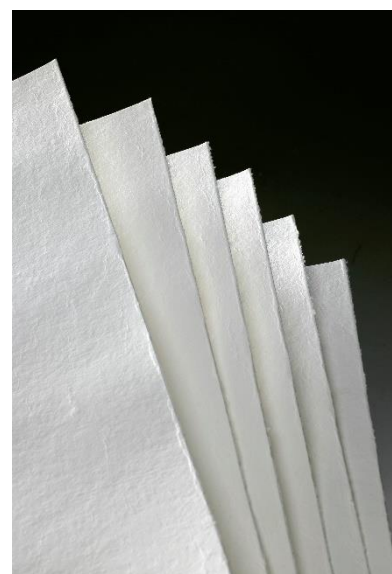


# FTP CALL TOPICS MANUAL HORIZON EUROPE 2023-2024

The complete manual for the Call topics relevant for  
the pulp & paper sector



Version 1.0 – 16/12/2022

Forest-based Sector  
Technology Platform



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## Introduction

Horizon Europe (2021-2027) with its dedicated budget of around €95 billion is the biggest EU Research and Innovation programme ever.

Horizon Europe is structured into three main Pillars. The first pillar focuses on the funding of excellent science through the European Research Council and the Marie Skłodowska-Curie grants programme. It also funds European research infrastructures, like CERN.

Pillar II addresses global challenges and the competitiveness of the European industry. Pillar II is divided into 6 thematic sub-budgets that are called Clusters.

Pillar III focuses on innovation and acts mainly through the European Innovation Council and the European Institute of Technology.

For the stakeholders of the Forest-based sector Technology Platform (FTP), the most relevant funding opportunities are found under Pillar II, Clusters 4, 5 and 6. There are funding opportunities under Pillar I and Pillar III too, but the Calls are not included in this document.

Cluster 4 is called 'Digital, Industry and Space', Cluster 5 is called 'Climate, Energy and Mobility', and Cluster 6 has the rather long title 'Food, Bioeconomy, Natural Resources, Agriculture and Environment'. Each Cluster has a budget for specified topics to be funded, called a Work Programme. They describe hundreds of Call Topics (calls for proposals) for a period of two, or sometimes three years.

There is also something called European Missions, for instance the European Mission on Soil Health. Missions have a separate Work Programme and some topics in this manual relates to this Work Programme.

Another special group of exceptions are the European Partnerships. The reader will see that we refer to some of them, e.g. Built4People Partnership, and Circular Biobased Europe JU (CBE JU) in this document. Some of the Partnerships, e.g. CBE JU, will have their own Work Programmes and are not available yet. Future Calls will have to be published separately.

### **FTPs Call Topic Manual covers the relevant Call Topics of the 2023-2024 Work Programmes for Clusters 4, 5 and 6 and European Missions and Partnerships**

The Horizon Europe budget is distributed by competitive Calls for Proposals. This means that in order to get money from the programme, applicants must submit proposals that will be evaluated and scored by external experts. This is a competition and only the best scoring proposals will be funded under each Call Topic/Call for Proposals.

The proposals, if they are funded, are annexed as part of the contract between the applicants and the European Commission. A proposal could be compared to a business plan of a start-up company. If the proposals are funded or not will depend on how they are ranked in the evaluation by independent experts. The scoring is based on three main criteria; **Excellence** (how ambitious is the proposal, is the idea sound, is the proposal actually covering the scope of the Call, etc), **Impact** (how will the outcomes of the project contribute to the objectives of the Call and relevant EU objectives), and **Quality and efficiency of the implementation** (is the project well planned in terms of budget, are all the reports and deliverables relevant and well described, Are the project milestones relevant and are there contingency plans prepared if the project run into problems). Although all three criteria are scored equally, the Impact criteria is usually considered the most important of the three.

This FTP Call Topic Manual showcases a list of the most relevant call topics for the forest-based sector. Each call topic describes the specific scope and challenge to be addressed by the applicants, as well as the expected impacts to be achieved by the project proposed. The topics selected and compiled in this manual are arranged with the link to the corresponding Research and Innovation Areas [of FTP's Strategic Research and Innovation Agenda for 2030 \(SIRA 2030\)](#).

Proposals can be submitted electronically through the European Commission's [Funding and Tenders Portal](#). The complete list and description of Calls and further guidance to submit a proposal are also published on this Web Portal.

Preparing a proposal takes time and effort. By this version of the FTP Call Topics Manual, we wish to give our members the advantage of an early start.

The texts we have analysed for this document constitute about 2000 pages text and several hundreds of Call Topics. We have identified approximately 100 of those Call Topics as relevant for different stakeholders in the forest-based sector.

**The Call Topics in this Manual will also be made available in the [FTP Research Database](#).**

## Budget for 2023–2024: Call topics relevant for the Pulp & Paper sector

	Number of Calls	Funding (million EUR)
<b>Cluster 4 – Digital, Industry and Space</b>	<b>11</b> (1 Indirect)	<b>328,67</b>
Destination 1 - Climate neutral, circular and digitised production	8 (1 indirect)	235,67
Destination 2 - Increased autonomy in key strategic value chains for resilient industry	3	93
<b>Cluster 5 – Climate, Energy and Mobility</b>	<b>6</b> (2 Indirect)	<b>89</b>
Destination 1 - Climate sciences and responses for the transformation towards climate neutrality	1	10
Destination 3 - Sustainable, secure and competitive energy supply	3	55
Destination 4 - Efficient, sustainable and inclusive energy use	2 (indirect)	24
<b>Cluster 6 – Food, Bioeconomy, Natural Resources, Agriculture and Environment</b>	<b>14</b> (1 Indirect)	<b>123</b>
Destination 3 - Circular economy and bioeconomy sectors	8	84
Destination 4 - Clean environment and zero pollution	5	34
Destination 6 - Resilient, inclusive, healthy and green rural, coastal and urban communities	1 (indirect)	5
<b>Total all Calls</b>	<b>31 Calls</b> (4 indirect)	<b>540,67 mln EUR</b>
<b>Total (High, Medium, Low)</b>	<b>27 Calls</b>	<b>493,67 mln EUR</b>



## **How to read this manual: The Call Topic Headers**

For each Call Topic, we provide in the header key information such as the Call publication date, application deadline(s), Call budget, recommended EU funding per project, starting TRL and ending TRL (TRL=Technology Readiness Levels).

Further on, to assist the reader to find their way to the Call Topics of highest relevance to them, we have introduced a few concepts in the header of each Call Topic: FTP Subsector, Relevance, Keywords, “FTP Comment” and “FTP SIRA 2030”.

### **FTP Subsector: F&F, WW, P&P + Biodiversity, Bioenergy, Policy**

This manual makes a basic classification of the forest-based sector into three subsectors: forests and forestry, pulp & paper industries, and woodworking industries.

In many cases, the scope of the Call Topic is relevant to actors in more than one subsector and if the scope covers, chain-of custody, life-cycle analysis, circular economy etc, we have included the whole value-chain, i.e., all three subsectors in this identification.

Forests and Forestry (abbreviated F&F): Sustainable forest management, forest-related sciences, remote sensing technologies, plant breeding and much more.

WoodWorking Industries (abbreviated WW) includes sawmilling, building with wood, wood manufacturing, boards, panel industry, carpentry, wood composite products like CLT, construction, reuse and recycling and much more.

Pulp & Paper Industries (abbreviated P&P): packaging, paper, biocomposites, biochemicals, hygiene and healthcare products, nanocellulose, foams, gels, recycling and reuse and much more.

### **Relevance: High, Medium, Low, Indirect**

High relevance is used when the Call Topic is specifically targeting an area of the forest-based sector, or when it is targeting a broader context but addresses a challenge of very high relevance to the sector.

Medium relevance is used when the Call Topic is relevant but the scope is encompassing for instance agriculture AND forestry, or process industries in general.

Low relevance is used when the topic is either covering a very narrow, special niche of the forest-based sector (e.g. New biocompatible healthcare products), or when the scope is broadly relevant to a much larger group of actors (e.g. a topic on transport and logistics solutions).

Indirect relevance is used when the actors in the forest-based sector should keep an eye of future outcomes, but the Call Topic is unlikely to be addressed by FTP stakeholders. For instance, projects related to standardisation of earth observation data from satellites or studies of climate change effects on biodiversity.

**Keywords** are selected from the Call Topic description.

**FTP Comment:** We share some of our own reflections and recommendations on the call topics which might help when deciding if to prepare an application or not, or when preparing the application.

**FTP SIRA 2030:** Here we identify which of the ten Vision Targets and the related Challenges identified in the FTP Strategic Research and Innovation Agenda 2030 that could be considered addressed by the call topic.

10 Visions Targets and Challenges of SIRA 2030:

1	Sustainable forest management, biodiversity and resilience to climate change
1.A	Capitalizing on the interdependencies between forest management and functional diversity
1.B	Strengthening forest ecosystem resilience and fostering Climate Smart Forestry
1.C	Enhancing the vital role of forests in regional and continental water supply
1.D	Mitigating wildfire risks in forested landscapes
1.E	Improving the partnership with citizens
2	Increased, sustainable wood production and mobilization
2.A	Improving seeds, seedlings and plants to increase productivity and resilience
2.B	Using digital revolution for precision forestry
2.C	Empowering small-scale forest owners
2.D	Harnessing novel technologies and automation in forest operations
2.E	Analysing and foresighting markets and material flows of forest-based products
3	More added value from non-wood ecosystem services
3.A	Improving business opportunities for non-wood forest products
3.B	Enhancing value creation with other ecosystem services
3.C	Providing forest-based benefits for urban and peri-urban societies
3.D	Identifying the benefits of forest expansion as a consequence of land-use change
3.E	Innovation in forest governance to promote forest-based benefits for society
4	Towards a zero-waste, circular society
4.A	Optimizing material recovery through efficient collection, sorting and separation
4.B	Adapting reuse and recycling technologies to complex products
4.C	Defining methods for cost assessment and optimization of recycling
4.D	Boosting the circularity of forest fibres and wood products
5	Efficient use of natural resources
5.A	Reducing energy consumption in biorefineries, including pulp and paper mills
5.B	Optimizing the use of raw materials by exact control of natural variations
5.C	Improving raw material efficiency and production value in wood-based manufacturing
5.D	Improving water balance and process water treatment
6	Diversification of production technologies and logistics

- 6.A Developing industrial symbiosis
- 6.B Creating new biorefinery concepts for the circular and biobased economy
- 6.C Adopting additive manufacturing technologies and new production methods
- 6.D Extracting and producing natural compounds with high added value
- 6.E Improving traceability and chain-of-custody throughout the value chain
- 6.F Integrating autonomous and/or electrified harvesting and transportation systems
- 7 Purposeful, safe jobs and links between rural and urban regions
- 7.A Growing the forest-based sector through creative jobs
- 7.B Creating job opportunities along the value chain through proactive management of small forest ownerships
- 7.C Developing new marketplaces and jobs in response to changing consumer trends
- 7.D Adapting job offers in an era of Artificial Intelligence (AI)
- 7.E Improving operator safety and ergonomics
- 8 Renewable building materials for healthier living
- 8.A Developing new building systems, including modular and pre-fabricated systems
- 8.B Improving wood-based products, including engineered wood and composites
- 8.C Harmonization and standardization research and more intelligent, digital design tools
- 8.D Exploring the experience of living with wood and its health benefits
- 9 New fibre-based products and 80 per cent lower CO2 emissions
- 9.A Providing sustainable, fibre-based, high-value consumer products
- 9.B Developing more sustainable and competitive processes for paper-making and other biobased products
- 9.C Developing building blocks for biobased materials and chemicals in the circular society
- 9.D Adding value through digitalization and functionalization
- 10 Renewable energy for society
- 10.A Developing new, efficient production systems for advanced, clean biofuels and chemicals
- 10.B Enhancing the valorization of forest residues
- 10.C Establishing integrated and holistic energy systems (including energy storage and managing demand fluctuations)
- 10.D Supporting fact-based decision-making on bioenergy-related issues

*DISCLAIMER: Please be aware that only the officially published Work Programme (WP) text, budget and deadlines should be taken as a reference for any proposal preparation. All applicants should consult the Funding and Tenders Portal to find the latest version.*

## Pillar II : Global challenges and European industrial competitiveness Pillar

### Cluster 4: Digital, Industry and Space<sup>1</sup>

#### Destination 1: Climate neutral, circular and digitised production

This destination will directly support the following Key Strategic Orientations, as outlined in the Strategic Plan:

- KSO C, '**Making Europe the first digitally led circular, climate-neutral and sustainable economy** through the transformation of its mobility, energy, construction and production systems.'
- KSO A, '**Promoting an open strategic autonomy by leading the development of key digital, enabling and emerging technologies, sectors and value chains** to accelerate and steer the digital and green transitions through human-centred technologies and innovations.'
- KSO D, '**Creating a more resilient, inclusive and democratic European society**, prepared and responsive to threats and disasters, addressing inequalities and providing high-quality health care, and empowering all citizens to act in the green and digital transitions.'

Proposals for topics under this Destination should set out a credible pathway to the following expected impact of Cluster 4:

**Global leadership in clean, climate-neutral and resilient industrial value chains, circular economy and climate-neutral and human-centric digital systems and infrastructures**, through innovative production and manufacturing processes and their digitisation, new business models, sustainable-by-design advanced materials and technologies enabling the switch to decarbonisation in all major emitting industrial sectors, including green digital technologies.

This Destination will contribute to putting the European Union and Associated Countries on track for achieving climate neutrality of the industrial sector by 2050, while also reducing other polluting emissions, and for speeding up Europe's independence from Russian fossil fuels, in line with the REPowerEU Plan, by means of cleaner, more efficient and more sustainable industrial processes.

<sup>1</sup> [Work Programme published by the European Commission on 6 December 2022](#)

The speed and scale of the twin green and digital transitions has accelerated, and significant opportunities lie ahead to position the European Union and Associated Countries as a technological and industrial leader of this transition, building on their world class R&I capacities and industrial base. Industrial ecosystems will not only need to develop, but also deploy technologies and reshape their goods and services towards a new reality, ensuring that industry can become the accelerator and enabler of the twin green and digital transition. It will also enhance the Union's open strategic autonomy with regard to the underlying technologies.

To achieve these goals, the activities in this Destination are complementary to those in Destination 'Increased Autonomy in Key Strategic Value Chains for Resilient Industry'.

The most relevant policies of the European Commission on this front are:

- The [European Industrial Strategy of March 2020](#), and in particular the [Update of May 2021](#): there is now a renewed momentum in the EU to tackle its strategic dependencies as well as to boost its resilience across key strategic areas. The Covid-19 crisis revealed the importance of improving production response and preparedness of EU industry, in support of its long-term competitiveness.
- The [Digital Decade](#) of March 2021, where the Commission presented a vision, targets and avenues for a successful digital transformation of Europe by 2030.
- The [Circular Economy Action Plan](#) of March 2020 announced initiatives along the entire life cycle of products. 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 EU economy for as long as possible.
- The [Fit for 55 Package of July 2021, delivering the EU's 2030 Climate Target on the way to climate neutrality](#), given the process industries' 20% share of global greenhouse gas emissions.
- The [Zero Pollution Action Plan](#) of May 2021 addresses both pollution and waste, where research needs could be tackled and is particularly relevant to advanced materials and the process industries, as well as to the manufacturing industry.

The topics serving the objectives of this destination are structured as follows:

- **Manufacturing Industry**

The implementation of the Green Deal has major repercussions for manufacturing.

Products and related value chains need to be made circular, carbon-neutral and regenerative – in other words, industry has to make positive contributions to the environment and to society, and offer a negative carbon footprint for future products. Manufacturing is expected to be a key driver in this transformation of industry. Current challenges addressed in this work programme include bio-intelligent manufacturing; high-precision and complex-product manufacturing; circularity and remanufacturing; collaborative distributed manufacturing and business models close to the customers, including Manufacturing as a Service, to enable the evolution from the ‘smart factory’ to the ‘smart value network’.

This industrial revolution should not be to the detriment of workers. The lack of appropriate skills in manufacturing is becoming a concern in many sectors, opening the opportunity for the use of breakthrough innovative technologies to make manufacturing jobs more attractive; and more broadly to ensure that manufacturing provides prosperity beyond jobs, while respecting planetary boundaries.

- **A new way to build**, accelerating disruptive change in construction

The construction industry needs to improve its productivity and competitiveness, and upskill its workforce. Its transition pathway depends on greater digitalisation, resilience and resource efficiency across the board. This need has been heightened by recent rising demand following the pandemic, pressure to maintain and repair works and to address hazardous substances.

- **Energy efficient and climate neutral process industries**

From the R&I perspective, climate neutrality by 2050 should be the starting point for any action paving the way to a regenerative industrial transformation. The International Panel on Climate Change (IPCC) report on climate mitigation, released in April 2022,<sup>4</sup> points out that the goal of net-zero GHG emissions for industry is challenging but possible. It will need coordinated action throughout value chains to promote all mitigation options, including energy and materials efficiency, circular material flows, as well as abatement technologies and transformational changes in production processes.

In this context, the process industries' climate neutrality goal is strongly related to the objectives of becoming independent on fossil fuel and fossil fuel imports. To reach these objectives, production processes need to be energy efficient, implying advanced digitisation; renewable energies need to be integrated via electrifications or use of hydrogen; and abatement technologies including CCU for processes that are hard to decarbonise need to be further developed.

This Work Programme refers to the operational objectives of the Processes4Planet partnership, found in the respective Memorandum of Understanding.<sup>5</sup>

- **Circularity and Zero Pollution in process industries**

Energy-intensive industries need to embrace the circular economy and restorative feedback loops, not as an afterthought but as a key pillar of the design of entire value chains. In this context the [Chemicals Strategy](#) for Sustainability, which aims to better protect citizens and the environment whilst boosting the innovation for safe and sustainable chemicals, and its related Strategic Research and innovation agenda are also key. Energy-intensive industries need to commit to engage in Hubs for Circularity and to adopt new collaborative circular business models. There is also a clear space to increase the circularity of industrial wastewater, in symbiosis with urban wastewater, recycling a much higher share of the water, including from the municipal sector to industry and valorising more components in the wastewater.

The **Hubs for Circularity (H4C)** will be a key instrument to advance the research and innovation agenda of European industries towards the Green Deal's objectives. The H4Cs will implement a collection of industrial -urban symbiosis and circularity technologies at scale, which will lead to first-of-a-kind, lighthouse demonstrator plants of (near) commercial size implementing industrial symbiosis and/or urban industrial symbiosis. Starting from existing industry cluster or heavy industrialized urban areas, their aim is to collectively achieve and demonstrate at scale a leap towards circularity and carbon neutrality in the use of resources (feedstock, energy and water) in a profitable way involving all stakeholders (Industry, SMEs, local authorities, educational institutions and civil society). It is a new way to re-imagine the whole value chain in a cross-sectorial and collaborative way exploiting synergies and anchoring in the local ecosystem to optimize the incoming resources including investments. It is about building on creativity, digital tools, AI, and breakthrough technologies for implementing cost-optimal pathways and new value chains for the engineering of a net-zero circular economy.

Projects outcomes will enable achievement of the objectives of Processes4Planet partnership by demonstrating hubs for circularity (H4Cs) concepts<sup>6</sup>, fostering circularity within and beyond process industries and driving the partnership's innovation portfolio towards "First of a kind" demonstrators to de-risk investment for subsequent roll-out. (P4Planet operational objectives 8 and 9).

- **Clean Steel**

Related to the objectives for energy-intensive industries in general, the steel industry will



be enabled to reduce its GHG emissions to the Fit for 55 targets, in particular contributing to fulfilling the new obligations foreseen in the revised ETS Directive to prepare for transition to climate neutrality and to take new pathways towards Circular Economy concepts.

**Business cases and exploitation strategies for industrialisation:** This section applies only to those topics in this Destination, for which proposals should demonstrate the expected impact by including a *business case and exploitation strategy for industrialisation*.

