestry (LULUCF) activities in the mitigation of climate change.

Carbon farming will be implemented in line with the communication on sustainable carbon cycles and related documentation. R&I activities under this destination, and in the work programme of the mission 'A Soil Deal for Europe' will **help coordinate** the research community and key stakeholders in **developing, testing and demonstrating carbon farming practices and in certifying carbon removals**. Results of funded activities will help in managing land and forests and in delivering of multiple services provided by agricultural land and forests, such as: i) the provision of goods and long-term carbon storage in harvested wood products, ii) protection of soils, water and biodiversity; and iii) mitigation of and adaptation to climate change.

Specific attention will be given to paludiculture, complementing the activities of Cluster 5 in the 2021/2022 work programme. R&I activities will help increase soil organic carbon, protect carbon-rich soils (e.g. grasslands and peatlands), restore peatlands and wetlands, and improve advisory services for land managers. Together with the work programme for the mission 'A

345 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2019%3A640%3AFIN
346 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021R1119&from=EN
347 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0554
348 https://ec.europa.eu/clima/system/files/2021-12/com_2021_800_en_0.pdf

Soil Deal for Europe', R&I activities will aim to reduce the financial burden resulting from the costs of management practices in carbon farming and the uncertainty about revenue possibilities. In the livestock sector, R&I on manure management will help **implement the EU methane strategy**[349]. R&I activities will also boost the contribution made by a forest **as a natural and man-made carbon sink** and maintain multiple ecosystem services (e.g., water replenishment, soil protection), as proposed in the **Fit for 55** package with the revised LULUCF Regulation and the new **EU forest strategy**.

Strengthening the **nexus between the ocean and climate change** is a priority for the EU. There is growing political awareness of the importance of ocean and polar regions as integral parts of the Earth's climate system and of the need to ensure the integrity and resilience of these vulnerable ecosystems in the context of climate change. The main outcomes expected are an improved understanding of the ocean's role in the Earth's climate system, resulting in the closing of the research gaps on ocean essential climate variables and improved ocean models for seasonal to decadal forecasting at local and regional scales. This in turn will support decision-making aimed at preserving the integrity of the ocean and aquatic ecosystems and the polar Regions, through a better understanding of the drivers of change and of emerging threats, including tipping points. The ocean is also a large storage system for the global reservoirs of climate-regulating factors, particularly carbon. R&I will advance knowledge innovations to develop ocean-based solutions/mitigation options, helping to close the emissions gap and stop ocean acidification and prevent the consequent biodiversity losses.

The following blue carbon ecosystem developments could be envisaged:

- more knowledge about identifying regions at risk;
- exploring, preserving, restoring or even creating new natural habitats, and providing solutions to strengthen resilience and protection of EU coastal areas against climate change;
- more knowledge and data on blue carbon quantification;
- consider nature-based solutions for carbon farming, e.g. on coastal wetlands, as well as seaweed and mollusc aquaculture.

Biodiversity protection plays an important role in all approaches for mitigation in ecosystems and Nature-based Solutions (NBS)are highly important in this context, providing further environmental, social and economic benefits. Building on the political momentum gained at COP25 where the ocean was identified as a priority, and on the latest developments at COP26, science on the climate and the ocean nexus developed under the Horizon Europe programme will contribute to and inform the dialogue under the United Nations Framework Convention on Climate Change (**UNFCCC)** on the ocean and climate change.

Other major contributions include: i) providing new scientific knowledge on polar regions for the **EU Arctic policy**; ii) supporting the new policy initiative on **sustainable blue economy**

[349] https://ec.europa.eu/energy/sites/ener/files/eu_methane_strategy.pdf

and its offshoot initiatives as well as implementing the **Marine Strategy and Water Framework Directives**; and iii) helping to achieve the **clean planet for all's** aim of neutralising all major threats to the health of the planetary ecosystem.

In line with the **climate adaptation strategy**[350], climate action also calls for ecosystems, primary production, food systems and the bioeconomy to adapt to climate change. Climate change is exacerbating existing risks to livelihoods, biodiversity, human and ecosystem health, infrastructure and food systems. Human activities relying on the availability and use of clean water are particularly affected by variable and extreme weather events, which may also lead to desertification. Agriculture and forestry in the EU are vulnerable to climate change. Specifically, there is growing evidence about the effects of climate change and extreme weather events, which need to be mitigated, on agricultural production, crop yields, and also on the forest sector.

In the area of forestry, R&I will improve knowledge on the interactions and interdependencies between biodiversity and climate change, and identify win-win management strategies, also addressing trade-offs in a sustainable manner. Marine and coastal areas are also threatened by the rise in sea level, saline water intrusion, biodiversity loss, ocean acidification, extreme events and a shrinking cryosphere. R&I will, therefore, be critical to stepping up adaptation and building resilience in agriculture, forestry, and activities in marine and coastal areas. They will aim to deliver on the urgent need to step up the adaptation of primary production, notably by providing farmers and other actors in bioeconomy value chains with better-adapted crop varieties and animal breeds with lower impacts on the related ecosystems.

R&I efforts are critical to avoiding, reducing and reversing desertification. They are also critical to delivering sustainable nature-based solutions that will also i) increase carbon sequestration, natural water retention, biodiversity conservation and restoration, ii) strengthen coastal protection, iii) reduce the risks of algal blooms and iv) offer ecotourism opportunities. Water adaptation strategies and approaches will be developed and tested. In this context, the innovation potential for a wide range of alternative water solutions (rainwater harvesting, storm water collection, water reuse and reclamation, brackish and sea water desalination, aquifer recharge, etc.) to be used for avoiding possible negative environmental impacts will be assessed and the European partnership for ensuring water security for the planet will be further supported. Potential trade-offs, and measures to mitigate and avoid them, will be assessed to ensure environmental sustainability and to keep the objectives of improving soil fertility, increasing carbon storage in soils and biomass to support benefitting agricultural productivity and food security and reduce biodiversity loss. R&I will also aim at providing a better understanding of how institutions and behaviour shape vulnerability and offer opportunities for adaptation.

350 https://ec.europa.eu/clima/eu-action/adaptation-climate-change/eu-adaptation-strategy_en

Expected outcomes include, by means of international cooperation, collaborative research on joint adaptation, mitigation and biodiversity reporting and monitoring of land contributing to the overall areas targeted in Cluster 6[351].

Expected impacts

Proposals for topics under this destination should set out credible pathways that contribute to **climate action on land - including forestland, grassland, cropland and wetland - as well as on oceans and water** and more specifically to one or several of the following impacts:

- better understanding and strengthening of the mitigation potential of ecosystems and sectors based on the sustainable management of natural resources;
- advancement of science and technology to support the **adaptation and resilience of natural and managed ecosystems**, on land, in the ocean, in water and soil systems as well as economic sectors in the context of the changing climate, including interaction with drivers of biodiversity change and zero pollution;
- efficient monitoring, assessment, modelling and data-driven decision-making support systems and projections related to **climate change impacts, mitigation and adaptation potential** in order to derive solutions for tackling existing and emerging threats and support decision-making in climate change mitigation and adaptation policies at European and global levels, including through the use of AI and other digital solutions;
- increased **climate change mitigation in the primary sectors**, including by means of reducing their GHG emissions and other pollutants, maintaining **natural and man-made carbon sinks** and increasing uptake and storage of carbon in ecosystems, taking into account trade-offs with regard to ecosystems;
- improved **capacity to climate change** of the ocean, sea, water and soil systems and related sectors to adapt to climate change, including by means of unlocking the potential of nature-based solutions;
- **sustainable management of scarce resources**, in particular soils and water, therefore mitigating climate related risks, especially desertification and erosion, thanks to informed decision-makers and stakeholders and the integration of adaptation measures in relevant EU policies.

The following call(s) in this work programme contribute to this destination:

Call	Budgets (EUR million)		Deadline(s)
	2023	2024	
HORIZON-CL6-2023-CLIMATE-01	90.00	18.00	12 Apr 2023

[351] This refers in particular to potential EU-China cooperation under the Climate Change and Biodiversity (CCB) Flagship.

HORIZON-CL6-2024-CLIMATE-01		75.00	22 Feb 2024
Overall indicative budget	90.00	93.00	

Call - Land, ocean and water for climate action

HORIZON-CL6-2023-CLIMATE-01

Conditions for the Call

Indicative budget(s)[352]

Topics	Type of Action	Budgets (EUR million)		Expected EU contribution per project (EUR million)[353]	Indicative number of projects expected to be funded
		2023	2024		
Opening: 22 Dec 2022 Deadline(s): 12 Apr 2023					
HORIZON-CL6-2023-CLIMATE-01-1	COFUND	18.00	18.00	Around 36.00	1
HORIZON-CL6-2023-CLIMATE-01-2	IA	10.00		Around 3.30	3
HORIZON-CL6-2023-CLIMATE-01-3	RIA	10.00		Around 5.00	2
HORIZON-CL6-2023-CLIMATE-01-4	RIA	20.00		Around 20.00	1
HORIZON-CL6-2023-CLIMATE-01-5	CSA	5.00		Around 5.00	1
HORIZON-CL6-2023-CLIMATE-01-6	RIA	5.00		Around 5.00	1
HORIZON-CL6-2023-CLIMATE-01-7	RIA	5.00		Around 5.00	1