The *business case* should demonstrate the expected impact of the proposal in terms of enhanced market opportunities for the participants and deployment in the EU, in the short to medium term. It should describe the targeted market(s); estimated market size in the EU and globally; user and customer needs; and demonstrate that the solutions will match the market and user needs in a cost-effective manner; and describe the expected market position and competitive advantage.

The *exploitation strategy* should identify obstacles, requirements and necessary actions involved in reaching higher TRLs (Technology Readiness Levels), for example: matching value chains, enhancing product robustness; securing industrial integrators; and user acceptance.

For TRL 7, a credible strategy to achieve future full-scale deployment in the EU is expected, indicating the commitments of the industrial partners after the end of the project.

Where relevant, in the context of **skills**, it is recommended to develop training material to endow workers with the right skillset in order to support the uptake and deployment of new innovative products, services, and processes developed in the different projects. This material should be tested and be scalable, and can potentially be up-scaled through the European Social Fund Plus (ESF+). This will help the European labour force to close the skill gaps in the relevant sectors and occupational groups and improve employment and social levels across the EU and associated countries.

In order to achieve the expected outcomes, for particular topics **international cooperation** is not mandatory but advised with some regions or countries, to get internationally connected and add additional specific expertise and value to the activities.

To achieve wider effects **activities beyond R&I investments** will be needed. Three **co-programmed partnerships** will enhance dissemination, community building and foster spillover effects: **Made in Europe** for the manufacturing industries; and **Processes4Planet** and **Clean Steel** for the energy-intensive industries. Wider activities include the further development of skills and competencies (also via the European Institute of Innovation and Technology, in particular EIT Manufacturing, EIT Digital and EIT Climate-KIC); and the use of financial products under the InvestEU Fund for further



commercialisation of R&I outcomes. For the energy-intensive industries in particular, links with the Innovation Fund are important.

**Synergies:**

For advanced manufacturing in general, synergies are necessary between the Made in Europe Partnership and the Digital Europe Programme, primarily Industrial Data Spaces, Cybersecurity Centres and European Digital Innovation Hubs.

Related to the construction activities, Cluster 5 addresses the energy performance of buildings, under the destination 'Efficient, sustainable and inclusive energy use', as well as the Built4People co-programmed partnership for a 'people-centric sustainable built environment'.

For the energy-intensive industries, there are synergies for energy efficiency and the management of thermal energy in industry in Cluster 5, under 'Industries in energy transition'; and with the Clean Hydrogen partnership.

As some necessary activities of the energy-intensive industries, such as first-of-a-kind plants, involve deployment beyond TRL 7, synergies with other EU programmes are essential in this context, in particular with the Innovation Fund, with the Life Plus Programme, and with the activities of the EIB. International cooperation in process industries will be strengthened through Mission Innovation 2.0 'Net zero Industries'.

**Innovation Actions** — Legal entities established in China are not eligible to participate in Innovation Actions in any capacity. Please refer to the Annex B of the General Annexes of this Work Programme for further details.

## Call – Twin green and digital transition 2023

### Energy Intensive Process Industries

Topic ID and title	<a href="#">HORIZON-CL4-2023-TWIN-TRANSITION-01-31: Energy efficiency breakthroughs in the process industries (Processes4Planet partnership) (RIA)</a>				
Budget	EUR 32 million	Opening date	08 December 2022	Deadline 1	20 April 2023
Budget per project	EUR 8 to 10 million			Deadline 2	/
Type of action	Research and Innovation Actions (RIA)				
FTP subsector	P&P				
Keywords	Energy efficiency				
FTP comments	This topic under the Processes4Planet Partnership is open to many sectors and activities, so competition will probably be high. However, the topic is of high importance to P&P process industries.				
FTP SIRA 2030 Challenges addressed	5A, 9B	FTP relevance		Medium	
		Starting TRL		4	
		End TRL		6	

#### Expected Outcome:

Projects outcomes will enable achievement of the objectives of Processes4Planet partnership by designing and digitising industrial processes for a maximum energy efficiency, ensuring process flexibility and capturing the full potential of renewable energy (related to P4Planet operational objectives 1 and 5).

Projects are expected to contribute to the following outcomes:

- Increase the energy efficiency of energy intensive industrial processes by reducing energy use by at least 30% and the process as compared to current state of the art;
- Enable the techno-economic feasibility of novel technologies and processes, validated and demonstrated at suitable scale against state of the art of industrial processes;
- Enable the potential of an increased use of renewable energy;
- Contribute to achieving EU climate neutrality goal and becoming independent from fossil fuel and fossil fuel imports as put forward in the REPowerEU Plan.

#### Scope:

To decarbonise the energy-intensive industries both, the availability of affordable renewable energy, and the increase of the industrial processes energy efficiency, will be needed. Today's energy efficiency improvements in conventional plants are about 1-2%

annually. The use of digital technologies in process optimisation has the potential to further reduce this energy demand. However, digital technologies alone cannot achieve the required change in the process industries' energy efficiency, the combination of digital technologies with highly energy efficient process breakthroughs is required.

Proposals under this topic should:

- Focus on the development of highly efficient technological breakthroughs for the innovation of the most energy intensive parts of specific processes;
- Demonstrate the decrease in energy intensity of output level (intermediate, final product);
- Integrate novel digital technologies from the fields of distributed process control and data driven AI based optimisation;
- Demonstrate and evaluate energy efficiency gains, where relevant in optimal interaction with energy flexibility and integration of renewables.

The proposals should include energy efficiency, techno-economic and life-cycle assessments considering the overall process.

Proposals submitted under this topic should include a business case and exploitation strategy, as outlined in the introduction to this Destination.

Proposals should build on or seek collaboration with existing projects and develop synergies with other relevant European, national or regional initiatives, funding programmes and platforms. Proposals are encouraged to consider outcomes from the projects carried out in the call DT-SPIRE-06-2019: Digital technologies for improved performance in cognitive production plants.

This topic implements the co-programmed European partnership Processes4Planet.

Topic ID and title	<a href="#">HORIZON-CL4-2023-TWIN-TRANSITION-01-33: Electrification of high temperature heating systems (Processes4Planet Partnership) (IA)</a>				
Budget	EUR 35,67 million	Opening date	08 December 2022	Deadline 1	20 April 2023
Budget per project	EUR 12 to 15 million			Deadline 2	/
Type of action	Innovation Actions (IA)				
FTP subsector	P&P				
Keywords	electrification, process flexibility, renewable energy				
FTP comments	This topic under the Processes4Planet Partnership is open to many sectors and activities, so competition will probably be high. However, the topic could offer financing for electrification strategies of the P&P process industries.				
FTP SIRA 2030 Challenges addressed	5A, 6A	FTP relevance		Low-Medium	
		Starting TRL		5	
		End TRL		7	

### Expected Outcome:

Projects outcomes will enable achieving the objectives of the Processes4Planet partnership, and the transition of the process industry towards climate neutrality, by developing new electrified processes, ensuring process flexibility, and capturing the full potential of renewable energy (related to P4Planet operational objective 1).

Projects are expected to contribute to the following outcomes:

- Demonstrate the use of advanced electric heating technologies for high temperature demand systems in the process industry;
- Prove the effectiveness of the technologies towards GHG emission avoidance;
- Reduce process emissions of high temperature heating systems by at least 30% compared to current state of the art levels of the process with fossil-based heating system;
- Enable the integration of renewable electricity in the process industries to substitute fossil fuels for heating, thereby contributing to the independence from fossil fuel and fossil fuel imports as put forward in the REPowerEU Plan;
- Showcase the scalability and the cost efficiency of the proposed solutions;
- Enable the economic viability of the entire unit to compete with the existing state of the art of fossil-based heating systems and increase of the competitiveness and resilience of the European process industry.

### Scope:

High temperature (over 400 °C) industrial heating systems, powered by fossil fuel combustion, are responsible for 20% of process industries GHG emissions. The topic focuses on the sustainable electrification of high temperature heating systems, for example, industrial furnaces, kilns and crackers among others. Electrification of these heating systems with renewable electricity could represent a major reduction of the related GHG emissions.

The proposals should:

- Integrate existing highly efficient technologies, e.g., induction heating, hybrid operation between electric heating and zero-carbon fuel heating microwave and plasma technologies, electric resistances, and/or the combination with digital technologies or hybrid modelling; this may include the development of high temperature heat storage for flexible usage of electricity (load shifting) or renewable electricity production (production fluctuation);
- Take a holistic approach which may include aspects such as advanced materials requirements and appropriate equipment design;
- Improve the process safety, flexibility, and ease of process control;
- Showcase the improved performance through at least one realistic use case that can be replicable in more than one process industry sector with demonstrable economic return.

The inclusion of a GHG avoidance methodology is recommended and should provide detailed descriptions of baselines and projected emissions reduction.

Proposals submitted under this topic should include a strong business case and sound exploitation strategy, as outlined in the introduction to this Destination. As a project output a more elaborated exploitation plan should be developed including preliminary plans for scalability, commercialisation, and deployment (feasibility study, business plan and financial model) indicating the possible funding sources to be potentially used (e.g., Innovation Fund, InvestEU, ESIF). Societal and environmental impact and implications for the workplace (such as skills, organisational change) should be outlined.

Research must build on existing standards or contribute to standardisation. Where relevant, interoperability for data sharing should be addressed.

Proposals should build on or seek collaboration with existing projects and develop synergies with other relevant European, national or regional initiatives, funding programs and platforms and are encouraged to consider the use of their expected outcomes in a wider approach that might benefit the establishment of Hubs for Circularity.

This topic implements the co-programmed European partnership Processes4Planet.

## A new way to build, accelerating disruptive change in construction

Topic ID and title	<a href="#">HORIZON-CL4-2023-TWIN-TRANSITION-01-36: Modelling industry transition to climate neutrality, sustainability and circularity (Processes4Planet Partnership) (RIA)</a>				
Budget	EUR 13 million	Opening date	08 December 2022	Deadline 1	20 April 2023
Budget per project	EUR 6 to 7 million			Deadline 2	/
Type of action	Research and Innovation Actions (RIA)				
FTP subsector	P&P				
Keywords	Modelling tools, Scenarios, Climate Neutrality, Process Industries				
FTP comments	This topic under the Processes4Planet Partnership will mainly engage the research community. However, it is important that a representative of the P&P process industries is participating in project, to provide accurate and relevant input to the scenario building.				
FTP SIRA 2030 Challenges addressed	4, 5	FTP relevance		Indirect	
		Starting TRL		/	
		End TRL		/	

### Expected Outcome:

Processes4Planet's Horizon Europe public private partnership ambition is to achieve a profound change in the way the materials that citizens need to sustain their quality of life are produced. Processes4Planet is about transforming European process industries to make them circular and achieve overall climate neutrality at EU level by 2050, while enhancing their global competitiveness. Modelling capacity and scenarios are needed to chart the pathways towards climate neutrality. Projects outcomes will enable the achievement of the objectives of Processes4Planet partnership by contributing to new framework conditions to generate a market for climate neutral and circular solutions (related P4Planet operational objective 10). They will support EU climate ambitions and, following the International Panel on Climate Change (IPCC) report on climate mitigation recommendations, allow for actions throughout value chains to promote all mitigation options, including energy and materials efficiency, circular material flows, as well as abatement technologies and transformational changes in production processes.

Projects are expected to contribute to the following outcomes:

- Development of a model, enhancement of existing modelling tools 30 towards understanding the pathways for industry, and Energy Intensive Industries in particular, to contribute to EU's climate neutrality;
- Modelling of scenarios of possible pathways of how industry, and Energy Intensive Industries in particular, can become climate neutral according to the following five dimensions: (1) their energy demand and use and energy efficiency, (2) their emissions including process emissions; (3) in use of raw materials, chemicals and water (e.g. via increasing the use of circular approaches and material substitution,

also in view of ensuring affordability of industrial products); (4) their production of consumer goods/equipment/construction products (e.g. looking at sustainability of products and embedded carbon – a preliminary approach only); (5) possibility of replacing fossil carbon in materials by more sustainable streams (e.g. recycled carbon from industrial emissions, from waste, sourced from sustainable biomass or directly from the atmosphere);

- Facilitate future EU and national industry, climate and energy policy assessments. Climate neutrality of industry will be a strong priority for the EU and national policies by 2030 and towards 2050 as industry is considered as hard-to-abate sector<sup>32</sup>. Any policy initiatives on the EU or national level will require a robust, forward-looking analytical basis interlinked with macro-economic and energy system trends and such can be provided by modelling;
- Set the climate neutrality transition pathways for process industries in an open and transparent manner via design, modelling, and assessment of pathways for these industries. Modelling exercises can set the framework conditions and project market uptake of transformative solutions and products;
- Enhance the knowledge about climate neutrality pathways for industry and academia as the resulting modelling capacity (model code) and input data should be fully transparent and published under an open-source licencing.

#### Scope:

##### **Development of the model**

Currently the modelling tools to represent EU industry's pathways to climate neutrality are not fully developed. The new modelling capacity should cover historical development starting in 1990 and projections up to 2070 and this for the European Union and Associated Countries altogether and each Member State/country separately as well as for European Economic Area according to the five dimensions outlined in the expected outcomes. Considering that materials, chemicals and goods are sourced and traded globally, or at least regionally, global sourcing and trade has to be captured with relevant granularity and based on exogenous assumptions and/or links with global trade models;. Considering that these industries link with other sectors of the economy, innovative ways have to be found to integrate such capacity in a fully consistent energy system picture and to link it with broader macroeconomic developments (notably as far as demand for industrial products is concerned) and meta-trends such as digitalisation.

The proposals should be built in a modular manner and progressively lead to the development of an integrated modelling capacity allowing to capture the economics and behavioural aspects of demand, production and trade of materials, as well as techno-



economic trajectories of the industrial sectors identified above. That would include (but not necessarily limited to) concepts from system dynamics modelling (for materials flows and stocks), techno-economic modelling (for the economics of production costs, elasticity of demand or trade effects), macro-economic modelling (socio-economics impacts), as well as agent-based modelling (choices of materials or technologies). The proposal should produce first results available for review by the project midterm.

The proposals as a part of its validation and stakeholders' involvement will enable to participate in peer-review processes, scientific conferences and publish in scientific journals and create possibilities for a feedback loop from stakeholders. The modelling capacity should be continuously developed based on the feedback from stakeholders.

### **Modelling of scenarios**

Secondly, the proposals should deploy this new modelling capacity to explore, through the development of several “what if” scenarios, capturing all dimensions mapped above in a consistent way. The scenarios produced with the model should be contrasted but internally consistent in their policy and economic contexts, presenting different pathways for climate neutrality transition in terms of energy needs, addressing the process emissions as well needs and supply of material and technological options to produce the materials in needed quantities. In addition, a preliminary approach for tracing the carbon embedded in products and replacing fossil carbon in materials should be explored.

Proposals should seek cooperation and give input to the Processes4Planet partnership Advisory Committee panels, i.e., “Impact Panel” and as social innovation is concerned, the “Feedback Panel”.

Proposals should build on or seek collaboration with existing projects and develop synergies with other relevant European, national or regional initiatives, funding programmes and comparative tools e.g., the Energy and Industry Geography Lab of the Joint Research Centre.

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

This topic implements the co-programmed European partnership Processes4Planet.

Topic ID and title	<a href="#">HORIZON-CL4-2023-TWIN-TRANSITION-01-37: Hubs for circularity for near zero emissions regions applying industrial symbiosis and cooperative approach to heavy industrialized clusters and surrounding ecosystems (Processes4Planet partnership) (IA)</a>				
Budget	EUR 40 million	Opening date	08 December 2022	Deadline 1	20 April 2023
Budget per project	EUR 15 to 20 million			Deadline 2	/
Type of action	Innovation Actions (IA)				
FTP subsector	WW, P&P				
Keywords	industrial symbiosis, decarbonisation strategies				
FTP comments	By its nature, projects funded under this Call will have many partners from various industry sectors, as well as municipalities and other regional entities. As such, the participation from P&P sector will always be minor. However, projects could support developing efficient and resource efficient cross-sector cooperations. Tip: If you want to apply to this call, take a moment to acquaint yourself with the Hubs4Circularity strategy proposed by the Processes4Planet Partnership.				
FTP SIRA 2030 Challenges addressed	4D – 5C - 6A – 10C			FTP relevance	Low
				Starting TRL	5
				End TRL	7

#### Expected Outcome:

Projects outcomes will enable achievement of the objectives of Processes4Planet partnership by demonstrating hubs for circularity (H4Cs) concepts, fostering circularity within and beyond process industries and driving the partnership's innovation portfolio towards "First of a kind" demonstrators so as to de-risk investment for subsequent roll-out. (P4Planet operational objectives 8 and 9).

Projects are expected to contribute to the following outcomes:

- Achieve a step change in circular utilization of resources within the process industries reducing the use of virgin resources (materials, energy, and water) by at least 20% of reduction as compared to current state of the art;
- Citizens living in proximity of heavily industrialized clusters will benefit from a healthier environment through industrial symbiosis by lowering emissions through circular and renewable energy sources;
- Use industrial symbiosis and cross-sectorial cooperation to pave the way for achieving the EU Green Deal and "Fit for 55" package objectives: providing recommendations for optimized regional framework conditions by highlighting barriers and suitable innovation-oriented policies.

The targets above are meant to be achieved collectively by the region/area where the demonstration is located, not only by consortium members.

### Scope:

An industrial symbiosis, near commercial scale demonstrator, hub should integrate infrastructures (e.g., industrial waste, by-product and water management infrastructure, fluid flow networks, digital infrastructure), and energy networks and grids (e.g., smart operations scheduling, district heat integration, digital power plant including distributed generation, seasonal storage, biomass, and heat pumps integration). Industries involved should boost: their resource efficiency, heat recovery, integration of e renewable energies, use of hydrogen as an energy carrier, and/or support the implementation of CCU locally or prepare for CCS logistics. The proposed demonstrator should comprehensively show how symbiosis and cross-sectorial cooperation can trigger the green transition by sharing resources and infrastructure investments.

Proposals should address the following aspects:

- Develop systemic solutions leading to a Hub for Circularity (H4C) for near zero emissions as described above;
- (Co-)design and adapt existing processes to integrate new solutions (energy and mass flow coupling, infrastructure, and logistics) and to exploit new synergies between sectors;
- Use digital modelling tools and sensing systems as a basis for dynamic resource management, including information on quantities and characterisation of material, component and product streams in view of full integrated LCA;
- Establish IT infrastructures and tools that provide a secure basis for the integrated management and the preservation of confidentiality of sensitive data, it might not be in the same location as the demonstrator and serve the needs of multiple hubs;
- Deploy one Industrial symbiosis near commercial scale demonstrator using renewables as energy sources, including renewable hydrogen as energy carrier, to achieve at least 30% CO<sub>2</sub> reduction when deployed at full scale at the Hub for Circularity and close environment level. This should balance the overall energy consumption with efficiency gains for the Hub for Circularity of at least 10%, including utilisation through cascading heat recovery, smart grid, and digitalised power plants. Optional: in addition, apply or enlarge the use of CCUS (Carbon Capture Utilization and Storage) to the existing local industries; the sustainability gains in energy use should be detailed;
- Plan in detail the replication and adaption of the concept, including the simulation and the business case and exploitation strategy of the First of a Kind hubs, in two to three alternative locations in close cooperation with the relevant local actors;

- Consider when applicable the co-development of industrial decarbonization strategies with heat-nets, i.e., based on a socio-economic optimum in the cascading re-use of waste heat and the supply low temperature process heat to the surrounding ecosystem;
- Use established reporting methodologies for the assessment of industrial symbiosis activities and exchanges including Symbiosis Readiness Levels (SRLs) and best practices established by the H4C European Community of Practice (ECoP). In addition, interact with the ECoP for support, best practice and knowledge exchange on technological and non-technological issue;
- Include a plan to extend the hub to additional parties who also should benefit and multiply the local/regional synergies in the co-implementation of the identified innovations and solutions within the next five years;
- Implement a social innovation action involving at least one of the local community actors and, additional actions to facilitate relations and engage with e local community actors e.g., exchanging knowledge with the educational establishments and developing flexible learning resources.