352 The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2023 and 2024.

353 Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

HORIZON-CL6-2023-CLIMATE-01-8	IA	17.00		5.00 to 6.00	3
Overall indicative budget		90.00	18.00		

General conditions relating to this call	
Admissibility conditions	The conditions are described in General Annex A.
Eligibility conditions	The conditions are described in General Annex B.
Financial and operational capacity and exclusion	The criteria are described in General Annex C.
Award criteria	The criteria are described in General Annex D.
Documents	The documents are described in General Annex E.
Procedure	The procedure is described in General Annex F.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G.

Proposals are invited against the following topic(s):

HORIZON-CL6-2023-CLIMATE-01-1: Additional activities for the European Partnership Water Security for the Planet (Water4All)

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 36.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 36.00 million.
Type of Action	Programme Co-fund Action
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The proposal must be submitted by the coordinator of the consortium

	funded under HORIZON-CL6-2021-CLIMATE-01-02: European Partnership Water Security for the Planet (Water4All). This eligibility condition is without prejudice to the possibility to include additional partners. If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
Procedure	The procedure is described in General Annex F. The following exceptions apply: The evaluation committee will be composed partially by representatives of EU institutions. If the proposal is successful, the next stage of the procedure will be grant agreement amendment preparations. If the outcome of amendment preparations is an award decision, the coordinator of the consortium funded under HORIZON-CL6-2021-CLIMATE-01-02: European Partnership Water Security for the Planet (Water4All) will be invited to submit an amendment to the grant agreement, on behalf of the beneficiaries.
Legal and financial set-up of the Grant Agreements	This action is intended to be implemented in the form of an amendment of the grant agreement concluded pursuant to topic HORIZON-CL6-2021-CLIMATE-01-02. For the additional activities covered by this action: • The funding rate is 30% of eligible costs. • Beneficiaries may provide financial support to third parties (FSTP). The support to third parties can only be provided in the form of grants. • Financial support provided by the participants to third parties is one of the primary activities of this action in order to be able to achieve its objectives. The 60 000 EUR threshold provided for in Article 204 (a) of the Financial Regulation No 2018/1046 does not apply. • The maximum amount of FSTP to be granted to an individual third party is EUR 10 000 000. This amount is justified since provision of FSTP is one of the primary activities of this action and it is based on the extensive experience under predecessors of this partnership.

	• The starting date of grants awarded under this topic may be as of the submission date of the application. Applicants must duly justify the need for a retroactive starting date in their application. Costs incurred from the starting date of the action may be considered eligible (and will be reflected in the entry into force date of the amendment to the grant agreement).
Total indicative budget	The total indicative budget for the duration of this partnership is EUR 126 million.

Expected Outcome: This topic is for the continuation of the European Partnership Water Security for the Planet (Water4All), i.e. EU contribution in WP 2023-2024.

The second instalment of the partnership is expected to contribute to expected outcomes specified in topic HORIZON-CL6-2021-CLIMATE-01-02: European Partnership Water Security for the Planet (Water4All), for continuation and new development of activities.

Scope: The objective of this action is to continue to provide support to the European Partnership Water4All identified in the Horizon Europe Strategic Plan 2021-2024 and first implemented under the topic HORIZON-CL6-2021-CLIMATE-01-02: European Partnership Water Security for the Planet, and in particular to fund additional activities (which may also be undertaken by additional partners) in view of its intended scope and duration, and in accordance with Article 24(2) of the Horizon Europe Regulation.

The consortium which applied to and received funding under HORIZON-CL6-2021-CLIMATE-01-02: European Partnership Water Security for the Planet is uniquely placed to submit a proposal to continue the envisioned partnership. Not only did this consortium submit the proposal leading to the identification of the partnership in the Horizon Europe strategic planning 2021-2024, it has also implemented the partnership through co-funded calls in 2021 and 2022 based on this planning and further to topic HORIZON-CL6-2021-CLIMATE-01-02. In this context, the current consortium has particular expertise in relation to the objectives of the Partnership, the activities to be implemented, in particular FSTP calls or other calls/scope of calls clearly required/envisioned pursuant to initial proposal/partnership, and other relevant aspects of the action. In practice, another consortium could not continue the activities of the Partnership underway without significant disruption to the ongoing activities, if at all.