Proposals submitted under this topic should include a business case and exploitation strategy, as outlined in the introduction to this Destination. As a project output a more elaborated exploitation plan should be developed including preliminary plans for scalability, commercialisation, and deployment (feasibility study, business plan and financial model) indicating the possible funding sources to be potentially used (e.g. Innovation Fund, LIFE, InvestEU, ESIF).

Relevant indicators and metrics, with baseline values, should be stated clearly in the proposal. Research must build on existing standards or contribute to standardisation. Interoperability for data sharing should be addressed.

Clustering and cooperation with other selected projects under this cross-cutting topic and other relevant topics in Horizon Europe as well as building on existing projects is strongly encouraged (see also Industrial Symbiosis and Trends Report from March 2020).

This topic aims to support the goals of the smart cities and climate adaptation missions by contributing to a decrease of harmful industrial emissions while favouring renewable energy sources.

This topic implements the co-programmed European partnership Processes4Planet.

Topic ID and title	<a href="#">HORIZON-CL4-2023-TWIN-TRANSITION-01-40: Sustainable and efficient industrial water consumption: through energy and solute recovery (Processes4Planet partnership) (RIA)</a>				
Budget	EUR 30 million	Opening date	08 December 2022	Deadline 1	20 April 2023
Budget per project	EUR 10 to 12 million			Deadline 2	/
Type of action	Research & Innovation Action (RIA)				
FTP subsector	P&P				
Keywords	water efficiency, wastewater, recycled water, energy, and solute recovery, Digital Twins				
FTP comments	As process water is a critical component in the P&P Industry, the topic is of high value. The focus however, lies many on the waste water and not on reducing process water or drying, which are key bottlenecks for saving energy in the P&P process.				
FTP SIRA 2030 Challenges addressed	5A, D – 9B	FTP relevance		Medium	
		Starting TRL		4	
		End TRL		6	

### Expected Outcome:

Projects outcomes will enable achieving the objectives of Processes4Planet partnership by designing industrial processes for the maximum resource (water) efficiency and developing new process to ensure full valorisation of process industries wastewater, recycled water, energy, and solute recovery (P4Planet operational objectives 5 and 7).

Projects are expected to contribute to the following outcomes:

- Demonstrate sustainable industrial water consumption based on new technologies for energy and solute recovery;
- Enable full circular use of water in process industry thus reducing industry dependence and utilisation of fresh water;
- Enable the techno-economic feasibility of the processes and technologies for water treatment and recycling particularly when combined with energy and waste reduction strategies to compete with the existing state of the art;
- Maximise the recovery of substances and energy present in the wastewater streams;
- Demonstrate contribution to EU climate neutrality goal.

### Scope:

Wastewater discharge from industry has decreased over decades. This is a consequence of increased regulation (e.g., Industrial Emissions Directive, IED; the European Pollutant Release and Transfer Register, E-PRTR), improvements in treatment and the implementation of best available techniques. Amongst process industries, pulp and paper, steel and chemicals have high wastewater discharges. The Processes4Planet target is to demonstrate the potential for

90% of wastewater reuse by 2030. A breakthrough in wastewater reduction could be envisaged, by combining existing technologies and novel water treatment technologies and reuse with process intensification, energy recovery and excess heat use e.g., integrated processes with separation systems will reduce water and energy consumption and the amount of final industrial wastewater produced. In addition, industrial waste waters often contain significant amounts of valuable solutes (e.g., organic matter, salts, phosphates, etc.) which are not optimally valorised.

The proposals should:

- Combine existing and novel water treatment technologies and re-use with process intensification;
- Use in combination smart monitoring technologies including affordable long lasting and reliable sensors and AI driven devices, integrated system risk management models and decision support tools and technologies for water re-use in process industries;
- Seek to integrate advanced digital tools for the optimisation of their process, such as Digital twins;
- Propose new technologies for recovering valuable solutes present in wastewater (metals, organic compounds, etc.) and for eliminating hazardous substances (e.g., micro and nano particles, toxic substances).

The proposals should include energy efficiency, techno-economic and life-cycle assessments considering the overall process. In order to maximize impact, technologies in the proposals should not be focused on one sector, but the proposed solution should be applicable in different types of industries; elements related to the replicability and scalability of the technology should be provided. Proposals are encouraged to consider outcomes from the Horizon 2020 topic CE-SPIRE-07-2020: Preserving fresh water: recycling industrial waters industry.

In addition, the topic could explore synergies with the Ocean and Waters and the Soil missions.

Proposals should build on or seek collaboration with existing projects and develop synergies with other relevant European, national or regional initiatives, funding programmes and platforms. Proposals are encouraged to consider the use of their expected outcomes in a wider approach that might benefit the establishment of Hubs for Circularity.

International cooperation can be considered specially with countries advanced in the field that could bring mutual benefit from different perspectives.

This topic implements the co-programmed European partnership Processes4Planet.

## Integration of Renewable and Electrification in process industry

Topic ID and title	<a href="#">HORIZON-CL4-2023-TWIN-TRANSITION-01-42: Circular economy in process industries: Upcycling large volumes of secondary resources (Processes4Planet partnership) (RIA)</a>				
Budget	EUR 30 million	Opening date	08 December 2022	Deadline 1	20 April 2023
Budget per project	EUR 10 to 12 million			Deadline 2	/
Type of action	Research and Innovation Actions (RIA)				
FTP subsector	P&P				
Keywords	upcycling by-products, secondary resources, data sharing FAIR, waste reduction				
FTP comments	This call focuses on making use of by-products in the process industry. As such it offers a significant opportunity to the P&P industry. The call topic is not limited to the P&P industries, but open to all process industry sectors.				
FTP SIRA 2030 Challenges addressed	5D – 6B, D			FTP relevance	Medium- High
				Starting TRL	4
				End TRL	6

### Expected Outcome:

Projects outcomes will enable the achievement of the operational objectives of Processes4Planet partnership by developing new processes for circularity of secondary materials from wastes/residues for all industrial processes (related to P4Planet operational objective 6).

Projects are expected to contribute to the following outcomes:

- Prove the technical and economic feasibility of the use of secondary resources in the process industry leading to products with identical properties and performances as those produced using primary resources and allowing production without quality restriction;
- Increase the use of secondary resources in the process industry leading to significant increase in resource efficiency across the value chain and subsequent reduction of CO2 emissions; reduction of waste sent to landfill and overall positive environmental impact;
- Increase the competitiveness of the European process industry; new business opportunities and revenue flows for recycling companies, benefiting particularly SMEs, which dominate this sector of the market;
- The proposed technologies should contribute to the matching of supply-versus-demand of feedstock at the level of quality constraints (removal of impurities or wrong matrices, concentration etc.);



- Foster data sharing, and FAIR (Findability, Accessibility, Interoperability and Reusability) digital assets principles, considering the application of digital product passport between recycling companies and the process industry to improve the economy of scale in upcycling of material streams;
- Increase the use of unused and new skills to unfold the potential of the technological solutions at the workplace for upcycling and contribution to inclusive growth;
- At a longer term, to pave the way toward sustainable-by-design for circular products.

#### Scope:

Currently only 12% of the material resources used in the European process industry are recycled and recovered materials and these are mostly down cycled to less valuable products. To move towards a truly circular and sustainable process industry that uses its resources consciously, and without landfilling, breakthrough innovations aiming at upcycling large amounts of secondary resources are needed. The focus of this topic is the upcycling of secondary resources that must lead to the same quality and diversity of products as those obtained when using primary resources. The innovation needed will depend on the addressed waste category. However, even if the upcycling technologies may be sector specific, the cross-sectorial elements are important and should deserve due attention.

Proposals are expected to address the following aspects:

- Considering the upgrading of secondary resources, when relevant, which may include the development of better separation and sorting technologies and digitalisation;
- Ensure consistent quality and safety of recyclates and their suitability for the upcycling process itself;
- If relevant, detection and removal additives in the secondary resources stream;
- Take due account of logistic aspects such as production planning, risk assessment and management or zero defect at supply chain level;
- The innovative upcycling of the secondary raw materials should be demonstrated through at least two realistic use cases that must lead to the same quality and diversity of products as those obtained when using primary resources, with demonstrable economic return, developed in closed cooperation between recyclers, process industry, users and technology providers;
- Successful upcycling relies on advanced monitoring and sensing in the process industries and value chains, and on an improved data completeness, accuracy and interoperability between the process and the recycling companies. Upcycling may

create new business opportunities and models. These are aspects that should be duly considered.

Proposals should include energy efficiency techno-economic and life-cycle assessment considerations of the overall process.

Proposals should actively pursue the involvement of all the actors in the value chain from the process industry to formulators, recyclers, public authorities, and standardisation actors.

Research must build on existing standards or contribute to standardisation. Where relevant interoperability for data sharing should be addressed.

Proposals submitted under this topic should include a business case and exploitation strategy, as outlined in the introduction to this Destination.

Additionally, a strategy for skills development should be presented, associating social partners where relevant. Particular attention should be given to the cooperation with existing initiatives that have developed education and skills activities and outcomes in this area.

All proposals should build on or seek collaboration with existing projects and develop synergies with other relevant European, national, or regional initiatives, funding programmes and are encouraged to consider the use of their expected outcomes in a wider approach that might benefit the establishment of Hubs for Circularity.

International cooperation can be considered specially with countries advanced in the field that could bring mutual benefit from different perspectives.

The proposals under this topic may cover any of the process industries sectors and related end of life wastes sectors (plastic wastes and composites,<sup>37</sup> which were the subject of the WP 2021-22,<sup>38</sup> and steel scrap implemented as part of the Clean Steel partnership are excluded).

This topic implements the co-programmed European partnership Processes4Planet.

## Call – Twin green and digital transition 2024

### Energy Intensive Process Industries

Topic ID and title	<a href="#">HORIZON-CL4-2024-TWIN-TRANSITION-01-32: Optimisation of thermal energy flows in the process industry (Processes4Planet partnership) (IA)</a>				
Budget	EUR 30 million	Opening date	19 September 2023	Deadline 1	07 February 2024
Budget per project	EUR 10 to 15 million			Deadline 2	/
Type of action	Innovation Actions (IA)				
FTP subsector	P&P				
Keywords	'thermal energy flows, heat recovery, heat pumps in high temperature installations				
FTP comments	This topic focuses on using heat pump technologies to make the process environment more efficient. This is highly relevant to the P&P sector, although it is not a topic dedicated to the forest-based sector.				
FTP SIRA 2030 Challenges addressed	5A	FTP relevance		High	
		Starting TRL		5	
		End TRL		7	

#### Expected Outcome:

Projects outcomes will enable achievement of the objectives of Processes4Planet partnership by enhancing process industries energy efficiency, ensuring process flexibility and capturing the full potential of renewable energy (related to P4Planet operational objective 1).

Projects are expected to contribute to the following outcomes:

- Energy intensive industries will be enabled to increase their energy efficiency through optimisation of thermal energy flows between processes, minimizing losses and using all levels of energy;
- Demonstrate highly process-integrated solutions that offer better opportunities to increase energy efficiency and reduce investment cost of high temperature installations;
- Demonstrate a substantial increase in flexibility of the processes;
- Contribute to achieving EU Climate neutrality goal and becoming independent from fossil fuel and fossil fuel imports as put forward in the REPowerEU Plan;
- Enable the increase of the competitiveness and resilience of the European process industry.

#### Scope:

More than 60% of the overall energy used in the process industry is process heating. The topic focuses on highly process-integrated technologies that allow heat recovery and use of high temperature installations. Heat storage, when needed, should be intermediary only. One example could be the adaptation and integration of heat pumps for high temperature (150-250 °C) applications for large thermal capacity (~1-20 MW), but not only – examples could also encompass the direct use of excess heat by e.g., the adaptation and integration of advanced heat exchangers.

The proposals under this topic should:

- Demonstrate the efficient integration and adaptation of heat exchanger or heat pumps into high temperature processes and equipment taking energy not only from air but also warm materials or liquid flows;
- Use high safety standard technologies and fluids with low environmental impact;
- Consider, where necessary, the use of advanced materials in the process development;
- Demonstrate the decrease of energy intensity of output level (intermediate, final product).

The inclusion of a GHG avoidance methodology 50 is recommended and should provide detailed description of baselines and projected reductions.

The heat power generation is out of the scope of this topic. The proposals should include energy efficiency, techno-economic and life-cycle assessments considering the overall process.

Proposals submitted under this topic should include a sound business case and strong exploitation strategy, as outlined in the introduction to this Destination. As a project output amore elaborated exploitation plan should be developed including preliminary plans for scalability, commercialisation and deployment (feasibility study, business plan and financial model). This should also include the assessment of possible societal and environmental impact and implications for the workplace (such as skills, organisational change).

Research must build on existing standards or contribute to standardisation. Where relevant, interoperability for data sharing should be addressed.

Proposals should build on or seek collaboration with existing projects and develop synergies with other relevant European, national, or regional initiatives, funding programmes and platforms.

This topic implements the co-programmed European partnership Processes4Planet.

## Call – Twin green and digital transition 2024 two stage

### Manufacturing Industry

Topic ID and title	<a href="#">HORIZON-CL4-2024-TWIN-TRANSITION-01-01: Bio-intelligent manufacturing industries (Made in Europe Partnership) (RIA)</a>				
Budget	EUR 25 million	Opening date	19 September 2023	Deadline 1	07 February 2024
Budget per project	EUR 4 to 5 million			Deadline 2	24 September 2024
Type of action	Research and Innovation Actions (RIA)				
FTP subsector	P&P				
Keywords	biomaterials, substitution, biomimetics, biotechnology				
FTP comments	This topic is a bit unclear as to what in reality is meant by biomimicry. However, it offers a great opportunity for a process industry using wood as raw material for biobased products. Expect competition from, or collaboration with the biochemicals sector.				
FTP SIRA 2030 Challenges addressed	9C, D	FTP relevance		Medium-High	
		Starting TRL		4	
		End TRL		6	

#### Expected Outcome:

European manufacturing industries are reinforced through biological transformation; in particular

- Access to bio-intelligent production technologies and architecture;
- Technological advances and improvements in sustainability (in particular SDGs 11, 12 and 13) arising from the integration of bio-intelligent principles, functions, structures and technologies in manufacturing;
- Substitution of raw materials by bio-based materials, or implementation of bio-based or bio-intelligent manufacturing operations, and business models leading to regenerative production.

#### Scope:

The biological transformation of industry is a pioneering frontier that the industry of the Union and Associated Countries can harness to enhance circularity and sustainability, while advancing production efficiency and competitiveness.

The biological transformation of industry involves the integration of bio-intelligent structures, processes, organisms or materials into technology by systematically applying knowledge from biology. This should lead to a necessary convergence of biotechnology with mechanical engineering, production technology and information technology with new possibilities for the flexible adaptation of production and value creation processes to requirements, especially in the context of sustainability.

The biological transformation of industries includes but is not limited to:

- Bio-inspired manufacturing processes (biomimicry, biomimetics);
- Development of bio-intelligent manufacturing systems or tools;
- Expanding opportunities of bio-intelligent and bio-based materials by substituting fossilbased raw materials and limiting the release of microplastics, e.g. in the textile industry;
- A systematic application of the knowledge of nature and/or natural processes aiming at optimising a manufacturing system through a convergence and the integration of technical and biological processes.

This transformation can also aid in reducing the carbon footprint of production and products, and foster circularity, while contributing to the competitiveness and digitalisation of the industry of the Union and Associated Countries.

Proposals need to demonstrate the development of digital and green technologies that facilitate the upscaled manufacturing of bio-based or bio-intelligent products in one manufacturing value chain. In addition, sustainable business models need to be developed for production and recycling of the products.

Proposals should address either advanced manufacturing techniques (e.g. additive manufacturing, extrusion, moulding etc.) to process bio-materials or bio-intelligent components for upscaled production; or bio-intelligent production technologies; or combinations of these two approaches.

*The focus of this topic is on manufacturing. The development of materials beyond the manufacturing context is excluded.*

Proposals submitted under this topic should include a business case and exploitation strategy, as outlined in the introduction to this Destination.

Research must build on existing standards or contribute to standardisation. Interoperability for data sharing should be addressed, leveraging on existing ontologies and metadata and though the implementation of the FAIR data principles.<sup>72</sup>

Additionally, a strategy for skills development should be presented, associating social partners and civil society where relevant. A close collaboration with EIT Manufacturing is encouraged, in particular on the development of skills in this area.

All projects should build on or seek collaboration with existing projects and develop

synergies with other relevant European, national or regional initiatives, funding programmes and platforms, for example with Horizon Europe Cluster 6 and its Destination on Circular Economy and Bioeconomy sectors and/or its Partnership Circular Bio-based Europe (CBE)<sup>73</sup>.

This topic implements the co-programmed European Partnership Made in Europe.

## Destination 2: Increased autonomy in key strategic value chains for resilient industry

This destination will directly support the following Key Strategic Orientations (KSOs), as outlined in the Strategic Plan<sup>75</sup>:

- KSO C, **‘Making Europe the first digitally-enabled circular, climate-neutral and sustainable economy** through the transformation of its mobility, energy, construction and production systems’
- KSO A, **‘Promoting an open strategic autonomy by leading the development of key digital, enabling and emerging technologies, sectors and value chains** to accelerate and steer the digital and green transitions through human-centred technologies and innovations’
- KSO D, **‘Creating a more resilient, inclusive and democratic European society,** prepared and responsive to threats and disasters, addressing inequalities and providing high-quality health care, and empowering all citizens to act in the green and digital transitions.

Proposals for topics under this Destination should set out a credible pathway to contributing to the following expected impact of Cluster 4:

- **Industrial leadership and increased autonomy in key strategic value chains with security of supply in raw materials,** achieved through breakthrough technologies in areas of industrial alliances, dynamic industrial innovation ecosystems and advanced solutions for substitution, resource and energy efficiency, effective reuse and recycling and clean primary production of raw materials, including critical raw materials, and leadership in the circular economy.

The COVID-19 crisis, the war against Ukraine and other crises have shown that global competitiveness and resilience are two sides of the same coin. Resilience is about more than the ability to withstand and cope with shocks; it is an opportunity to undergo transitions in a sustainable and fair way. As the European Union and Associated Countries gear up to becoming a climate-neutral, circular and competitive economy by 2050, resilience will require paying attention to new vulnerabilities as entire sectors undergo deep transformations while creating opportunities for Europe’s industry to develop its own markets, products and services which boost competitiveness.

Research and innovation will be fundamental to spur industrial leadership, enhanced sustainability and resilience. It will support the modernisation of traditional industrial models while developing novel technologies, business models and processes. This should



enhance the flexibility of the EU's industrial base, and increase its resilience by reducing EU dependencies on third countries for critical raw materials and technologies.

The most relevant policies of the European Commission on this front are:

- The European Industrial Strategy of March 2020, and in particular the Update of May 2021: there is now a renewed momentum in the EU to tackle its strategic dependencies as well as to boost its resilience across key strategic areas. The Covid-19 crisis revealed the importance of improving production response and preparedness of EU industry, in support of its long-term competitiveness. The Industrial Strategy Update and the accompanying Staff Working Document on strategic dependencies, showed that 99 products in the most sensitive ecosystems included materials on the list of critical raw materials.
- The Circular Economy Action Plan of March 2020 announced initiatives along the entire life cycle of products. It targets how products are designed, promotes circular economy processes, encourages sustainable consumption, and aims to ensure that waste is prevented and resources used are kept in the EU economy for as long as possible.
- The Chemicals Strategy for Sustainability of October 2020 strategy aims to better protect citizens and the environment whilst boosting the innovation for safe and sustainable chemicals. It calls for actions in the frame of research and innovation to develop a Safe and Sustainable by Design (SSdB) framework and criteria and a Strategic Research and Innovation Agenda addressing research and innovation needs raised in the Strategy and beyond.
- The Zero Pollution Action Plan of May 2021 set's out the objective that by 2050 air, water and soil pollution shall be reduced to levels no longer considered harmful to health and natural ecosystems, that respect the boundaries of the planet. The action plan aims to strengthen the EU green, digital and economic leadership, whilst creating a healthier, socially fairer Europe and planet. It provides a compass to mainstream pollution prevention in all relevant EU policies, to step up implementation of the relevant EU legislation and to identify possible gaps.
- The Materials 2030 Roadmap, presented by a large group of stakeholders, will enable the green and digital transition, anchoring on good design principles, combined with synergies between advanced materials, circularity, digital and industrial technologies. It calls for the evolution of materials research by uniting digital and material capacities and competences, combining technology push with market pull and united actions at Member States level, to benefit from Europe's strength.

- The Digital Decade of March 2021, where the Commission presented a vision, targets and avenues for a successful digital transformation of Europe by 2030.
- The Fit for 55 Package of July 2021, delivering the EU's 2030 Climate Target on the way to climate neutrality, given the process industries' 20% share of global greenhouse gas emissions.

The topics serving the objectives of this destination are structured as follows:

- **Raw Materials for EU open strategic autonomy and successful transition to a climate-neutral and circular economy**

Since the Work Programme 2021-22 was drafted, strategic dependencies have increased in importance, given their prominence in accelerating and delivering the green and digital transformation of the EU's key industrial ecosystems, as well as the objective of supporting a more resilient European industry. The transition of the European industrial ecosystems is dependent on the supply of raw materials (both from primary and secondary sources) as many digital and green technologies rely on this supply. The focus in this Work Programme is on Diversifying the international supply chains of critical raw materials; and on Developing internal capacity for primary and secondary raw materials production.

- **Safe and Sustainable by Design (SSbD) chemicals and materials**

Safe and Sustainable by Design (SSbD) is an approach to the design, development and use of chemicals and materials that focuses on providing a function (or service), while reducing harmful impacts to human health and the environment. The Commission published a framework and criteria for Safe and Sustainable chemicals and materials in 2022. Projects across Horizon Europe developing new chemicals or materials are expected to adhere to the framework as of this Work Programme.

Under Horizon 2020 a series of research projects were funded aimed to define and implement a Safe-by-Design concept for nanomaterials. This generated a knowledge base that serves as the foundation for the SSbD concept, which is now a key feature of the Chemical Strategy for Sustainability. The new SSbD concept covers chemicals and materials, including advanced materials and therefore nanomaterials.

The focus on this work programme is on extending the portfolio of methods and models applicable in the SSbD framework as well as on the actual application of the framework to develop SSbD alternatives to substances of concern. Projects resulting from the SSbD topics are expected to contribute to extending the available scientific knowledge base for regulations and policy making.

- **Strategic Innovation Markets driven by Advanced Materials**

Materials, in particular advanced materials, are not only the backbone and source of prosperity of the European society. They will also play a decisive and enabling role in the twin green and digital transition. The Materials2030 Roadmap highlighted that innovation markets are the industrial perspective presenting the “market pull” to address societal needs and challenges under a long-term perspective. The focus in this Work Programme is on a systemic approach to develop the next generation solution-oriented advanced materials, which will offer faster, scalable and efficient responses to the societal and technological challenges, that are relevant and can be considered as opportunities for Europe’s society, economy and environment today and over the next three decades. The competition for critical raw materials (CRMs) Europe’s open strategic autonomy at risk in key technologies of the twin green and digital transition. Advanced materials may mitigate these risks by replacing or substituting CRMs.

Moreover, this Work Programme addresses data exchange and interoperability in materials modelling and characterisation across value chains, to support the green and digital transformation of European industry.

- **Improving the resilience of EU businesses, especially SMEs and Startups**

EU companies, in particular SMEs, need to have capabilities to respond in an agile and effective way to supply disruption, but also to be better equipped for dealing with such shocks in the future.

**Business cases and exploitation strategies for industrialisation:** This section applies only to those topics in this Destination, for which proposals should demonstrate the expected impact by including a *business case and exploitation strategy for industrialisation*.

The *business case* should demonstrate the expected impact of the proposal in terms of enhanced market opportunities for the participants and deployment in the EU, in the short to medium term. It should describe the targeted market(s); estimated market size in the EU and globally; user and customer needs; and demonstrate that the solutions will match the market and user needs in a cost-effective manner; and describe the expected market position and competitive advantage.

The *exploitation strategy* should identify obstacles, requirements and necessary actions involved in reaching higher TRLs (Technology Readiness Levels), for example: matching value chains, enhancing product robustness; securing industrial integrators; and user acceptance.

For TRL 7, a credible strategy to achieve future full-scale deployment in the EU is expected, indicating the commitments of the industrial partners after the end of the project.

Where relevant, in the context of **skills**, it is recommended to develop training material to endow workers with the right skillset in order to support the uptake and deployment of new

innovative products, services, and processes developed in the different projects. This material should be tested and be scalable, and can potentially be up-scaled through the European Social Fund Plus (ESF+). This will help the European labour force to close the skill gaps in the relevant sectors and occupational groups and improve employment and social levels across the EU and associated countries.

In order to achieve the expected outcomes, for particular topics **international cooperation** is not mandatory but advised with some regions or countries, to get internationally connected and add additional specific expertise and value to the activities.

To achieve wider effects **activities beyond R&I investments** will be needed. Wider activities include the further development of skills and competencies (also via the European Institute of Innovation and Technology, in particular EIT Raw Materials, EIT Climate-KIC and EIT Digital); and the use of financial products under the InvestEU Fund for further commercialisation of R&I outcomes.

### **Synergies:**

For **raw materials**, there are synergies with energy-intensive industries and in particular the circularity part; and with strategic innovation markets driven by advanced materials. A further synergy is with Cluster 5: Renewable energies and energy storage.

**Safe and Sustainable by Design** presents synergies with

Cluster 6 'Food, Bioeconomy, Natural Resources, Agriculture' in areas Bio-based Innovation Systems in the EU Bioeconomy and Circular Systems;

Cluster 5 'Climate, Energy and Mobility' in view of areas on lightweight materials;

Cluster 1 'Health', Destination 'Living and working in a health-promoting environment: research on impact of chemicals on human health'; and

Horizon Europe Partnership on the Assessment of Risks from Chemicals (PARC): on exposure and hazard activities as well as the SSbD toolbox and case studies.

**Strategic Innovation Markets driven by Advanced Materials** presents synergies with the energy-intensive and manufacturing industries, in view of both the circularity approaches and low-carbon technologies; and with

Cluster 1 'Health', in view of areas on bio-based materials;

Cluster 5 'Climate, Energy and Mobility' in view of areas on lightweight materials;

Cluster 6 'Food, Bioeconomy, Natural Resources, Agriculture' in view of areas on agrochemicals.

While focusing *exclusively* on civilian applications, there may be synergies with actions conducted under the European Defence Fund (EDF) or its precursor programmes (Preparatory Action on Defence Research and European Defence Industry Development Programme), notably in the field of advanced sensing and advanced materials.

**Innovation Actions** — Legal entities established in China are not eligible to participate in Innovation Actions in any capacity. Please refer to the Annex B of the General Annexes of this Work Programme for further details.

## Call – Resilient value chains 2023 two stage

### Strategic innovation markets driven by advanced materials

Topic ID and title	<a href="#">HORIZON-CL4-2023-RESILIENCE-01-32: Bioinspired and biomimetic materials for sustainable textiles (IA)</a>				
Budget	EUR 31 million	Opening date	08 December 2022	Deadline 1	07 March 2023
Budget per project	EUR 6 to 8 million			Deadline 2	05 October 2023
Type of action	Innovation Actions (IA)				
FTP subsector	P&P				
Keywords	technical textiles, fibres, textiles, biopolymers, circularity				
FTP comments	This topic focuses mainly on the textiles industry, so a subsector of the P&P industries will definitely find this topic worth looking into. Observe, this evaluation is a pilot for blind evaluation, which means that applicants must not disclose their identity at the first evaluation stage.				
FTP SIRA 2030 Challenges addressed	4A – 6C – 7A – 9A, D			FTP relevance	Medium-High
				Starting TRL	4
				End TRL	6-7

#### Expected Outcome:

This topic refers to the innovation market for *Sustainable Textiles* and will support citizens and their needs. Europe's textile sector, its technology providers and research community are world leading. The most technologically advanced textile products are being manufactured in Europe and new manufacturing value chains such as technical textiles, in the 1990's and early 2000's are developed in Europe first.

Several materials specifications and related innovations needs will support this topic such as renewable and recyclable materials, alternative active ingredients, design for circularity.

Projects are expected to contribute to the following outcomes:

- The innovation market of sustainable textiles requires the use of a new generation of renewable and recyclable materials designed with properties that are inspired by nature.
- Bioinspired and biomimetic advanced materials that do not require or limit the need to use chemical additives or coatings will have a positive impact on the environment, the climate, and the circularity of textile materials, in view of the Safe and Sustainable by Design Framework.
- Smart functions or functionalities of textiles will address future consumer needs.
- Low-cost, low-resource, and low environment-impact high performance durable fibres and textiles from renewable sources will serve for technical end markets.

- Develop effective circularity enabling technologies for technical textiles, non-woven and fibre-reinforced composites, e.g. biopolymer or natural fibre based high performance fibres.
- Use of hazardous chemical processing shall be reduced and reserved for crucial technical functionalities of textiles.
- Designed circularity for renewables and recyclable materials supporting the sustainable use of textiles, reducing the CO<sub>2</sub>-footprint of the textiles industry.

#### Scope:

Proposals **should address at least three of the following activities:**

- Bio-inspired and biomimetic polymers for use as smart textile materials will provide improved functionalities, e.g. for outdoor use.
- The molecular functionalities of natural polymers, and their macromolecular structures and properties, provide inspiration for designing different classes of high-performance polymeric materials that aim to reproduce specific functions of natural polymers, such as adaptability, self-healing, adhesiveness, surface super-hydrophobicity, chiral recognition, and bioactivity.
- Biodegradability and recyclability of polymers will be a factor, so the consideration of natural polymers, such as polysaccharides, proteins, lignin-based polymers and composites could be a pathway. This is expected to translate into lower GHG-emissions in the textiles value chain, as well as reducing landfill waste volumes.
- Projects must prove scalability of biomimetic materials for the manufacturing process of smart fabrics and sustainable textiles.
- To enable a fast development of new advanced materials, digital tools such as modelling, simulation and characterisation techniques (including those provided by analytical infrastructures) are under the scope, assisted by advanced methods, e.g. physics-based methods, machine learning or artificial intelligence.

Dovetailing with digital technology, e.g. sensors, is encouraged.

Materials and products should be developed under Safe and Sustainable by Design framework taking into account circularity aspects, and with prognostic and product health management to ensure product and system reliability.

Proposals submitted under this topic should include a business case and exploitation strategy, as outlined in the introduction to this Destination.

Projects should build on or seek collaboration with existing projects and develop synergies with other relevant European, national or regional initiatives, funding programmes and platforms.



## Call – Resilient value chains 2024 two stage

### Strategic innovation markets driven by advanced materials

Topic ID and title	<a href="#">HORIZON-CL4-2024-RESILIENCE-01-35: Biodegradable polymers for sustainable packaging materials (IA)</a>				
Budget	EUR 31 million	Opening date	19 September 2023	Deadline 1	07 February 2024
Budget per project	EUR 6 to 8 million			Deadline 2	24 September 2024
Type of action	Innovation Actions (IA)				
FTP subsector	P&P				
Keywords	packaging, biodegradable, polymers, Single-use Plastics Directive, LCA, digital tools				
FTP comments	This Call offers a great opportunity for the P&P packaging industry. However, it is focusing mainly on replacing PE, PP and PET plastics and projects are expected to seek collaborations with existing projects, which makes it more favourable to applicants that already are active in a relevant EU project.				
FTP SIRA 2030 Challenges addressed	9A, D	FTP relevance		High	
		Starting TRL		4	
		End TRL		6-7	

#### Expected Outcome:

Projects are expected to contribute to the following outcomes:

- The packaging industry will have access to the next generation of biodegradable polymer materials, which will also be recyclable materials. Plastic materials producers will switch from PP, PE, and PET to bio-degradable materials with reduced GHG emissions along the value chain.
- The packaging industry will apply business model of circularity-by-design and sustainable end-of-life (EoL) solutions for plastic packaging materials. This has the potential to lead to a reduction in landfill waste volume of packaging materials; and to a reduction of littering of plastics, coherent with the ambition of the Horizon Europe Ocean and Waters mission, to reduce the plastic pollution of the oceans. Projects are expected to contribute to the Plastics strategy, the Single-use Plastics Directive and the EU Circular Economy Action plan (CEAP).
- Standards and labels for specific applications will be further defined based on the development of testing of biodegradability of plastics in open environments

#### Scope:

Proposals **should address at least four of the following activities:**

- Develop new, demonstrate and scale-up novel advanced bio-degradable polymer materials and innovative processes that will allow the bio-degradable polymers to be

produced at a large scale with a similar economy of scale to replace present production with PE, PP and PET, and with an improved sustainability profile compared to present production and EoL characteristics.

- Develop sustainable additives and catalysts to support the production of bio-degradable polymers.
- Provide evidence with life cycle and techno-economic assessment (LCA/TEA) that the cost for the novel advanced biodegradable polymer products are not significantly higher compared to existing polymer products (PE, PP, PET) on the market.
- Scale up the production of packaging materials at pilot level.
- Identify and test the biodegradability pathways in all environmentally relevant conditions (for the application of the developed material in relevant shape or form); and extensive quantified risk analysis from both a human and environmental perspective for all the different intermediate and end products of biodegradation, including quantification of the contribution to GHG emissions. Contribute to further defining standards and labels for specific applications. Model the lifetime of the developed polymers along the biodegradation pathway in environmentally relevant conditions, both in natural, (terrestrial and marine), and in waste processing environments.
- Demonstrate complete biodegradability in all relevant conditions and environmental compartments (e.g. landfill, compost site, litter in marine-freshwater-sediment-soil) within acceptable timeframes, determination of the main influencing environmental conditions; and assessment of the impact on the environment. Integrate a holistic sustainability assessment, accounting for the full life cycle (including sourcing of feedstock).

Develop and demonstrate circular business model for production at industrial level, where the release of GHG emissions is; and assess significantly reduced; and assess the potential of secondary raw materials as a feedstock (including from renewable sources) for the production of bio-degradable polymers.

To enable a fast development of new advanced materials, digital tools, such as modelling and simulation, and characterisation techniques (including those provided by analytical infrastructures) are under the scope, assisted by advanced methods, e.g. physics-based methods or artificial intelligence (including machine learning).

The future Commission initiative for Safe and Sustainable by Design will set a framework for assessing safety and sustainability of chemicals and materials and should be considered as a baseline in the proposal.

Proposals submitted under this topic should include a business case and exploitation strategy, as outlined in the introduction to this Destination.

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. An early involvement of end users could be essential.

Projects should build on or seek collaboration with existing projects (e.g. Open Innovation Testbeds) and develop synergies with other relevant European, national or regional initiatives, funding programmes and platforms. Where relevant, proposals should seek links with and capitalise on the results of past and ongoing EU funded research projects, including the ones under Cluster 6 'Food, Bioeconomy, Natural Resources, Agriculture and Environment' and Circular Bio-based Europe JU (CBE JU).

## A new way to build, accelerating disruptive change in construction

Topic ID and title	<a href="#">HORIZON-CL4-2024-RESILIENCE-01-36: Advanced biomaterials for the Health Care (IA)</a>				
Budget	EUR 31 million	Opening date	19 September 2023	Deadline 1	7 February 2024
Budget per project	EUR 6 to 8 million			Deadline 2	24 September 2024
Type of action	Innovation Actions (IA)				
FTP subsector	P&P				
Keywords	biomaterials for healthcare, biocompatible, 3D and 4D materials, nanotechnologies, medical, injectable				
FTP comments	This Call offers a great opportunity to the subsector that deals with healthcare products and are familiar with medical and surgical standards and expectations.				
FTP SIRA 2030 Challenges addressed	6C - 9A, D			FTP relevance	High
				Starting TRL	3-4
				End TRL	5-6

### Expected Outcome:

This topic refers to the innovation market for Healthcare and Medicine, which affects many citizens and their needs. Several materials specifications and related innovations needs will support this topic such as renewable and recyclable materials, alternative active ingredients, design for circularity, lightweight materials. The topic should address several key policies of the European Union such as Circular Economy Action Plan, EU Chemicals strategy.

Projects are expected to contribute to the following outcomes:

- Develop the swiftly growing innovation market of medical applications, which is dependent on advanced biocompatible materials that can be printed or injected, including 4D materials that change their 3D structures following external impact (e.g. thermic, electric, mechanical or radiation treatment).
- Medical and/or surgical procedures will benefit from injectable materials for noninvasive surgical procedures.
- Some of their advantages include easy deliverability into the body, increased implantation precision, controllable release of therapeutic agents, antimicrobial properties and the possibility of monitoring or stimulating biological events.

Medical suppliers can commercialise injectable hydrogels, including those made of nanocomposite, natural and synthetic polymer-based biomaterials, bone cements, bioceramics and electronics

### Scope:

Proposals **should address at least four of the following activities:**

- To enable a fast development of new advanced novel injectable biomaterials, digital tools such as modelling, simulation and characterisation techniques (including those provided by analytical infrastructures) assisted by advanced methods e.g. physics-based methods, machine learning or artificial intelligence.
- The innovation market of medical applications is fast growing and dependent on advanced biocompatible materials that can be printed or injected. The 4D materials will change their 3D structures after external impact such as thermic, electric, mechanical or radiation treatment.
- Proposals shall demonstrate new engineering strategies that present functional characteristics beyond bio-compatibility, and express properties that can be used to control the physiological environment (shape-memory, self-healing properties) and induce a response.
- Proposals shall address biomaterials with antibacterial properties contributing to the widespread bottleneck of antimicrobial resistance often encountered in clinical care
- Demonstrate the scaling of injectable hydrogels, including those made of nanocomposite, natural and synthetic polymer-based biomaterials, bone cements, bioceramics and electronics.
- The design for circularity has to develop, when relevant, bio-degradable or bioabsorbable biomaterials that are gradually eliminated by the body after fulfilling a purpose.

The biomaterials used should be safe and sustainable by design (SSbD), taking also into account any specific medical requirements.

Proposals submitted under this topic should include a business case and exploitation strategy, as outlined in the introduction to this Destination.

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. An early involvement of end users could be essential.

Projects should build on or seek collaboration with existing projects and develop synergies with other relevant European, national or regional initiatives, funding programmes and platforms.

Where relevant, proposals should seek links with and capitalise on the results of past and ongoing EU funded research projects, including the ones under Cluster 1 “Health” and Cluster 6 'Food, Bioeconomy, Natural Resources, Agriculture and Environment.

## Cluster 5: Climate, Energy and Mobility<sup>2</sup>

### Destination 1: Climate sciences and responses for the transformation towards climate neutrality

Europe has been at the forefront of climate science and should retain its leadership position to support EU policies as well as international efforts for a global uptake of climate action in line with the Paris Agreement and the Sustainable Development Goals (SDGs), including biodiversity objectives. Advancing climate science and further broadening and deepening the knowledge base is essential to inform the societal transition towards a climate neutral and climate resilient society by 2050, as well as towards a more ambitious greenhouse gas reduction target by 2030. It will involve research that furthers our understanding of past, present and expected future changes in climate and its implications on ecosystems and society, closing knowledge gaps, and the development of the tools that support policy coherence and the implementation of effective mitigation and adaptation solutions.