The scope of the application for this call on the European Partnership Water Security for the Planet should focus on the 2023-27 programmes according to the partnership's co-created strategic research and innovation agenda for seven years, which includes joint calls for research projects, activities to fostering the uptake of R&I results from various stakeholders, living labs and demonstration sites activities to demonstrate the efficiency of innovative solutions, activities to enhance international collaborations and support the achievement of the water related UN SDGs and transfer of in foreign contexts, where specific challenges can be encountered. Actions to ensure coordination and alignment of EU, national and regional

programmes, to strengthen the research/policy interface and all horizontal activities to allow the Partnership to operate and to achieve its specific objectives should be also addressed.

It is expected that the partnership continues to organise joint calls on an annual base and therefore it should factor ample time to run the co-funded projects.

Specific activities to strengthen the synergies of Water4All partnership with the related Missions and Partnerships, identified in the proposal submitted by the coordinator of the consortium funded under HORIZON-CL6-2021-CLIMATE-01-02 should be also described.

While the award of a grant to continue the Partnership in accordance with this call should be based on a proposal submitted by the coordinator of the consortium funded under HORIZON-CL6-2021-CLIMATE-01-02: European Partnership Water Security for the Planet (Water4All) and the additional activities (which may include additional partners) to be funded by the grant should be subject to an evaluation, this evaluation should take into account the existing context and the scope of the initial evaluation as relevant, and related obligations enshrined in the grant agreement.

Taking into account that the present action is a continuation of topic HORIZON-CL6-2021-CLIMATE-01-02 and foresees an amendment to an existing grant agreement, the proposal should also present in a separate document the additional activities and additional partners, if any, to be covered by the award in terms of how they would be reflected in the grant agreement.

The partnership should pool the necessary financial resources from the participating national (or regional) research programmes with a view to implementing joints call for transnational proposals resulting in grants to third parties.

The Commission envisages to include new actions in future work programmes to continue providing support to the partnership for the duration of Horizon Europe.

HORIZON-CL6-2023-CLIMATE-01-2: Improve the reliability and effectiveness of alternative water resources supply systems and technologies

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 3.30 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply:

	The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.

Expected Outcome: In support of the European Green Deal and EU water-related policies, successful proposals will contribute to fostering the adaptation of water resources to climate change, in particular the expected impact of the Destination 'Land, ocean and water for climate action' to "Advance understanding and science to support adaptation and resilience of natural and managed ecosystems, ocean, water and soil systems and economic sectors in the context of the changing climate".

Projects results are expected to contribute to all of the following expected outcomes:

- Recommendations on alternative water resources options in water scarce areas to address current and future challenges to water supplies and adapt to climate change, ensuring the water quality for a specific uses;
- Support for decision makers to integrate alternative water resources supply technologies in their strategic plans for water resources management taking into consideration the relevant EU regulatory frameworks (e.g. water and marine related policies, climate change adaptation strategy, Fit for 55);
- Increased societal awareness, acceptance of and trust in of several alternative water supply resources for water use in various societal, environmental and economic contexts;
- Increased market potential of alternative water resources.

Scope: The search for affordable, acceptable and reliable solutions is today a common challenge for water supply planners. A changing climate and increasing water scarcity, population growth, urbanisation and intensifying economic activities have put a strain on traditional water resources, which typically rely on available surface and groundwater resources. Ensuring the availability and sustainability of both surface and groundwater is a key element of the new EU strategy on adaptation to climate change.

According to a recent report on the drivers of and pressures arising from selected key water management challenges (EEA, 2021), water abstraction for public water supply, agriculture and industry is the main significant cause of failure to achieve good quantitative status. Over abstraction of surface water bodies can alter freshwater ecosystems and have adverse ecological effects, including decline of biodiversity. In addition, the over abstraction of groundwater bodies can lower groundwater levels with further impacts on groundwater-dependent aquatic ecosystems and cause salinisation of coastal aquifers, making them unusable for drinking water supply.

To address these problems and in order to improve the security of water supply, alternative water resources, such as rainwater harvesting, storm water, water reuse and reclamation, brackish and sea water desalination, aquifer recharge, are increasingly being used by water managers in rural, coastal and urban areas. However, in many case, the implementation of

several alternative water resources is not sustainable and not embedded in a strategic integrated water management plan at river basin or regional scale. In many cases the negative environmental impacts and associated infrastructure maintenance and investments costs are not properly assessed, nor the costs associated with meeting the EU water policy related requirements (i.e. WFD requirements). Finally, the public/social acceptance of several alternative water resources is lacking and this prevent their further implementation and market uptake. Further research and innovation is needed for making full use of alternative water resources.