The activities implemented under this section will enable the transition to a climate-neutral and resilient society and economy through improving the knowledge of the Earth system and the ability to predict and project its changes under different natural and socio-economic drivers. This includes a better understanding of society's response and behavioural changes, allowing a better estimation of the impacts of climate change and the design and evaluation of solutions and pathways for climate change mitigation and adaptation and related social transformation.

This Destination contributes directly to the Strategic Plan's **Key Strategic Orientation D** *"Making Europe the first digitally led circular, climate-neutral and sustainable economy through the transformation of its mobility, energy, construction and production systems"* and the **impact area** "Climate change mitigation and adaptation".

In line with the Strategic Plan, the overall **expected impact** of this Destination is to contribute to the *"Transition to a climate-neutral and resilient society and economy enabled through advanced climate science, pathways and responses to climate change (mitigation and adaptation) and behavioural transformations"*, notably through:

- Advancing knowledge and providing solutions in the any of following areas:
  - Earth system science;
  - Pathways to climate neutrality;
  - Climate change adaptation;

<sup>2</sup> [Work Programme published by the European Commission on 6 December 2022](#)

- Climate services;
  - Social science for climate action; and
  - Better understanding of climate-ecosystems interactions.
- Contributing substantially to key international assessments such as those of the Intergovernmental Panel on Climate Change (IPCC), the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) or the European Environment Agency (e.g. European environment - state and outlook reports, SOER).
  - Strengthening the European Research Area on climate change.
  - Increasing the transparency, robustness, trustworthiness and practical usability of the knowledge base on climate change for use by policy makers, practitioners, other stakeholders and citizens.

Coordination and synergies should be fostered between activities supported under this destination and those under other destinations of cluster 5, as well as with other clusters of Horizon Europe.

In particular, complementarities with cluster 4 and cluster 6 should be taken into account by planning for adequate resources for co-ordination and clustering activities. Following a systemic approach, this destination concentrates on activities related to climate science and modelling, whereas cluster 4 supports activities in the area of low-carbon and circular industry, and cluster 6 contributes to R&I on the implementation of climate change mitigation and adaptation solutions in the areas covered by cluster 6 (notably Intervention Area (IA) 1 on biodiversity and nature-based solutions (NBS), Earth observation, IA 4 on seas, oceans and inland waters...).

Coordination and synergies are also encouraged with the activities funded under the work programmes on the Horizon Europe missions, in particular the Mission “Adaptation to Climate Change”, the Mission “Climate Neutral and Smart Cities” and the Mission “Restore our Ocean and Waters by 2030”. While this destination supports upstream research activities on climate science, the Missions focus on the testing, demonstration and scale up of solutions to address the challenges of climate change and environmental degradation.

Actions should envisage clustering activities with other relevant ongoing and selected projects for cross-projects cooperation, consultations and joint activities on crosscutting issues and share of results, as well as participating in joint meetings and communication events. To this end, proposals should foresee a dedicated work package and/or task and earmark the appropriate resources accordingly.



Synergies are also sought throughout this destination with the work of the European Space Agency (ESA), in order to ensure complementarity and mutual benefit regarding research and innovation actions conducted at the ESA.

## Call – Climate sciences and responses 2023

Topic ID and title	<a href="#">HORIZON-CL5-2023-D1-01-06: Broadening the range of policy options in transition pathway analysis</a>				
Budget	EUR 10 million	Opening date	13 December 2022	Deadline 1	18 April 2023
Budget per project	EUR 5 million			Deadline 2	/
Type of action	Research and Innovation Actions (RIA)				
FTP subsector	F&F, WW, P&P				
Keywords	Paris Agreement, policy biodiversity, energy, circular economy and land use mentioned, economic growth				
FTP comments	This is a topic for research community and policy makers and the scope is huge. However, the forest-based sector is significantly affected by the policy development related to the Paris Agreement and representation of forest-sector competence would be of strategic importance.				
FTP SIRA 2030 Challenges addressed	1E	FTP relevance		Low	
		Starting TRL		/	
		End TRL		/	

### Expected Outcome:

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

- A broader range of policy options that reflect different visions of sustainability and resilience based on alternative economic, technological and societal futures and reflecting different perspectives from economics, (other) social and natural sciences.
- Assessment of long-term feasibility of reconciling economic growth with climate and other environmental objectives and consequences for mitigation pathways.
- More comprehensive understanding of the implications of Paris Agreement-aligned transformation for other (than climate) environmental thresholds and social outcomes, including equity and justice, as a basis for fostering synergies between climate action and other policy goals such as those embedded in the Sustainable Development Agenda.
- Increased diversity of frameworks and scenarios used in climate change mitigation modelling.
- Enhanced assessments of 1) energy and material demands and their links to the macro-economy, 2) behavioural and lifestyle changes, including sufficiency measures and their representation in integrated assessment models and 3) circular economy approaches to decrease the use of energy and materials.
- Development of knowledge to inform future major international scientific assessments such as reports by IPCC and IPBES.

### Scope:

There is an urgent need for a new paradigm that reconciles continued development of human societies with the maintenance of the Earth system in a resilient and stable state. Meeting the ambitious goals of the Paris Agreement while simultaneously respecting other environmental and social constraints would require not only rapid reductions of GHG emissions and other climate forcers, but also decoupling of economic output from material throughput, pollution and biodiversity loss. However, empirical evidence demonstrates a strong relationship between economic growth (expressed in GDP terms) and GHG emissions, energy use, demand for raw materials, land and other natural resources, as well as pollution, with projections indicating that with existing growth trajectories, absolute decoupling on the scale required could prove extremely challenging.

Actions should advance knowledge on the feasibility of the green growth paradigm in the context of transition to climate neutrality, including improved understanding of underlying challenges and opportunities, and by building on the latest scientific evidence. They should explore alternative (to growth-oriented) socio-economic scenarios (such as, but not limited to, degrowth, postgrowth, or “Doughnut” economic models) which could inform the transition to climate neutrality. Research should look well beyond general concepts and explore the practical implications (where possible quantified), benefits, barriers, conditions for delivering strong social outcomes and feasibility of pursuing such alternative options as a viable policy choice within the EU and beyond. In their work, actions should examine the role of emerging/potential trends (such as digitalisation, circularity, structural changes in the economy, relocation of value chains), geopolitical events and shifts in societal values (e.g. COVID related) in shaping future socio-economic development and assess their impacts on the achievement of climate policy objectives. The analysis should also account for the accelerating impacts of climate change and embrace interlinkages with other policy goals, notably biodiversity, resource conservation and human development related. Building on these results, actions should draw conclusions for Nationally Determined Contributions (NDCs) and long-term strategies under the Paris Agreement.

Actions should address some of the following aspects in their research:

- Improve the understanding of the dynamics between economic growth and energy, materials' use, pollution and land demand. This could include assessing whether shifts within a GDP-based system, such as a greater share of services and recognition of household labour in national statistics, affect the compatibility of economic growth with climate and biodiversity goals.
- Advance knowledge about the role and potential of lifestyle changes and sufficiency-oriented measures in the overall strategies towards climate neutrality and in the

context of other environmental goals, improve their quantification and representation in modelling frameworks and explore the socio-economic, cultural, institutional, infrastructural, regulatory and other conditions for scaling-up.

- Identify and explore the main barriers to adoption of alternatives to growth-based economic models. For example: How plausible is it for policy makers to embrace them? Are there real-world examples? Can a region such as Europe pursue alternative approaches unilaterally?
- Assess the relationship between continued economic growth and societal well-being. Investigate alternative approaches to delivering social progress and evaluate the well-being outcomes of measures to transform societies towards climate-neutrality, taking into account distributional and equity related considerations as well as a broad range of well-being indicators and differences between social groups.
- Investigate how alternative economic approaches could be explained to and accepted by citizens and businesses concerned about both climate and their livelihoods/operating conditions. For example, which concrete day-to-day changes would be required? What are the implications for living standards? How would professions work? What dis-/incentives would firms face to compete, expand and innovate?
- Assess the risks of disruption to energy, food and other key commodity markets based on alternative future transition pathways and development paradigms.
- Explore potential future development paradigms in both high-income and developing economies, taking into account fairness dimension, and evaluate implications for the transition process towards climate neutrality.

The projects are expected to take a truly interdisciplinary approach, leveraging natural, economic and other social sciences to inform policies capable of delivering on multiple environmental, economic and social objectives simultaneously while taking into account constraints related to feasibility and acceptability.

When dealing with models, actions should promote the highest standards of transparency and openness, as much as possible going well beyond model documentation and extending to aspects such as assumptions, code and data that is managed in compliance with the FAIR principles. In particular, beneficiaries are strongly encouraged to publish data and results in open access databases and/or as annexes to publications.

Successful proposals should establish synergies with the projects resulting from the topic [HORIZON-CL5-2021-D1-01-02: Modelling the role of the circular economy for climate change mitigation](#) as well as with the future project resulting from the topic “HORIZONCL5- 2024-D1-

01-06: The role of climate change foresight for primary and secondary raw materials supply” as regards implications for resource demand and the associated GHG emissions.

This topic requires the effective contribution of SSH disciplines (e.g. sociology, economics, behavioural sciences, gender studies, etc.) 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.

## Destination 3: Sustainable, secure and competitive energy supply

This Destination includes activities targeting a sustainable, secure and competitive energy supply. In line with the scope of cluster 5, this includes activities in the areas of renewable energy; energy system, grids and storage; as well as Carbon Capture, Utilisation and Storage (CCUS).

The transition of the energy system will rely on reducing the overall energy demand and making the energy supply side climate neutral, in current and future climate conditions. R&I actions will help to make the energy supply side cleaner, more secure, and competitive by boosting cost performance and reliability of a broad portfolio of renewable energy solutions, in line with societal needs and preferences. Furthermore, R&I activities will underpin the modernisation of the energy networks to support energy system integration, including the progressive electrification of demand side sectors (buildings, mobility, industry) and integration of other climate neutral, renewable energy carriers, such as clean hydrogen. Innovative energy storage solutions (including chemical, mechanical, electrical and thermal storage) are a key element of such energy system and R&I actions will advance their technological readiness for industrial-scale and domestic applications. Carbon Capture, Utilisation and Storage (CCUS) is a CO<sub>2</sub> emission abatement option that holds great potential and R&I actions will accelerate the development of CCUS in electricity generation and industry applications.

This destination contributes to the activities of the Strategic Energy Technology Plan (SET Plan) and its implementation working groups.

This Destination contributes to the following Strategic Plan's **Key Strategic Orientations (KSO)**:

- *C: Making Europe the first digitally enabled circular, climate-neutral and sustainable economy through the transformation of its mobility, energy, construction and production systems;*
- *A: Promoting an open strategic autonomy by leading the development of key digital, enabling and emerging technologies, sectors and value chains to accelerate and steer the digital and green transitions through human-centred technologies and innovations;*

It covers the following **impact areas**:

- Industrial leadership in key and emerging technologies that work for people;
- Affordable and clean energy.

The **expected impact**, in line with the Strategic Plan, is to contribute to *“More efficient, clean, sustainable, secure and competitive energy supply through new solutions for smart grids and energy systems based on more performant renewable energy solutions”*, notably through

- i. Fostering European global leadership in affordable, secure and sustainable **renewable energy technologies** and services by improving their competitiveness in global value chains and their position in growth markets, notably through the diversification of the renewable services and technology portfolio (more detailed information below).
- ii. Ensuring cost-effective uninterrupted and affordable supply of energy to households and industries in a scenario of high penetration of variable renewables and other new low carbon energy supply. This includes more efficient approaches to managing **smart and cyber-secure energy grids** and optimisation the interaction between producers, consumers, networks, infrastructures and vectors (more detailed information below).
- iii. Accelerating the development of **Carbon Capture, Use and Storage (CCUS)** as a CO<sub>2</sub> emission mitigation option in electricity generation and industry applications (including also conversion of CO<sub>2</sub> to products) (more detailed information below).

### **Global leadership in renewable energy**

Renewable energy technologies encompass renewable electricity, renewable heating and cooling and renewable fuel technologies. They provide major opportunities to replace or substitute carbon from fossil origin in the power, heating/cooling, transportation, agriculture and industry economic sectors. Their large scale and decentralised deployment is expected to create more jobs than the fossil fuel equivalent and, especially, local jobs. Renewable energy technologies are the baseline on which to build a European and global climate-neutral future. A strong global European leadership in renewable energy technologies will pave the way to increase energy security and reliability.

It is imperative to enhance affordability, security, sustainability, and efficiency for more established renewable energy technologies (such as wind energy, photovoltaics, solar thermal, bioenergy or hydropower), and to further diversify the technology portfolio. Furthermore, advanced renewable fuels, including synthetic fuels (which contain also direct solar fuels) and sustainable advanced biofuels, are also needed to provide long-term carbon-neutral solutions for the transport, energy consuming and energy-intensive industrial sectors, in particular for applications where direct electrification is not a technically and cost-efficient option.

In line with the “do not significantly harm” principle for the environment, research and innovation actions for all renewable energy technologies aim to also improve the environmental sustainability of the technologies, delivering products with reduced greenhouse gas emissions and improved environmental performance regarding water use, circularity, pollution, and ecosystems. For biofuels and bioenergy improving the environmental sustainability is associated to the biomass conversion part of the value chain and the quality of the product, while air pollution associated to combustion in engines falls in the scope of other destinations in Cluster 5 and other environmental aspects will be under Cluster 6.

Synergies with activities in cluster 4 are necessary for integrating renewable energy technologies and solutions in energy consuming industries and ensure that renewable energy solutions do not harm the environment. Complementarities with cluster 6 concern mainly biomass-related activities and with EIC low technology readiness level actions.

All renewable energy technologies are addressed as they have all a strong international market potential, and it will be coherent with the EU policy of industrial leadership worldwide.

Regarding the REPowerEU communication, renewable energy technologies are - as described above - a key instrument to diversify EU gas supplies and reduce the EU's dependence on fossil fuels. Most of the topics in this work programme are centred along two of the REPowerEU tracks, with the remainder of the topics fully contributing to decreasing the EU's dependence on fossil fuels:

- **PV, wind energy and heat pumps**, encompassing the most readily available renewable energy technologies to reduce the EU's dependence on fossil fuels. (17 topics)
- **Renewable fuels**, encompassing the most readily available technologies (advanced biofuels) but also the less mature ones (synthetic renewable fuels). Renewable fuels can be used in transport but also in buildings and industry to meet the demand for electricity and heat, therefore displacing fossil fuels. Gaseous renewable fuels are one of the named actions in the REPowerEU communication, as regards increasing the production of bio methane twice above the European Green Deal target in 2030. All forms of renewable fuels, and in particular advanced biofuels, contribute to reduce the EU's dependence, because they are drop-in fuels and direct replacements of fossil fuels, utilizing the existing infrastructure. (8 topics)
- The remainder of the topics also contributes to the objective of **decreasing the EU's dependence on fossil fuels**, with the focus either on specific renewable energy



sectors (bioenergy, geothermal, hydropower, ocean energy and solar thermal) or on cross-technology activities (next generation renewable energy, market measures, international cooperation). (18 topics)

#### Main expected impacts

- Availability of disruptive sustainable renewable energy and renewable fuel technologies & systems accelerating the replacement of fossil-based energy technologies to achieve climate neutrality in the energy sector by 2050, considering future climate conditions, and without harming biodiversity, environment and natural resources.
- Reduced cost and improved efficiency of sustainable renewable energy and renewable fuel technologies and their value chains.
- Support de-risking of sustainable renewable energy and fuel technologies with a view to their commercial exploitation to contribute to the 2030 “Fit for 55” targets increasing the share of renewable electricity, heat and fuels in the EU energy consumption (in particular, 40% renewable energy overall, 2.2% advanced biofuels and 2.6% renewable fuels of non-biological origin).
- Better integration of sustainable renewable energy and renewable fuel-based solutions in all economic sectors, including through digital technologies.
- Enhanced security and autonomy of energy supply in the EU, while accelerating the green transition.
- Affordable, secure and sustainable energy solutions to diversify gas supplies in the EU by increasing the level of biomethane.
- Reinforced European scientific basis and European export potential for renewable energy technologies through international collaborations (e.g., the AU-EU Climate Change and Sustainable Energy partnership, the missions and innovation communities of Mission Innovation 2.0).
- Enhanced sustainability of renewable energy and renewable fuels value chains, taking fully into account circular economy, social, economic and environmental aspects in line with the European Green Deal priorities.
- More effective market uptake of sustainable renewable energy and fuel technologies to support their commercialisation and provide inputs to policy making.
- Increased knowledge on the environmental impacts of the different renewable energy technologies along their lifecycle and value chains.

#### **Energy systems, grids and storage**

##### Main expected impacts:

- Increased resilience of the energy system, based on improved and/or new technologies and energy vectors, to control the system and maintain system stability under difficult circumstances.
- Increased flexibility and resilience of the energy system to plan and operate different networks for different energy carriers simultaneously in a coordinated manner that will also contribute to climate neutrality of hard-to-electrify sectors.
- Innovative data-driven services for consumers that empower them to engage in the energy transition. Enhanced consumer satisfaction and increased system flexibility thanks to enabling consumers to benefit from new energy services and facilitating their investment and engagement in the energy transition.
- Improved energy storage and energy vector technologies, in particular technologies for long-term storage of electricity and heat.
- Foster the European market for new energy services and business models as well as tested standardised and open interfaces of energy devices through a higher degree of interoperability, increased data availability and easier data exchange.
- More effective and efficient solutions for transporting and seamlessly integrating off-shore energy with new electricity transmission technologies, in particular using superconducting technologies, power electronics and hybrid Alternate Current – Direct Current grid solutions as well as MT HVDC (Multi Terminal High Voltage Direct Current) solutions.
- Based on easy data-sharing, increased flexibility of the energy system to integrate renewables, and better predictability of return on investments in renewable and energy efficiency investments.
- Speeding up of (from early-adoption to upscaling) of new digital technologies in the energy sector for the benefit of the energy transition
- Development of cyber-security and privacy tools and technologies tailor-made for the specific requirements of the energy system.
- Development of technologies and systemic approaches that optimise energy management of IT technologies.

### **Carbon Capture, Utilisation and Storage (CCUS)**

#### Main expected impacts:

#### Carbon capture, utilisation and storage (CCUS)

- Accelerated rollout of infrastructure, in particular for CCUS hubs and clusters.
- Continuing knowledge and best practice sharing activities, in particular on connecting industrial CO<sub>2</sub> sources with potential bankable storage sites and installations using CO<sub>2</sub>, providing greater confidence for decision makers and investors.

- Proven feasibility of integrating CO<sub>2</sub> capture, CO<sub>2</sub> storage and CO<sub>2</sub> use in industrial facilities and to maximize the efforts to close the carbon cycle. Demonstrating these technologies at industrial scale should pave the way for subsequent first-of-a-kind industrial projects.
- Reduced cost of the CCUS value chain, with CO<sub>2</sub> capture being still the most relevant stumbling block for a wider application of CCUS. Develop innovative technology for CO<sub>2</sub> conversion to reduce the need for pre-concentration and/or purification.
- Adequate frameworks for Measurement, Monitoring and Verification (MMV) for storage and use projects, to document safe storage and for public buy-in of the technology.
- Further research in DACCS and BECCS as CO<sub>2</sub> capture technologies in combination with CO<sub>2</sub> storage in order to deliver carbon removals in view of achieving the net zero targets.
- Assess the environmental impacts and risks, in the short, medium and long term, of CCUS technologies, with respect to the Do No Significant Harm principle, and to inter-generational solidarity.

## Call – Sustainable, secure and competitive energy supply 2023

### Global leadership in renewable energy

Topic ID and title	<a href="#">HORIZON-CL5-2023-D3-01-01: Renewable Energy Valleys to increase energy security while accelerating the green transition in Europe</a>				
Budget	EUR 40 million	Opening date	13 December 2022	Deadline 1	30 March 2023
Budget per project	EUR 20 million			Deadline 2	/
Type of action	Innovation Actions (IA)				
FTP subsector	F&F, WW, P&P				
Keywords	renewable energy (organic waste, agricultural residues, electricity, heat, fuels, regional energy systems), REPowerEU Plan, Digital Twin				
FTP comments	"Renewable energy valleys" and "living labs" are two rather fuzzy concepts that are emphasised in this Call. It might be beneficial to look those concepts up before deciding to apply or participate as a partner in an application. Actors from industry, farmers/foresters, public authorities and the public is likely going to be included in a project.				
FTP SIRA 2030 Challenges addressed	10B, C, D			FTP relevance	Low
				Starting TRL	/
				End TRL	7-8

#### Expected Outcome:

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

- Contribute to the implementation of the REPowerEU Plan, in particular to i) diversify gas supplies via higher levels of sustainable bio-methane (mainly based on organic waste and agricultural residues) and green hydrogen, and ii) speed up Europe's path to independence from fossil fuels by increasing the share of renewable energy (electricity, heat and fuels) in the European energy consumption.
- Increase the roll-out of local or regional renewable energy system solutions for electricity, heat and fuel needs and contribute to their market up-take in Europe.
- Create new sustainable jobs linked to local or regional renewable energy system value chains and enhance economic growth in local or regional European communities.
- Enhance security and autonomy of local or regional energy supply in EU Member States/Associated countries in current and future climate conditions.
- Increase the readiness, reliability, performance and affordability of local or regional renewable energy system solutions in Europe.

#### Scope:

The EU energy system strongly relies on centralised electricity generation and on fuel imports, with 95% of its oil and 84% of its gas consumption sourced from outside the EU. The REPowerEU Plan proposes a set of actions to reduce the EU's dependence on fossil fuels and diversify its energy supply 'well before 2030'. The three pillars of the plan are to ramp up the production of green energy, diversify our energy supplies, and reduce our demand for fossil gas, coal and oil.

Renewable energy valleys are understood as decentralised renewable energy systems that offer a viable and efficient solution to the challenges mentioned above. For example, local production and consumption, reduced transmission and distribution losses thanks to the reliance on local networks for energy needs, greater operational flexibility and reduced dependence on expensive fuel imports all contribute to a higher energy autonomy, a more secure supply, and lower, more stable overall energy costs, including for individual citizens. In addition, this alleviates a part of the load on the centralised grid and avoids blockages by the capacity of the grid.

Proposals are expected to address the following aspects:

- Creation of a renewable energy valley 'living lab' in local, peri-urban or regional communities that demonstrates in real life conditions the sustainable and cost-effective production and storage of renewable energy from different local renewable energy sources providing multiple renewable energy carriers (e.g., electricity, heat, renewable fuels, bio-methane, biogas, hydrogen), fully covering the local energy needs on an annual basis.
- Consideration of different potentials in terms of geography, climate and natural resources in the concept design.
- Consideration of different end users (e.g. buildings, mobility, industry, industrial parks) of the multiple renewable energy carriers.
- Reduction of energy use and energy losses through the integration of effective and innovative energy-efficient solutions.
- Development and testing of a digital twin of the specific local energy grid for all types of energy carriers (i.e., electricity, heat, fuels including gases) for operational analysis, detailed energy forecasting and local grid management.
- Scenario analysis using the digital twin to constantly improve multiple carrier grid management, planning, data gathering/handling and cyber security.
- Development of cost-effective upscaling and commercialisation approaches of the solutions, linked to robust business models along the value chains, considering

inclusive and affordable access to energy for consumers. This can include collaborative ventures with local stakeholders.

- Regarding the development of the renewable energy technologies value chains, fostering the participation of the local industry and other stakeholders, including citizens, Energy Communities and the Energy Communities Repository<sup>151</sup> as appropriate, therefore generating local jobs, skills, economic growth and benefits for citizens. Where applicable, synergies with other economic sectors than the energy sector may be considered.
- Regarding the local or regional renewable energy system developed, assessment of its stability, robustness, and fitness to the local resources and needs, including understanding consumer behaviour.
- Assessment of costs avoidance from fossil fuels imports in line with REPowerEU to decrease the dependence on such imports.
- Assessment - both at the design phase and during operation - of environmental and socio-economic impacts (positive and negative) for the local community or region, and development of measures to mitigate the negative impacts.

The renewable energy valleys can take diverse configurations, such as peri-urban settings, (agro-) industrial clusters or remote or islanded areas. They can also take the form of either distinct but combined systems or unique poly-generation systems (i.e., in the same infrastructure) to deliver multiple energy carriers from combined renewable energy resources and technologies.

The proposal should indicate how the operation and maintenance of the living lab will be guaranteed after the end of the project.

Technological developments for hydrogen production and storage are addressed in the frame of the Clean Hydrogen European Partnership and are therefore excluded from this call, but proposals may include the integration of such devices in the demonstration.

Proposals are expected to foresee coordination and collaboration with similar EU-funded projects (in particular, those that will be funded under this topic) for policy relevant issues such as regulatory framework, business models and obstacles to innovation.

## Call – Sustainable, secure and competitive energy supply 2023

### Global leadership in renewable energy

Topic ID and title	<a href="#">HORIZON-CL5-2023-D3-02-01: Development of near zero-emission biomass heat and/or CHP including carbon capture</a>				
Budget	EUR 8 million	Opening date	04 May 2023	Deadline 1	05 September 2023
Budget per project	EUR 4 million			Deadline 2	/
Type of action	Research & Innovations Actions (RIA)				
FTP subsector	P&P				
Keywords	bioenergy, biomass, CHP, Nox, Sox near zero emmissions				
FTP comments	The focus here is more on the technology development than larger development. It should be of high relevance for several actors in the forest-based value-chain				
FTP SIRA 2030 Challenges addressed				FTP relevance	High
				Starting TRL	/
				End TRL	5

#### Expected Outcome:

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

- Advance the European scientific basis and increase technology competitiveness and technology export potential in the area of bioenergy.
- Reduced cost and improved technical performance and efficiency of bio-based heat and/or CHP.
- Enhance sustainability of biomass-based heat and/or CHP by addressing socioeconomic and environmental sustainability, in particular in reducing emissions and air pollution and also addressing aspects of carbon reuse and circularity, also in particular in fossil-fuel-based economic areas in transition.

#### Scope:

Development of novel near zero-emission bio-based heat and/or CHP technologies, which allow for highly efficient use of sustainable solid biomass residues, going hand in hand with close to zero emissions for particles and harmful gaseous emissions including NO<sub>x</sub>, SO<sub>x</sub>, aromatics etc. Flexibility for different biomass fuels and power/heat ratios featuring a wide range of temperatures for heat supply as well as technological interfaces for carbon capture as well as high cost-efficiency for the consumer are to be included.

The near zero-emission solution has to be implemented and assessed for the running biomass-based heat and/or CHP system at pilot scale. Cost performance and environmental

impact should be assessed and improved in comparison to state-of-the-art emissions capture and cleaning systems.

Socio-economic aspects including SDGs when applying such solutions in regions in transition from coal, lignite, peat, or other fossil fuels should be analysed and illustrated in the proposal.



## Call – Sustainable, secure and competitive energy supply 2024

### Global leadership in renewable energy

Topic ID and title	<a href="#">HORIZON-CL5-2024-D3-02-03: Development of smart concepts of integrated energy driven bio-refineries for co-production of advanced biofuels, bio-chemicals and biomaterials</a>				
Budget	EUR 7 million	Opening date	07 May 2024	Deadline 1	05 September 2024
Budget per project	EUR 3,5 million			Deadline 2	/
Type of action	Research & Innovations Actions (RIA)				
FTP subsector	P&P				
Keywords	integrated biorefineries, biofuels, international cooperation				
FTP comments	The focus here is more on the technology development than larger development. It should be of high relevance for several actors in the forest-based value-chain				
FTP SIRA 2030 Challenges addressed	6B - 10A	FTP relevance		High	
		Starting TRL		/	
		End TRL		5	

#### Expected Outcome:

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

- Expand the portfolio of cost-effective advanced biofuel production concepts through energy-driven biorefineries.
- Reduce cost, improve efficiency, support de-risking, to accelerate the availability of competitive and zero-waste advanced biofuel production concepts.
- Contribute to the Mission Innovation 2.0 mission of Integrated Biorefineries.
- Optimize resource efficiency, energy output and total products value from biomass
- Reinforce the European scientific basis and European export potential for renewable fuel production solutions through international collaborations.

#### Scope:

Development of zero-waste and neutral or negative carbon emission energy-efficient biorefinery concepts for enabling the production of low-cost advanced biofuels through co-production of added value bio-based products and bioenergy. Conversion of biogenic wastes and residues as well as algae and aquatic biomass through chemical, biochemical, electrochemical, biological, thermochemical pathways or combinations of them in highly circular processes are in scope. The integration design is expected to include mass and energy flows, addressing the process heat and power needs by the use of co-produced bio-heat and bio-power, capturing and reusing biogenic effluent gases and sequestering

biogenic emissions, for example in the form of biochar as soil amendment, such as to maximize overall material and energy efficiencies. An assessment of the feedstock cost supply at regional and local level and improvement of feedstock mobilisation patterns including via enabling technologies, such as digitalisation, should be included. Socioeconomic and environmental sustainability including circular economy, social, economic and environmental aspects are expected to be assessed on a life-cycle analysis basis. The advanced biofuels cost should aim to be reduced at parity with marketed biofuel equivalents or in the absence of these competitive to the fossil fuel equivalents. Technology validated in relevant environment is required. International cooperation with Mission Innovation countries is expected. Proposals should provide information and assessment about the economic feasibility and the potential of scaling-up the technology at commercial scale as appropriate.

Synergies are possible with topic HORIZON-CL6-2023-ZEROPOLLUTION: Innovative technologies for zero pollution, zero-waste biorefineries (RIA) and respective cooperation activities are encouraged.

## Destination 4: Efficient, sustainable and inclusive energy use

This Destination addresses activities targeting the energy demand side, notably a more efficient use of energy as regards buildings and industry. It contributes to the activities of the Strategic Energy Technology Plan (SET Plan) and its implementation working groups.

This Destination contributes to the following Strategic Plan's **Key Strategic Orientations (KSO)**:

- *C: Making Europe the first digitally enabled circular, climate-neutral and sustainable economy through the transformation of its mobility, energy, construction and production systems;*
- *A: Promoting an open strategic autonomy<sup>187</sup> by leading the development of key digital, enabling and emerging technologies, sectors and value chains to accelerate and steer the digital and green transitions through human-centred technologies and innovations.*

It covers the following **impact areas**:

- Industrial leadership in key and emerging technologies that work for people;
- Affordable and clean energy;
- Circular and clean economy.

The **expected impact**, in line with the Strategic Plan, is to contribute to the “*Efficient and sustainable use of energy, accessible for all is ensured through a clean energy system and a just transition*”, notably through

- Technological and socio-economic breakthroughs for achieving climate neutrality and the transition to zero pollution of the **building stock** by 2050, based on inclusive and people-centric R&I (more detailed information below).
- Increased energy efficiency in **industry** and reducing industry's Greenhouse Gas (GHG) and air pollutant emissions through recovery, upgrade and/or conversion of industrial excess (waste) heat and through electrification of heat generation (more information below).

This Destination has at its core the ambition to deliver on the research, innovation and technological developments needs to meet EU climate and energy targets, forward-looking policy implementation and long-term carbon neutrality objective. The Destination contributes as well (e.g. through the topics that support digitalisation and smartness of buildings) to the EU digital agenda. Though biodiversity is not in the focus of this Destination, the multiple impacts of the built environment on biodiversity (e.g. in the scope of renovation) should be considered.

The Destination has a strong policy dimension – it is steered by EU policy action in the energy and climate domains, the European Green Deal overarching policy priority, the Renovation Wave Strategy (for buildings topics), the Industrial Strategy, the Industrial Emissions Directive (for industry topics) and the forward-looking policy measures proposed in the Fit for 55 – Delivering European Green Deal package.

In the light of the Versailles Declaration, and acknowledging the need to reduce the energy dependencies of the EU, this Destination will strongly focus on innovations that boost energy efficiency and reduce energy demand in buildings and the industry, thereby contributing to making Europe independent from Russian gas supplies (and other fossil fuel supply from Russia) by the end of the decade in line with the REPowerEU Communication.

### **Highly energy-efficient and climate neutral EU building stock**

The Destination will contribute to putting the EU on track for achieving climate neutrality of its building stock by 2050 and to effectively promoting Europe's independence from Russian gas supplies (and other fossil fuels from Russia) before 2030 by means of a more clean, efficient and sustainable building stock. It will deliver the solutions that can help increase buildings renovation rates, reduce energy consumptions of buildings, improve smart readiness, improve circularity, and improve users' comfort, well-being and health, while keeping housing affordable, in line with the objectives of the Renovation Wave and the revised Energy Performance of Buildings Directive.

This Destination will contribute to 'reducing our energy dependencies' priority of the Versailles declaration across all topics, in particular by improving energy efficiency and the management of energy consumption in buildings, and by delivering more circular approaches to construction and renovation of buildings. The Destination will also contribute to the 'Electrify Europe' track of REPowerEU by delivering innovative solutions for energy efficiency and electrification of homes and buildings, e.g. thanks to heat pumps. These priorities are addressed in a specific flagship topic.

It will contribute to the uptake of digital and smart solutions in buildings and to improved energy flexibility, in line with the Action Plan on the digitalisation of the energy sector. The Destination's innovation will contribute to make the sector fit to support the achievement of higher ambition on energy efficiency under Fit for 55. The Destination's topics contribute significantly to the New European Bauhaus (NEB), integrating the core NEB values of sustainability, inclusion and aesthetics in the built environment (e.g. in relation to cultural heritage and quality of experience), and they are consistent with the EU roadmap and policy initiatives on digitalisation in the construction sector and on sustainability of buildings (e.g.

Level(s)). On climate, one aim will also be to enhance the role of buildings as carbon sinks in the voluntary market for carbon removals, in line with the upcoming Communication on Restoring sustainable carbon cycles and the Proposal for a regulatory framework for carbon removal certification.

The Destination also relies on the Built4People co-programmed partnership's broader action and is complementary to Driving Urban Transitions partnership and to the Mission on Climate Neutral and Smart Cities.

#### Main expected impacts:

- The European buildings and energy sectors are able to effectively support higher EU ambition on energy efficiency, energy independence, and the transition to zero-emission buildings, with a stronger link between innovation in technology and practices, and policy drivers and instruments.
- Building stocks continue to evolve to combine energy efficiency, renewable energy sources, storage, and digital and smart technologies, supporting the transformation of the energy system towards climate neutrality and reducing Europe's energy dependencies.
- Buildings constructed and renovated see their performance enhanced across the board (energy, life-cycle emissions, indoor environment quality), with lower environmental impacts, and rates of holistic renovations continue increasing. Buildings are able to adapt to changing user needs for dynamic and more efficient use of building spaces and they are more resilient to climate change.
- A higher quality, more affordable and inclusive, built environment mitigating climate change and preserving environment, safeguarding cultural heritage, considering sustainability, circularity and aesthetics, while ensuring better living conditions.

#### **Industry**

The Destination will contribute to putting the EU on track for achieving climate neutrality of the industrial sector by 2050, while also reducing other polluting emissions, and for effectively promoting Europe's independence from Russian gas supplies (and other fossil fuels from Russia) before 2030 by means of a more clean, efficient and sustainable industrial processes. It will deliver the solutions that can help a faster transition to renewable and low carbon energy sources for thermal energy generation, and a reduction of the energy consumption through waste heat recovery, storage and upgrade for reuse in other processes. These solutions will contribute to reduce GHG and polluting emissions and reinforce the frontrunner and competitive position of the European industry. They are in line

with the research and innovations areas identified in the Implementation Plan of the action of the Strategic Energy Technology (SET) Plan dedicated to 'energy efficiency in industry'.

The bulk of R&I dedicated to industry is covered in Cluster 4 (Digital, Industry and Space), and in particular by the private public partnership Processes4Planet focussing on process industries. In Cluster 5, this Destination focusses on the management of thermal energy in industry.

Main expected impacts:

- Increasing energy efficiency in industry and reducing industry's energy dependence, Greenhouse Gas (GHG) and air pollutant emissions through recovery, upgrade and/or conversion of industrial excess (waste) heat and through the integration of renewable energy sources into more efficient and flexible systems for the generation of heat and cold for industrial processes.

## Call – Efficient, sustainable and inclusive energy use 2023

### Highly energy-efficient and climate neutral EU building stock

Topic ID and title	<a href="#">HORIZON-CL5-2023-D4-01-03: Interoperable solutions for positive energy districts (PEDs), including a better integration of local renewables and local excess heat sources</a>				
Budget	EUR 8 million	Opening date	13 December 2022	Deadline 1	20 April 2023
Budget per project	EUR 4 million			Deadline 2	/
Type of action	Innovations Actions (IA)				
FTP subsector	WW, P&P				
Keywords	Positive Energy Districts, renewable energy, citizen participation, tools for planning and managing buildings and districts				
FTP comments	This topic might be of interest to the building with wood sector and energy suppliers, like district heating suppliers.				
FTP SIRA 2030 Challenges addressed	8 - 10C			FTP relevance	Indirect
				Starting TRL	/
				End TRL	6-8

#### Expected Outcome:

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

- Increased availability of tools, guides and interoperable solutions for planning, design, development and management of Positive Energy Districts (PEDs).
- Improved integration of energy (e.g. distributed renewable energy generation, waste heat utilisation, storage) and non-energy sectors (e.g. mobility) within PEDs.
- Improved integration of PEDs in energy systems and improved contribution of PEDs to energy grid robustness with regard to dependencies to energy supplies.
- Increased social entrepreneurship and citizen participation and engagement in energy communities.
- Increased participation of consumers and energy communities in the value chain of the energy system.

#### Scope:

Recent projects have demonstrated positive energy districts, but there is a need to demonstrate fully interoperable solutions that include improved energy efficiency coupled with a better integration of local renewables and local excess heat sources within the district. In parallel, the interoperability of positive energy districts with the urban and renewable energy system in which they are embedded needs to be enhanced through effective

solutions that will allow interaction and integration between buildings, the users and the regional energy, mobility and ICT systems.

Projects are expected to address all of the following:

- Develop solutions (products, tools, etc.) for planning and managing assets (e.g. buildings, energy systems, mobility systems, ICT) in positive energy districts.
- Develop tools and methods for planning and designing PEDs, that support PED developers and managers to optimise the mix of PED solutions depending on the local conditions.
- Develop data exchange platforms (heat & electricity) and technologies to integrate buildings with energy markets (e.g. flexibility market) relying on available standards (e.g. SAREF), allowing buildings to contribute effectively to grid stabilisation at district / city level.
- Develop methodologies and/or planning tools for the optimal integration of distributed renewable generation and excess heat at district (or building) level.
- Develop innovative business models for integration of PEDs in the energy markets including technological, financial and regulatory aspects.
- Deploy and test certification and standardisation frameworks for interoperable solutions in positive energy districts.
- Demonstrate the proposed solutions in at least three PEDs to promote replication, upscaling and mainstreaming.

To ensure interoperability and integration into the grid, projects should make use of operational end-to-end architectures, digital platforms and other data exchange infrastructure for the energy system being developed under ongoing Horizon 2020, Horizon Europe as well as under other EU programs such as the Digital Europe Program, when addressing communication and data exchange between inverters and other components, other appliances and the electricity network.

The selected projects are expected to contribute to relevant BRIDGE initiative, actively participate to its activities and allocate up to 2% of their budgets to that end. Additional contributions to the “Alliance for Internet of Things Innovation” (AIOTI) and other relevant activities (e.g. clusters of digital projects and coordinating actions) might be considered, when relevant.