Additionally, assessments and recommendations of how alternative water supply sources and infrastructures can relate to existing - mostly centralized - water utility regimes remain unexplored and there is a need to explore how the regulations around these centralized regimes can support infrastructure diversification.

The objective of this action is to improve the sustainability of various alternative water supply resources in the context of climate change and water scarcity adaptation. To achieve this objective the following issues should be addressed:

- Improve the efficiency, reliability and cost-effectiveness and sustainable design of a wide range of alternative water solutions (e.g., rainwater harvesting, storm water, water reclamation and reuse , brackish and sea water desalination, aquifer recharge).

- Assess the interaction between choices of the various alternative water supply technologies with the infrastructure design and development, the scale of operation and the water-energy interactions.

- Assess various alternative water solutions with regards to their potential their innovation, climate mitigation and adaptation and their environmental and health impacts. Explore the potential of digital technologies for appropriate data collection and integration. Attention should be given to reducing the negative impacts of infrastructures to increase water supply in water-scarce areas as well as reducing water demand (rebound effect).

- Develop a comprehensive framework or guidance tool for selecting specific technologies and management strategies for different water scarcity situations that can be adapted on a case-by-case basis and with a view of developing large-scale deployment strategies, in line with the requirements of the Water Framework Directive.

- Assess the critical factors that hinder the public acceptance of alternative water resources and identify measures and actions (e.g., policy actions, marketing interventions) to encourage their acceptance.

The possible participation of the JRC in the selected project would ensure that the approach proposed can be integrated as a scenario in the tool used by the European Commission for the estimation of water availability.

This action should bring together relevant researchers, technology providers, water utilities, business representatives, investors, policy makers and other water users and citizens. The

active participation and engagement of different stakeholders should span the entire project development and implementation to ensure performance and sustainability and maximise the final impact.

Proposals should cover various regions with a balanced coverage reflecting the various biogeographical and climate zones in Europe in a representative way.

The inclusion of relevant SSH expertise would be also needed to ensure the proposed solutions are also socially accepted.

HORIZON-CL6-2023-CLIMATE-01-3: Ocean and coastal waters carbon- and biodiversity-rich ecosystems and habitats in Europe and the Polar Regions

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
Technology Readiness Level	Activities are expected to achieve TRL 2-4 by the end of the project (Option B) – see General Annex B. Activities are expected to achieve TRL 3-5 by the end of the project (Option A) – see General Annex B.
Procedure	The procedure is described in General Annex F. The following exceptions apply: To ensure a balanced portfolio covering the topic, grants will be awarded to applications not only in order of ranking but at least also to those that are the highest ranked within each of the two options (A or B) set under 'scope' , provided that the proposals attain all thresholds.
Legal and financial set-up of the Grant	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the

Agreements	Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [354].

Expected Outcome: In line with the European Green Deal and, in particular with the objectives of the European Climate Law [355], the EU climate adaptation and mitigation strategies, the EU biodiversity strategy for 2030, the EU proposal for a nature restoration law[356], the Marine Strategy Framework Directive (MSFD), the Birds and Habitats Directives, the Regulation (EU) n. 734/2008 on the protection of vulnerable marine ecosystems in the high seas from the adverse impacts of bottom fishing gears, successful proposals should further the European efforts in achieving climate-neutrality by maintaining and enhancing natural carbon sinks and stocks in marine and polar ecosystems, while preserving and enhancing their biodiversity, including by unfolding the potential of nature-based solutions, where adaptations to climate change are also being fostered for enhanced resilience.

Successful proposals are expected to contribute to all of the following expected outcomes:

- Better understood and enhanced mitigation potential of ecosystems, based on sustainable management of natural resources and climate change mitigation fostered through the maintenance and enhancement of natural carbon sinks and stocks, while preserving or enhancing biodiversity in ecosystems, in support of a sustained European leadership in ocean–climate–biodiversity nexus science;

- Advanced understanding and science in support of adaptation and resilience of natural and managed marine and polar ecosystems in the context of a changing climate, including its interaction with other natural or anthropogenic stressors such as pollutants, invasive species or marine construction, and better understood impacts of climate change on coastal zones (including the associated ecosystems) and improved adaptive capacity of ocean and marine systems, including by unlocking the potential of nature-based solutions;

- Uncovered mitigation opportunities of newly emerging European and polar blue carbon habitats (novel habitats emerging due to the rising atmospheric CO2 that is intensifying climate change but also driving global and particularly polar greening; polar blue carbon increases with losses of marine ice (sea ice, ice shelf and glacier retreat) that generates a valuable negative feedback on (mitigating) climate change);

354 This decision is available on the Funding and Tenders Portal, in the reference documents section for Horizon Europe, under 'Simplified costs decisions' or through this link: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/ls-decision_he_en.pdf

355 Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999, available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021R1119.

356 Proposal for a Regulation of the European Parliament and of the Council on nature restoration, COM(2022) 304 final, 22.06.2022

- Reduced knowledge gaps for enabling the inclusion of carbon- and biodiversity-rich marine habitats and accounting in nationally determined contributions (NDCs) and associated national climate plans and strategies (NAPs), such as additional national data collection, science and technical capacity, as well as significant contributions made to the implementation of the European Green Deal, particularly the climate and biodiversity objectives, the UNFCCC Ocean and Climate Change Dialogue, the Global Biodiversity Framework, and global scientific assessments.

Scope: The ocean and coastal ecosystems and habitats play a significant role in the global carbon cycle, representing the largest long-term carbon sink. Over the past decade, research efforts to understand the ocean and blue carbon sinks and utilize their potential in climate mitigation frameworks has increased. There are remaining research gaps for advancing opportunities to incorporate potential ocean and blue carbon ecosystems into climate frameworks. Evaluating and quantifying the broad range of benefits provided by coastal and marine ecosystems should strengthen the ability to account for them in nationally determined contributions (NDCs) and national adaptation plans (NAPs). Avoiding and reversing the loss and degradation and restoring carbon- and species-rich ecosystems in the ocean and coastal waters is highly effective and of highest importance for combined biodiversity protection and climate change mitigation actions with large adaptation co-benefits. If degraded or lost, these ecosystems are likely to release most of their carbon back into the atmosphere.

Actions should aim at developing innovative approaches to address only one of the following options:

- **Option A:** European and polar blue carbon hotspots and priority areas for climate policy frameworks and effective management (TRL 3-5)

The research actions should map European and polar blue carbon hotspots and priority areas for carbon sequestration and climate change mitigation potential, including an estimate of the area/extent of the habitats. In doing so, the successful proposal should rely on the synergistic use of Earth Observation data (in-situ, airborne, satellite) and models to monitor, evaluate and quantify both carbon fluxes and carbon stocks and stock changes in ocean and coastal reservoirs, to evaluate current trends and improve modelling skills and predictions, including using space and in-situ existing datasets and climate records that can be used as proxy (e.g., Copernicus, EMODnet).

The action should also gather information on organic carbon stocks and accumulation, their characteristics (source, lability, dissolved particulate, living, non-living), and their potential change under pressures from human activities. The action should identify the key characteristics that make the selected ecosystem and habitat a hotspot for blue carbon (i.e. geomorphology, physical-chemical characteristics, anthropogenic manipulation, sea level rise effects, etc.). The action should enable a better understanding of the dynamics of carbon between these reservoirs and the associated timescales involved. A quantification of the approximate amount of carbon (and preferably nutrients) fixed annually by those natural ecosystems in Europe, as well as a quantification of the annual degradation rates of the

ecosystems and consequent reduction in carbon sequestration should also be carried out. This knowledge should then be consolidated into a framework for predictive tools to investigate climate-smart management scenarios at appropriate scales, as well as methodologies, methods, and guidance tailored to the specific EU maritime region. The research action will identify and recommend best suited, fit-for-purpose, climate smart and resilient initiatives and activities that are relevant to local communities in order to protect, sustainably manage, restore, and enhance blue carbon habitats. Particular attention should be given to win-win-win solutions and strategies that have multiple benefits for climate mitigation and adaptation, biodiversity gains and benefit to people, including nature-based solutions, ecosystem-based approaches and technological-ecological synergies (TES) (combining technological and nature-based solutions). Where applicable and desirable, socioeconomic aspect of sustainability should also be part of such solutions, in order to make the projects more socially acceptable; e.g. allowing for eco-tourism, recreational activities and/or extraction activities (for example recreational fishing with permits or mussels farming that does not require any feed inputs) could also allow symbiosis with the communities in the coastal areas in which these ecosystems are situated. Where appropriate, this should include technological-ecological synergies (TES) as an integrated systems approach that recognizes the potential co-benefits that exist in combining technological and nature-based solutions. The action should also assess the synergies and trade-offs of combining nature-based solutions and blue infrastructure with grey infrastructure (i.e. hybrid measures), assess the scalability of nature-based solutions and whether the same benefits and effects achieved on a small scale can be achieved by implementing them across larger spatial scales. Actions should keep in mind and address the challenge that several factors may limit the effectiveness of nature-based solutions applied to coastal areas, making the case for more effective long-term strategies and activities (lack of knowledge of the benefits and limitations of nature-based solutions options, poor planning of measures, impacts of extreme weather- and climate-related hazards, emission of CH4 and N2O, and biogenic calcification, risks of slow-onset events, such as increasing temperature and biodiversity loss, and their interaction with multiple drivers (e.g., land use change) and cascading tipping points related to ecosystem degradation). Many of the approaches are conceptually feasible or have been demonstrated in the laboratory, but their consequences for the ocean, including on its biodiversity are uncertain, especially if applied at scale. Any proposed solutions should have to keep the precautionary approach in mind and demonstrate that they are biodiversity positive and have no negative impacts on the marine environment and ecosystem functioning. Particular attention should be given to maladaptation solutions. For each proposed solution, the action should identify the status, costs, potentials, risk & impacts (including tipping points and irreversibility, as well as the challenges posed by the emissions of blue methane, sea level rise, underwater permafrost thaw, coastal nitrate enrichment, etc.), co-benefits, trade-offs and spill over effects, and role in mitigation pathways. In addition, the economic feasibility should be taken into account, as well as the cost/benefit ratio of natural regeneration (rewilding) vs. assisted (e.g., Posidonia beds restoration/protection against trawling) vs. full restoration.