## Call – Efficient, sustainable and inclusive energy 2024

### Industry

Topic ID and title	<a href="#">HORIZON-CL5-2024-D4-01-03: Alternative heating systems for efficient, flexible and electrified heat generation in industry</a>				
Budget	EUR 16 million	Opening date	07 December 2023	Deadline 1	18 April 2024
Budget per project	EUR 5,3 million			Deadline 2	/
Type of action	Innovations Actions (IA)				
FTP subsector	P&P				
Keywords	heating systems, electricity grid, district heating, energy storage				
FTP comments	This topic is only of low or indirect relevance. It could offer some opportunities for process industries offering heat and electricity as by-products to the built environment to be more involved with the end users.				
FTP SIRA 2030 Challenges addressed	10C	FTP relevance		Indirect	
		Starting TRL		/	
		End TRL		6-7	

### Expected Outcome:

Project results are expected to contribute to all the following expected outcomes, except where options are specified:

- Take full advantage of alternative heating systems for electrified, efficient and precisely focussed heat generation in industry, that create the possibility for new, decarbonised and flexible processes, reducing fossil fuel imports dependency, maximising primary energy savings and CO2 emission reduction compared to present state-of-the-art, demonstrated by LCA or similar studies (assuming decarbonised electricity use).
- Environmental and technical performances, health protection, safety and economic viability of novel heating technologies demonstrated and validated in industrial processes.
- Better awareness of the challenges and benefits of alternative heating systems in the relevant industrial sectors.

### Scope:

Alternative forms of energy such as for example ultrasound, microwaves, plasma, infrared, visible and ultraviolet radiations ... are unconventional and contactless heat sources, that create the possibility of new, efficient and flexible processes, in that they are applied precisely where they are needed and with shortened reaction times. They are key enablers for switching processes from fossil energy to renewable or low-carbon energy sources, and

can contribute to increasing their energy efficiency, thereby reducing fossil fuel imports dependency.

They provide higher production flexibility, allowing variable throughputs to better follow market demand and enabling leaner production paradigms (e.g. decreased stock, production on demand), as well as flexibility for the electricity grid via demand response. Furthermore, such technologies are suitable for downscaling, which can be an advantage in some cases (e.g. local waste or biomass feedstock processing).

*Note: the electrification of furnaces to heat large volumes at very high temperatures is not in the scope of this topic, because it is covered in Cluster4 work programme.*

Further research and upscaling work is necessary to demonstrate their potential to be deployed on an industrial scale.

In order to reach this goal all the following development areas are expected to be covered:

- Cost effective and improved designs for at least two alternative heat sources technologies.
- Integration and demonstration of the system at industrial scale of at least one alternative heat source technology in at least on industrial process; demonstrate the financial viability and develop a business case.
- Make a preliminary estimation of the future equipment cost for at least one alternative heat source technology, in a total of at least three industrial applications (including the demonstrated application), to evaluate their economic potential.
- Make an analysis of the potential industrial deployment and related benefits (technical, economic, climatic, environmental) of at least one alternative heat source technology in three industrial sectors, in the EU and (if data are available) in the Associated States and, by extrapolation, at global level.
- Define an exploitation strategy. For proposals submitted under this topic, the plan for the exploitation and dissemination of results should include a strong business case and sound exploitation strategy, as outlined in the introduction to this Destination. The exploitation plans should include preliminary plans for scalability, commercialisation, and deployment (feasibility study, business plan) indicating the possible funding sources to be potentially used (in particular the Innovation Fund).

## Cluster 6 : Food, Bioeconomy, Natural Resources, Agriculture and Environment<sup>3</sup>

### Destination 3: Circular economy and bioeconomy sectors

This destination and its topics target climate-neutrality, zero pollution, fair and just circular and bioeconomy transitions. 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, b) sustainable forestry, c) small-scale rural bio-based solutions, d) environmental services and e) aquatic (including marine and freshwater) value chains.

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;
- the EU strategy on adaptation to climate change adopted in February 2021;
- the EU zero pollution action plan, adopted in May 2021, with the chemicals strategy for sustainability from October 2020 and the new approach for a sustainable blue economy adopted in May 2021;
- the EU forest strategy for 2030: research and innovation will be key drivers in achieving the ambitious goals of this strategy;
- the EU climate law targeting climate-neutrality by 2050 and AFOLU 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;
- the new European Bauhaus initiative and the renovation wave.

Furthermore, the Horizon Europe work programme for 2023-2024 will play a critical role in implementing the EU strategy for sustainable textiles, 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

<sup>3</sup> [Work Programme published by the European Commission on 06 December 2022](#)

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) 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 and its action plan;
- 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 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.
- **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 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, 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.

## Call – Circular economy and bioeconomy sectors 2023

### Enabling a circular economy transition

Topic ID and title	<a href="#">HORIZON-CL6-2023-CIRCBIO-01-7: Symbiosis in the bio-based industrial ecosystems</a>				
Budget	EUR 3 million	Opening date	22 December 2022	Deadline 1	28 March 2023
Budget per project	EUR 1,5 million			Deadline 2	/
Type of action	Coordination & Support Actions (CSA)				
FTP subsector	WW, P&P				
Keywords	Industrial symbiosis, digitalisation, environmental impacts				
FTP comments	The call will support assessment and analysis of how synergies can be developed or strengthened between industrial actors from different value-chains in the bioeconomy. E.g. between personal care products and construction materials				
FTP SIRA 2030 Challenges addressed	5 – 6A	FTP relevance		Low	
		Starting TRL		/	
		End TRL		/	

### 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.

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 and on the knowledge collected and elaborated under the European Community of Practice (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;
- Assessment 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 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;
- 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, NEBLab 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 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.

Topic ID and title	<a href="#">HORIZON-CL6-2023-CIRCBIO-01-9: Business models that balance the share of power and profit in the bioeconomy</a>				
Budget	EUR 8 million	Opening date	22 December 2022	Deadline 1	28 March 2023
Budget per project	EUR 4 million			Deadline 2	/
Type of action	Research & Innovation Actions (RIA)				
FTP subsector	F&F, WW, P&P – Value Chain				
Keywords	green jobs, business models, biorefineries, cooperatives, marginal lands, R&I priorities				
FTP comments	This call topic is for the whole value chain and the forest-based sector is included.				
FTP SIRA 2030 Challenges addressed	2E - 3E - 5 – 6A, B – 7 – 9A, B – 10B			FTP relevance	Low
				Starting TRL	/
				End TRL	/

### 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.
- 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).
- 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' behavior 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, SME's 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.

## Call – Circular economy and bioeconomy sectors 2023 two stage

### Enabling a circular economy transition

Topic ID and title	<a href="#">HORIZON-CL6-2023-CIRCBIO-02-2-two-stage: Novel, sustainable and circular bio-based textiles</a>				
Budget	EUR 14 million	Opening date	22 December 2022	Deadline 1	28 March 2023
Budget per project	EUR 7 million			Deadline 2	26 September 2023
Type of action	Innovation Actions (IA)				
FTP subsector	P&P				
Keywords	textiles circularity, environmental impacts, recycling, bio-based fibres, social impacts, biomass, upcycling, New European Bauhaus, CBE JU				
FTP comments	The expected project results sounds very promising to the wood-based textiles businesses. They are: A) Reduce the negative environmental impact of textiles throughout their lifecycle. This impact encompasses primary raw materials and water consumption. B) Increase recyclability and circularity of textiles. C) Increase the use of EU (regionally-sourced) alternative, bio-based fibres. D) Address social impacts. E) Empower and increase SMEs participation. F) Establish new and innovative circular bio-based value chains				
FTP SIRA 2030 Challenges addressed	4B, D – 9A	FTP relevance		Medium	
		Starting TRL		/	
		End TRL		6-8	

### 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 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<sup>262</sup>.
- 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:

- 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 biobased textiles to produce circular bio-based textiles is in scope;
- Design for circularity, enabling thus material design for 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<sup>263</sup> 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.<sup>264</sup> 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 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, NEBLab 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.

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 call and it is highly encouraged to address them as cross-cutting issues.



## Call – Circular economy and bioeconomy sectors 2024

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

Topic ID and title	<a href="#">HORIZON-CL6-2024-CIRCBIO-01-6: Digital information systems for bio-based products</a>				
Budget	EUR 6 million	Opening date	17 October 2023	Deadline 1	22 February 2024
Budget per project	EUR 3 million			Deadline 2	/
Type of action	Research and Innovations Actions (RIA)				
FTP subsector	WW, P&P				
Keywords	digitalisation, CBE JU, EU Digital strategy, Circular Economy, Bioeconomy				
FTP comments	The scope of the topic is to digitalise the biobased value chains (through AI tools, digital chain-of-custody solutions, etc) for better circularity. It targets the bioeconomy as a whole. Participation of relevant stakeholders of the complex forest-based value-chain, is important but. This role is likely suitable for a technical/research Institute. The topic is part of the Circular Biobased Europe JU programme.				
FTP SIRA 2030 Challenges addressed	2E – 6E – 8C – 9D			FTP relevance	Medium
				Starting TRL	/
				End TRL	5

#### 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 and the proposal for the Ecodesign for sustainable Products Regulation as well as the EU data strategy.

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 EU Digital strategy's Circular Electronics Initiative 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 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.

## Call – Circular economy and bioeconomy sectors 2024 two-stage

### Enabling a circular economy transition

Topic ID and title	<a href="#">HORIZON-CL6-2024-CIRCBIO-02-1-two-stage: Circular solutions for textile value chains through innovative sorting, recycling, and design for recycling</a>				
Budget	EUR 15 million	Opening date	17 October 2023	Deadline 1	22 February 2024
Budget per project	EUR 5 million			Deadline 2	17 September 2024
Type of action	Research & Innovations Actions (RIA)				
FTP subsector	P&P				
Keywords	textiles circularity, digitalisation, recycling, disintegration				
FTP comments	This topic could potentially be of high interest for specific companies in the forest-based sector that have entered into the fibre textiles business. The topic is part of the Circular Biobased Europe JU programme.				
FTP SIRA 2030 Challenges addressed	4B, C, D – 9A	FTP relevance		Low	
		Starting TRL		/	
		End TRL		5-6	

#### 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: 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.

Topic ID and title	<a href="#">HORIZON-CL6-2024-CIRCBIO-02-4-two-stage: New circular solutions and decentralised approaches for water and wastewater management</a>				
Budget	EUR 15 million	Opening date	17 October 2023	Deadline 1	22 February 2024
Budget per project	EUR 5 million			Deadline 2	17 September 2024
Type of action	Innovation Actions (IA)				
FTP subsector	P&P				
Keywords	waste-water treatment, digital technologies, decentralised systems				
FTP comments	This topic might be most interesting for water companies and waste-water treatment facilities. However, the p&p industries water usage and waste-water treatment might bring them in as a relevant applicant, seeking circular solutions with a wider group of stakeholders. The topic is part of the Circular Biobased Europe JU programme.				
FTP SIRA 2030 Challenges addressed	5D	FTP relevance		Low	
		Starting TRL		/	
		End TRL		6-8	

### 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, 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

Topic ID and title	<a href="#">HORIZON-CL6-2024-CIRCBIO-02-5-two-stage: Circular design of bio-based processes and products</a>				
Budget	EUR 8 million	Opening date	17 October 2023	Deadline 1	22 February 2024
Budget per project	EUR 4 million			Deadline 2	17 September 2024
Type of action	Research & Innovation Actions (RIA)				
FTP subsector	WW, P&P				
Keywords	circularity, biobased processes and products, reuse, recycling, environmental impacts				
FTP comments	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 aim is to improve circularity of biobased products. As such it could be very relevant for several actors in the forest-based sector. The topic is part of the Circular Biobased Europe JU programme.				
FTP SIRA 2030 Challenges addressed	4	FTP relevance		Medium	
		Starting TRL		/	
		End TRL		5	

### 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 biobased 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<sup>206</sup>. 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, NEBLab 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<sup>207</sup>, 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.

Topic ID and title	<a href="#">HORIZON-CL6-2024-CIRCBIO-02-6-two-stage: From silos to diversity - small-scale bio-based demonstration pilots</a>				
Budget	EUR 15 million	Opening date	17 October 2023	Deadline 1	22 February 2024
Budget per project	EUR 5 million			Deadline 2	17 September 2024
Type of action	Innovations Actions (IA)				
FTP subsector	F&F, P&P				
Keywords	business models, biomass, bioeconomy, primary producers, pilots, side streams				
FTP comments	This topic is mainly focusing on farming and agricultural feedstocks, but forestry residues in also included. The topic addresses "...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". As such the scope is highly relevant to the forest-based value chain.				
FTP SIRA 2030 Challenges addressed	2E – 6A, B			FTP relevance	High
				Starting TRL	/
				End TRL	6-7

### 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 SME's.
- 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, pretreatment (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 SME's 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 4: 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, 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 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.

## Call – Clean environment and zero pollution 2023

### Increasing environmental performances and sustainability of bio-based processes and products

Topic ID and title	<a href="#">HORIZON-CL6-2023-ZEROPOLLUTION-01-4: Environmental sustainability and circularity criteria for industrial bio-based systems</a>				
Budget	EUR 8 million	Opening date	22 December 2022	Deadline 1	28 March 2023
Budget per project	EUR 4 million			Deadline 2	/
Type of action	Research & Innovations Actions (RIA)				
FTP subsector	F&F, WW, P&P				
Keywords	biobased industrial systems, environmental impacts, circularity, life cycle analysis LCA				
FTP comments	This topic is very ambitious and expect projects to deliver sustainability criteria for the bioeconomy, inventory of TRL levels for relevant technologies and processes, etc. The result of funded projects should be used for future preparations of research funding programmes in the area of the circular bioeconomy (note: biofuels and bioenergy is excluded). As such, it is critical for the forest-based sector that relevant knowledge is represented in the proposals. It is most likely that this competence and willingness to apply is found in the academia or research institutes.				
FTP SIRA 2030 Challenges addressed	2E – 4D – 5C – 9B			FTP relevance	High
				Starting TRL	/
				End TRL	5

#### 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 biobased 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 biobased 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 and ongoing EU funded projects, including under the Circular Bio-based Europe JU 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.

Topic ID and title	<a href="#">HORIZON-CL6-2023-ZEROPOLLUTION-01-5: Industrial biotechnology approaches for improved sustainability and output of industrial bio-based processes</a>				
Budget	EUR 10 million	Opening date	22 December 2022	Deadline 1	28 March 2023
Budget per project	EUR 5 million			Deadline 2	/
Type of action	Innovation Actions (IA)				
FTP subsector	P&P				
Keywords	industrial biotechnology, genetics, synthetic biology				
FTP comments	The aim of this topic is to support efforts to replace fossil-based chemicals with biobased-chemicals while not making new environmental mistakes. As such, it might be most relevant for the biotech sector and biochemical producers but it should also be relevant to the forest-based process industry.				
FTP SIRA 2030 Challenges addressed	9C	FTP relevance		Medium	
		Starting TRL		/	
		End TRL		6-8	

### 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 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 multiproduct 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 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. Approaches based on improved enzymatic solutions should carefully consider a parallel topic, 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.



## Reducing the environmental impact and pollution in food systems

Topic ID and title	<a href="#">HORIZON-CL6-2023-ZEROPOLLUTION-01-7: Strategies to prevent and reduce plastic packaging pollution from the food system</a>				
Budget	EUR 8 million	Opening date	22 December 2022	Deadline 1	28 March 2023
Budget per project	EUR 4 million			Deadline 2	/
Type of action	Research & Innovation Action (RIA)				
FTP subsector	P&P				
Keywords	food packaging, plastics, reuse, recycling, sustainable packaging				
FTP comments	This topic should be highly relevant to the packaging industry for instance by replacing fossil-based plastics in paper-based food packaging				
FTP SIRA 2030 Challenges addressed	4	FTP relevance		High	
		Starting TRL		/	
		End TRL		/	

### 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 European 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,
- 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 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.

- 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 2023 two stage

### Increasing environmental performance and sustainability of processes and products

Topic ID and title	<a href="#">HORIZON-CL6-2023-ZEROPOLLUTION-02-2-two-stage: Safe-and-sustainable-by-design bio-based platform chemicals, additives, materials or products as alternatives</a>				
Budget	EUR 8 million	Opening date	22 December 2022	Deadline 1	28 March 2023
Budget per project	EUR 4 million			Deadline 2	26 September 2023
Type of action	Research and Innovations Actions (RIA)				
FTP subsector	P&P				
Keywords	platform chemicals, circularity-by-design, biotechnology, AI				
FTP comments	The aim of this topic is to support efforts to replace fossil-based chemicals with biobased-chemicals while not making new environmental mistakes. As such, it might be most relevant for the biotech sector and biochemical producers but it should also be relevant to the forest-based process industry.				
FTP SIRA 2030 Challenges addressed	9C	FTP relevance		Medium	
		Starting TRL		/	
		End TRL		4-5	

#### 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 biobased products.

#### Scope:

To deliver on the expected outcome, proposals should:

- Perform a wider scoping exercise, including opportunities and challenges, to propose priority areas 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 biobased 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.
- 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 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.

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 2024 two stage

### Increasing environmental performance and sustainability of bio-based processes and products

Topic ID and title	<a href="#">HORIZON-CL6-2024-ZEROPOLLUTION-02-2-two-stage: Innovative technologies for zero pollution, zero-waste biorefineries</a>				
Budget	EUR 8 million	Opening date	17 October 2023	Deadline 1	21 February 2024
Budget per project	EUR 4 million			Deadline 2	17 September 2024
Type of action	Research and Innovations Actions (RIA)				
FTP subsector	P&P				
Keywords	biorefineries, circularity, zero-pollution, digital innovation, bio-based processes				
FTP comments	The topic focuses on biorefinery concepts and in particular integrated pollution prevention and control in bio-based systems targeting soil, water and air quality and noise levels. As such it should be relevant to the P&P sector. The topic is part of the Circular Biobased Europe JU programme.				
FTP SIRA 2030 Challenges addressed	4C – 6B – 7E			FTP relevance	Medium
				Starting TRL	/
				End TRL	4-5

#### 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 zerowaste, zero-pollution ambition.
- Integrated pollution prevention and control in bio-based systems targeting soil, water and air quality and 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 biobased 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 6: Resilient, inclusive, healthy and green rural, coastal and urban communities

Places and people matter when it comes achieving of a more sustainable Europe. The Sustainable Development Goals and the ecological and digital transitions brought forward by the European Green Deal with its farm to fork and biodiversity strategies, zero pollution action plan, common fisheries policy (CFP), along with the recent pandemic, bring challenges and opportunities that vary for different places and people. Rural (including mountains and sparsely populated areas) and coastal areas, play a key role in protecting, managing, and using natural resources. The provision of both private and public goods from these areas depends on the resilience and attractiveness of communities there and the capacity of people living and working there to enjoy an adequate level of well-being, which should be guaranteed by, e.g. the access to good quality services. The COVID-19 pandemic has highlighted deficiencies in digital infrastructures and economic opportunities that hamper resilience. It also highlighted the importance of high-quality and biodiverse green and blue spaces for the health and well-being of local communities, in primis, but also for that of visitors of these areas.

Innovation is a key enabler of the long-term vision for the EU's rural areas (LTVRA) that aims to overcome the challenges outlined above and make rural areas stronger, connected, resilient and prosperous by 2040. Urban communities generally offer better access to many services but are also more vulnerable to supply-chain disruptions, as shown during the COVID-19 pandemic. Furthermore, they have a key role to play in fostering sustainable production and consumption as major demand drivers. The New European Bauhaus initiative offers possibilities to redesign living spaces to improve sustainability, inclusiveness, and aesthetics, setting out a path to a more resilient, inclusive, healthy and green (built) environment. In all communities, social, cultural and behavioural drivers play an important role in either enabling or slowing down transitions. Knowledge and innovative solutions need to be developed to strengthen every community's resilience and capacity to contribute to and benefit from the upcoming transitions in an economy that works for all territories and ensures a fair and just transition leaving no one behind.

Under this destination, transdisciplinary R&I with a strong social, behavioural and humanities sciences dimension (SSH), which pay and attention to gender aspects, will enable a sustainable, balanced, equitable and inclusive development and management of rural, coastal and urban areas in three different ways.