The action should identify and quantify the impact of anthropogenically induced activities that lead to the disturbance, degradation and destruction of these habitats (with estimation of

the most and least impactful activities, CO2 release in the atmosphere and the cost of no action) (direct or indirect pressure from human activities, such as bottom-contact fisheries, and climate forcing).

Finally, the action should make policy recommendations for advancing the incorporation of potential blue carbon ecosystems into climate frameworks, transforming science into effective policy and management and significantly contribute to the implementation of the European Green Deal and its climate and biodiversity strategies and objectives, including the Communication on Sustainable Carbon Cycles and the EU proposal for a nature restoration law[357] which includes targets.

- **Option B:** Uncover mitigation opportunities of newly emerging European and polar blue carbon habitats (TRL 2-4)

Rising atmospheric CO2 is intensifying climate change but it is also driving global and particularly polar greening. Polar blue carbon increases with losses of marine ice over high latitude continental shelf areas. Marine ice (sea ice, ice shelf and glacier retreat) losses generate a valuable negative feedback on (mitigating) climate change. The research action should conduct exploratory research into potentially new habitats emerging that could yield both mitigation and biodiversity benefits, if appropriately managed. Among the emerging habitats that should be tested in terms of their emerging role in carbon storage and sequestration, with the aim of understanding of carbon sink balances and climate change–feedback variability and reduce uncertainty in model projections, are: blue carbon change with sea ice losses; blue carbon gains from glacier retreat along fjords (fjordic blue carbon, i.e. seabed biological carbon gains as a result of recent rapid glacier retreat along fjords); blue carbon gains from ice shelf losses through opening up of productive new habitat and leaving nutrient-fertilized wakes of enhanced productivity; slight increases in sea temperature may also increase polar blue carbon; blue carbon around Antarctica is increasing with climate change, and the productivity within emerging fjords is likely to further increase with age and seasonal sea ice loss; snow and ice retreat in the subarctic and subantarctic; marine ice losses that create new polar continental shelf habitat across millions of km2 and doubling seabed carbon stocks in 25 years; fjords that have become exposed by glacier retreat (fjords are hotspots for the burial and storage of organic carbon and for their potential to provide an important long-term global climate regulation service); massive coastal embayment emerging as a result of giant iceberg breakout from ice shelves; new and intense phytoplankton blooms around the Southern Ocean which have doubled carbon storage by seafloor organisms in the last 25 years; marine ice loss in the Arctic; macroalgal particulate organic carbon sinks; changes in primary production in open Arctic waters; loss of pagophilic (ice-dependent) species and lower albedo, macroalgae, bivalves; species yet to be discovered in polar and deep-ocean ecosystems; relatively inaccessible habitats; novel approaches to secure carbon stocks in the face of fishing disruption (e.g., through changes in target species, gear, target areas).The action should build on existing and novel datasets (in-situ and satellite) to gather

[357] Proposal for a Regulation of the European Parliament and of the Council on nature restoration, COM(2022) 304 final, 22.06.2022

carbon information on stocks and accumulation, carbon characteristics (source, lability), change under pressures from human activities if not protected, the potential for carbon sequestration and associated timescales, understanding of carbon dynamics, framework and criteria to integrate these considerations and predictive tools to investigate management scenarios at appropriate scales, including displacement and trade-offs. The action should identify the key characteristics that led to the selected ecosystem and habitat to be considered a hotspot for blue carbon (i.e. geomorphology, physical-chemical characteristics, anthropogenic manipulation, sea level rise effects, etc.).

The action should also identify and recommend best suited, fit-for-purpose, climate smart and resilient and locally informed actions, initiatives and activities to protect, sustainably manage, restore, and enhance these newly emerging European and polar blue carbon habitats and assess the impact of anthropogenically induced activities that lead to the disturbance, degradation and destruction of these habitats and assess the synergies and trade-offs of protection vs. no action.

For **both options (A & B)**, international cooperation is strongly encouraged, with a strong linkage with the ongoing activities under the All-Atlantic Ocean Research and Innovation Alliance.

Proposals should include a dedicated task, appropriate resources and a plan on how they will collaborate with the other project funded under this topic, and ensure synergy with relevant activities carried out under other initiatives in Horizon Europe, and the EU Polar Cluster. Actions should build upon and link with Horizon projects (in particular project funded under the calls HORIZON-CL6-2022-CLIMATE-01-02:Understanding the oceanic carbon cycle, HORIZON-CL6-2021-BIODIV-01-03: Understanding and valuing coastal and marine biodiversity and ecosystems services, HORIZON-CL6-2022-BIODIV-01-01: Observing and mapping biodiversity and ecosystems, with particular focus on coastal and marine ecosystems, HORIZON-CL6-2021-CIRCBIO-01-09: Unlocking the potential of algae for a thriving European blue bioeconomy, HORIZON-MISS-2021-OCEAN-02-01: European Blue Parks, HORIZON-MISS-2022-OCEAN-01-07: Integration of biodiversity monitoring data into the Digital Twin Ocean, EU PolarNET2), the Copernicus marine service, Sustaining Arctic Observing Networks (SAON), Scientific Committee on Antarctic Research (SCAR) and Southern Ocean Observing System (SOOS), and international Ocean Observing Initiatives. The R&I needs to be conducted in a multidisciplinary and ecosystem-based approach.

This topic is part of a coordination initiative between the European Space Agency and the European Commission on Earth System Science. Under the initiative, both institutions aim at coordinating efforts to support complementarities between the Horizon Europe and the European Space Agency FutureEO programmes, and their projects. Proposals under this topic should address networking and collaborative research activities with relevant European Space Agency actions. In particular, the European Space Agency will contribute to this topic with existing and planned projects focused on enhancing the observation capacity and understanding from satellite EO technology of carbon sinks and stocks in marine and polar

ecosystems[358]. Relevant European Space Agency activities will be implemented under the A) Ocean Science Clusters (eo4society.esa.int/communities/scientists/esa-ocean-science-cluster), B) the Biodiversity Science Clusters (eo4society.esa.int/) and C) the Polar Science Cluster (eo4society.esa.int/communities/scientists/esa-polar-science-cluster). Proposals should address the collaboration with ongoing or future European Space Agency projects, including those that will be funded through dedicated coordinated invitations to tender, and should towards this end include sufficient means and resources for effective coordination. Applicants are encouraged to contact the European Space Agency to organise the joint European Commission - European Space Agency work. Collaboration with the relevant existing European Research Infrastructures is encouraged.

All in-situ data collected through actions funded from this call should follow INSPIRE principles and be available through open access repositories supported by the European Commission (Copernicus, GEOSS, and EMODnet).

Synergies and complementarities with projects funded under topics: HORIZON-CL5-2024-D1-01-07: Quantification of the role of key terrestrial ecosystems on the carbon cycle and related climate effects; HORIZON-CL5-2023-D1-02-02: EU-China international cooperation on blue carbon; Mission Restore our Ocean and Waters by 2030 (HORIZON-MISS-2021-OCEAN-02-01: European Blue Parks, HORIZON-MISS-2021-OCEAN-02-03: Atlantic and Arctic basin lighthouse - restoration of marine and coastal ecosystems and increased climate resilience, HORIZON-MISS-2022-OCEAN-01-01: European Blue Parks – Protection and restoration solutions for degraded coastal and marine habitats, HORIZON-MISS-2022-OCEANCLIMA-01-01: Mission Climate adaptation and Mission Ocean and waters - Joint demonstration for coastal resilience in the Arctic and Atlantic sea basin).

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

HORIZON-CL6-2023-CLIMATE-01-4: Demonstration network on climate-smart farming – linking research stations

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 20.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 20.00 million.
Type of Action	Research and Innovation Actions
Eligibility	The conditions are described in General Annex B. The following

[358] Dedicated ESA invitation to tenders to be launched in 2023 and 2024 for each of the clusters will be published in the ESA-STAR Tender publication system (https://esastar-publication-ext.sso.esa.int).