Firstly, it will aim to **increase our understanding** of the different ways of climate, environmental, socio-economic and demographic changes affect rural, coastal and urban

areas in order to identify ways to turn these changes into equal, and, when needed equitable, opportunities for people wherever they live. This would strengthen territorial cohesion and enable a just transition. Secondly, it will **explore innovative ways to tailor policy responses** to the place-based challenges and needs identified at various levels of governance. Thirdly, it will **support bottom-up community-led innovation** to empower communities to develop, test and upscale solutions that answer global challenges in locally adapted ways. Achieving policy goals require providing people with more equitable access to the knowledge and skills needed to make informed choices and ensure they are actively engaged in the conservation. It also requires natural resources to be managed in a sustainable and circular manner, from production or service provision to consumption, in the spirit of the EU competence framework for sustainability. Rural, coastal and urban communities need improved labour conditions, quality of life and long-term socio-economic prospects in the context of major transitions and rising threats to climate, resources and health. This is particularly the case for women, young people older people, people with disabilities, people in vulnerable situations (e.g. income falling below the poverty line, or at risk of poverty), migrants, ethnic minorities and indigenous people and those hit the hardest by the COVID-19 pandemic. Their capacity to drive community-led innovations and their resilience must be increased across the diverse European territories including remote and peripheral places such as mountains, forests, archipelagos, sparsely populated areas, as well as the Arctic. The necessary changes will be facilitated and resilient, smart, and climate friendly production and lifestyles will be supported through mobilising the forces of i) digital transformation, ii) upgraded innovation ecosystems, iii) cultural and natural heritage, iv) nature-based solutions, more sustainable and regenerative tourism as well as social and policy innovation will facilitate necessary changes and support resilient, smart, and climate friendly production and lifestyles.

This destination will in particular:

- Address the spatial and socio-economic or behavioural drivers of the **European Green Deal** (including farm to fork, biodiversity and sustainable and smart mobility strategies), especially its just transition component.
- It will make a key contribution to the **flagship initiative 'R&I for rural communities'** and to the four areas of work under the **long-term vision for the EU's rural areas**: making areas stronger, connected, resilient, prosperous. It will in particular help achieve to climate targets by putting the focus on the climate-neutrality of rural communities that have specific needs and are often neglected by climate action.

- It will complement the **New European Bauhaus (NEB) initiative** that connects the European Green Deal to our living and public spaces; The NEB aims to achieve deep transformation of these spaces, closely involving the public, and integrating the core NEB values of sustainability, inclusion and aesthetics. It will make a key contribution to improving **social inclusion** in Europe in line with the principles of the **European pillar for social rights**, the **EU social economy action plan** and contributing to the **strategy for the rights of persons with disabilities for 2021-2030**.
- It will contribute to the: i) implementation of the **new joint communication on the Arctic** (adopted on 13 October 2021), ii) the fourth Arctic Science Ministerial Joint Statement<sup>384</sup> and iii) to the All- Atlantic Ocean Research Alliance.
- It will contribute to the: i) implementation of the **competence framework for sustainability** prepared by the Commission<sup>385</sup> and the Council Recommendation on education for environmental sustainability for learners of all ages and at all levels of education (part of the EU biodiversity strategy for 2030).
- It will help implement the **EU agenda for tourism** (expected in late 2022).
- It will contribute and link to the **just, green and digital transitions** called for by the European Green Deal, the European industrial strategy, the circular economy action plan and the updated bioeconomy strategy, by exploiting the potential of digital technologies (e.g., using local digital twins for participatory urban planning and evidence-based policy-making).

The following outcomes are expected.

- Policy makers and the public will have a better citizens understanding of **social inclusion challenges**, the circumstances of **people in vulnerable situations in rural and coastal areas** and how to strengthen **social resilience**, including in relation to ecosystem services, biodiversity and natural heritage for coastal areas.
- Policy makers will have a better understanding of the **behavioural and structural drivers of people's lifestyle choices and people's perceptions of rural life** in the aftermath of COVID-19 and of the long-term trends and opportunities for rural areas.
- A **sustainable post-COVID recovery will be enabled in urban, rural and coastal communities** through biodiversity-friendly actions, and valorisation of natural and cultural heritage for sustainable recovery, professional, collective and personal attitudes.

- There will be an improvement **connections, strategies and governance arrangements that enable synergistic development of rural, coastal and urban areas** and more integrated territorial policies and interventions in a growing number of localities and across several sectors.
- **Rural, urban and coastal actors will be engaged in a just and green transition. They will be** equipped with strategies and innovations to contribute to the EU's climate-neutrality by 2050 and benefit from a climate-neutral economy.
- Prosperity will increase thanks to the deployment of business models that are fit for the future and greater job opportunities will be provided for rural and coastal people, particularly in relation to territorial and marine economies and critical resources (soil, water, biodiversity). This is in line with the objectives of the EU Missions 'A Soil Deal for Europe', 'Restore our Ocean and Waters', and 'Adaptation to climate change'.
- More **innovative and integrated policy framework will be upgraded and developed**, capitalising on international knowledge exchange, including indigenous, traditional and local knowledge<sup>387</sup> and cultural heritage in a bottom-up approach.
- Knowledge on the costs and benefits of **urban farming** and improved policy frameworks will be strengthened to maximise its benefits for European society at large across all dimensions of sustainability.
- More **diverse and systemic approaches and innovative solutions** (digital, nature-based, social and community-led) will be developed **with and for local communities** and there is an increase in the number of local actors with improved capacity to sustain these innovative processes and take up these solutions.
- Connections between food provision and multi-functional nature-based solutions for the benefit and well-being of people will be increased. Resilience (climate adaptation mechanisms) will also increase through the combination of the vision of the **New European Bauhaus initiative** to '*call on all Europeans to imagine and build together a sustainable and inclusive future that is beautiful for our eyes, minds, and souls*' with a sustainable food systems approach and make use of Novel sources of inspiration will be put to best use.
- **Understanding, support and engagement will increase** among young people, professionals, authorities, decision makers and the public **for all dimensions of sustainability**.

- Local, coastal and policy communities will use coastal and nature-based heritage, culture and ecosystem services as a basis for potentially year-round diversified sustainable eco-tourism activities.
- A framework will be developed to measure communities' well-being beyond economic indicators (e.g. social, environmental) and use both to create collaborative community management models, including for sustainable and/or regenerative tourism.

### Expected impact

Proposals for topics under this destination should set out a credible pathway to achieving **resilient, inclusive, just, healthy and green rural, coastal and urban communities** and more specifically one or several of the following expected impacts:

- **Rural, coastal and urban areas are developed in a sustainable, balanced, equitable and inclusive manner** thanks to a better understanding of the i) environmental, socio-economic, behavioural, cultural, architectural and demographic structures, ii) needs and drivers of change and their interconnections, and iii) how digital, nature-based, social and community-led innovations are deployed.
- **Rural, coastal and urban communities are empowered to i) act for change**, ii) be better prepared to achieve climate-neutrality and adapt to climate change, and iii) use the digital and green transitions to increase resilience and provide positive long-term prospects.
- **Rural communities are equipped with upgraded innovation ecosystems and innovative and smarter circular solutions** that i) increase access to services and job opportunities, including for women, young people in vulnerable situations, ii) increase their attractiveness and iii) reduce the feeling of being left behind, even in remote locations like mountains and outermost regions.
- **Sustainable development of coastal areas**, including coastal protection and resilience, is enhanced, reaping the benefits of social, digital and community-led innovations, to deliver nature-based and scientifically validated solutions to current coastal socio-economic and environmental threats.
- **Urban and peri-urban communities** – including people in vulnerable situations – can access, afford and choose healthy, nutritious and environmental-friendly food.

Communities in natural and coastal areas can offer sustainable, quality, environmentally and socially friendly tourism, recreational and leisure activities.

## Call – Resilient, inclusive, healthy and green rural, coastal and urban communities 2024 two stage

Topic ID and title	<a href="#">HORIZON-CL6-2024-COMMUNITIES-02-1-two-stage: Innovating for climate-neutral rural communities by 2050</a>				
Budget	EUR 10 million	Opening date	17 October 2023	Deadline 1	22 February 2024
Budget per project	EUR 5 million			Deadline 2	17 September 2024
Type of action	Innovation Actions (IA)				
FTP subsector	F&F, WW, P&P				
Keywords	innovation, rural communities, fire prevention, biodiversity, circularity				
FTP comments	This topic has indirect relevance on the rural forest-based economy, job creation and sustainability.				
FTP SIRA 2030 Challenges addressed	7B	FTP relevance		Indirect	
		Starting TRL		/	
		End TRL		/	

### Expected Outcome

The successful proposal will contribute to fostering a sustainable, balanced, equitable and inclusive development of rural areas, supporting the implementation of the long-term vision for the EU's rural areas and its objectives (in particular contributing to stronger and resilient rural areas) and to its flagship initiative “Research and innovation for rural communities”, the European Green Deal, in particular the climate pact, the fit for 55 package, the forest and biodiversity strategies, and the new soil strategy as well as the territorial agenda 2030, the common agricultural policy (CAP) and the REPowerEU Plan. In addition, proposals will complement the EU Mission Climate-Neutral and Smart Cities, covering sparsely populated areas, and contribute to the objectives of the EU Mission ‘A Soil Deal for Europe’.

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

- rural communities are empowered and engaged in the green transition and equipped with strategies and innovative solutions to contribute to EU's climate-neutrality objectives (by 2035 and 2050) and benefit from a climate-neutral economy;
- rural communities take advantage of data, interoperable platforms and digital technologies available to help them meet climate-neutrality objectives, such as dashboards, data visualisation techniques, modelling, digital twins of entire rural communities and tools contributing to spatial planning;
- policy makers are better informed about policy and regulatory frameworks, conditions and processes that are likely to encourage rural areas' climate-neutrality while sustaining an adequate social welfare and well-being and avoiding negative social, economic and environmental externalities;

- a stronger rural innovation ecosystem is in place bringing together public and private players and making rural areas an attractive place for innovators to work and live.

### Scope

The EU aims to be climate-neutral by 2050 – an economy with net-zero greenhouse gas emissions. This objective is in line with the EU's commitment to global climate action under the Paris Agreement and it is reflected in the European Green Deal objectives. Considering that approximately one third of EU citizens live in rural areas, which represent 83% of the EU territory, it is key to empower rural communities to transit towards sustainability by fostering innovation in key areas such as environment and sustainable management of resources (air, soil, water), energy, transport, agriculture, industry, bioeconomy, and finance and ensure that no one is left behind.

Projects funded under this topic are expected to:

- design, prototype and test concrete innovations (technical, social, organisational) supporting climate-neutrality, zero pollution and biodiversity enhancement in rural communities, possibly including initiatives such as nature-based solutions (NBS), circularity and bioeconomy, bio-based solutions, community-energy systems, climate neutral mobility, fire-prevention, etc. Innovations should be co-created with rural stakeholders to respond to their needs and tested for their feasibility for the territorial development opportunities or drawbacks that they bring;
- include training and capacity building for local administrations and rural stakeholders in order to create and maintain a rural innovation ecosystem and enable them to make use or benefit from the successful innovation developed and from existing funding opportunities for the green and digital transitions;
- boost networking and enhance peer-to-peer learning between communities and capitalise on lessons learnt making them available as recommendations for policy makers at various levels (European, national, regional and local);

Proposals are encouraged to fully exploit and build complementarities with the ongoing work regarding the establishment of the European Open Science Cloud and interact with relevant projects developing metadata standards and added-value tools to ensure interoperability within and across fields of study.

This topic should involve the effective contribution of social sciences and humanities (SSH), (e.g., for expertise in behavioural change, etc.) and must implement the multi-actor approach by involving relevant stakeholders from an early stage (e.g. rural communities representatives, small-medium enterprises -SMEs, etc., end-users, local authorities, etc.).



Proposals should cover various biogeographical regions with a balanced coverage reflecting the various pedo-climatic zones in Europe in a representative way.

Proposals are expected to build on the preliminary results of the Horizon Europe projects GRANULAR and RUSTIK, in particular its framework and indicators on climate-neutrality of rural communities.

Proposals should also create synergies and coordinate activities with the other project funded under this topic and should allocate appropriate budget for this task. Proposals are also encouraged to build synergies with relevant projects that will be financed under this call.

## Destination 7: Innovative governance, environmental observations and digital solutions in support of the Green Deal

Taking advantage of the use, uptake, and deployment of environmental observations as well as digital and data-based green solutions, assessed through the European Green Deal's 'do no harm' principle, is key for innovative governance models and for designing, implementing and monitoring science-based policy. To maximise impacts of R&I on the ground and spark behavioural and socio-economic change, the knowledge and innovation produced throughout the whole cluster should be widely disseminated to and exchanged between the key stakeholders and end users. In particular, the Agricultural Knowledge and Innovation Systems (AKIS) need to be strengthened in line with the 2023-2027 CAP to accelerate the required transformative changes.

### Innovating with governance models and supporting policies

Transformative changes such as those required within the European Green Deal are dynamic processes that require appropriate governance. At the same time, to ensure coordination and for collaborative and informed decision-making, governance requires multiple channels and networks that provide readily available and robust data and information from different sources.

R&I activities under this destination aim to both: experiment with new ways to govern the transition process and strengthen the governance, in particular by ensuring i) appropriate and inclusive engagement with stakeholders, e.g. civil society and regional and local actors, ii) environmental observations coverage, and iii) that information and knowledge is made available and accessible. R&I for governance to support the European Green Deal should provide insights into the opportunities to overcome potential institutional barriers such as lock-ins, path dependency, political and cultural inertia, power imbalances and the ways to strengthen the effectiveness and efficiency of regulatory pathways. It should also help create synergies and linkages between different policy instruments and funding opportunities.

Innovative governance supporting the European Green Deal objectives needs to recognise, cope with and promote resilience and inclusiveness in the face of on-going shocks and disruptions across Europe and the world, whether these be climatic, ecological, economic, social, geopolitical or related to agricultural inputs and resources, food, health, bio-based sectors or the wider bioeconomy. The creation of networks with the public (citizen engagement) and researchers, including also through digital technologies, can step up transformation and enhance resilience in different areas, such as food. Critical risk assessment and reduction strategies need to be incorporated, including the diversification

of infrastructures, resources and knowledge through more self-sufficiency and autonomy. Innovative governance will: i) support social innovation in the bioeconomy and bio-based systems (e.g. revitalisation of local communities with innovative bio-based business models and social innovation, or with co-creation and trust-building measures for biotechnology and bio-based innovation systems); ii) assess existing and emerging trade-offs of land and biomass; and iii) strengthen the national bioeconomy networks in countries taking part in the Central-Eastern European Initiative for Knowledge-Based Agriculture, Aquaculture and Forestry in the Bioeconomy (BIOEAST Initiative).

The new **partnership 'Agriculture of Data'** will help improve the sustainability performance of agricultural production and strengthen policy monitoring and evaluation capacities through using the full potential of Earth and environmental observation and data technologies. It will address public and private sector interests in a synergetic way. This will be done through responsible R&I delivering data-based green solutions and through establishing governance structures which allow for systemic approaches to capitalising and using data. The **partnership for a 'Climate-neutral, sustainable and productive Blue Economy'** will enable a just and inclusive transition to a climate-neutral, sustainable and productive blue economy providing for a healthy ocean, people's wellbeing, and a blue economy that is in harmony with nature and whose benefits are distributed fairly.

### **Deploying and adding value to environmental observations**

Data and information obtained through environmental observation is of great value when assessing the state of the planet and is crucial to supporting the European Green Deal and the climate and ecological transitions. Integrating this information from different sources (space-based, airborne including drones, in-situ and citizens observations) with other relevant data and knowledge while ensuring (better) accessible, interoperable or deployable information, provides the information necessary for shaping the direction of policy development in the broad context of Cluster 6A strong link to Copernicus, the European Earth observation and monitoring part of the EU Space programme (in Cluster 4 - Digital, Industry and Space) and the European Space Agency's (ESA) Earth observation programme, as well as support to the Group on Earth Observation (GEO), its European regional initiative (EuroGEO), the Global Earth Observation System of Systems (GEOSS) and the European Commission initiative *DestinationEarth*, is foreseen for topics on environmental observations under this destination. R&I activities relevant to the ocean, seas and coastal waters will complement and support the UN Decade of Ocean Science for Sustainable Development and the UN Decade on Ecosystem Restoration, the G7 Future of the Seas and Oceans Initiative, the European Global Ocean Observing System (EOOS) and the GOOS 2030 strategy.

## **Digital and data technologies as key enablers**

Digital and data-based innovation, in complementarity with activities supported by Cluster 4 and the Digital Europe Programme, should bring benefits for citizens, businesses, researchers, the environment, society at large and policymakers. The potential of the ongoing digital transformation, and its wider impacts – both positive and negative – need to be better understood and monitored in view of future policy design and implementation, governance, and solution development. The potential for digital and data technologies, including AI-, IoT-, and augmented reality-based solutions, to increase the sustainability and resilience of production and consumption systems, as well as industry and services, in sectors covered by this Cluster will be exploited. This destination will contribute to the development, support and take up of innovative digital and data-based solutions to support communities, economic sectors relevant for this cluster and society at large to achieve sustainability objectives. The focus is on overall sustainable solutions tailored to the needs of end-users and/or the systems. More specifically, R&I activities will contribute to economic circularity by promoting reuse of materials and waste reduction, adding value to existing knowledge and increasing cost-effectiveness, safety and trustworthiness of innovative environmentally-friendly technologies in and across primary production sectors, food systems, bio-based sectors, bioeconomy, and sectors related to the oceans and biodiversity.

It will also increase attention given to precision and collaborative technologies and contribute to the human-centric twin green and digital transitions. This is a key policy objective that is also supported by the cross-cutting objective pursued by the CAP, the EU digital strategy, the European industrial strategy, the circular economy action plan, the SME strategy and the European data strategy.

## **Strengthening agricultural knowledge and innovation systems (AKIS)**

Knowledge and advice to all actors relevant to this cluster are key to improving sustainability. For instance, primary producers have a particular need for impartial and tailored advice on sustainable management choices. Agriculture Knowledge and Innovation Systems (AKIS, which are at the heart of the 2023-2027 CAP's cross-cutting objective, go beyond agriculture, farming and rural activities and cover environment, climate, biodiversity, landscape, bioeconomy, consumers and citizens, i.e. all food and bio-based systems including value chains up to the consumer. R&I actions under this destination will support effective AKIS as a key driver to bridge the gap between science and practice and to enhance co-creation. This will speed up innovation and the take-up of results needed to achieve the European Green Deal objectives and targets.

This includes promoting interactive innovation and co-ownership of results by users as well as strengthening synergies with other EU funds, especially the CAP, boosting the multi-actor approach and setting up structural networking within national/regional/local AKIS. In addition, social innovation also has the potential to achieve the objectives set in this destination, as it strengthens the resilience of communities, increases the relevance, acceptance and uptake of innovation, and helps bring about lasting changes in social practices, therefore acting as a system changer.

Where appropriate, proposals are encouraged to cooperate with the European Commission Knowledge Centre on Earth Observation (KCEO), in order to e.g. disseminate and exploit results.

### Expected impact

Proposals for topics under this destination should set out a credible pathway contributing to innovative governance and sound decision-making on policies for the green transition and more specifically to one or more of the following impacts:

- innovative governance models enabling sustainability and resilience notably to achieve better informed decision-making processes, societal engagement and innovation;
- areas related to the European Green Deal benefit from further deployment and exploitation of environmental observation data, products and “green” solutions;
- a strengthened Global Earth Observation System of Systems (GEOSS);
- sustainability performance and competitiveness in the areas covered by Cluster 6 are improved through further deployment of digital and data technologies as key enablers;
- stakeholders and end users including primary producers and consumers are better informed and engaged thanks to effective platforms such as AKIS;
- strengthened EU and international science-policy interfaces to achieve the Sustainable Development Goals.

When considering their impact, proposals also need to assess their compliance with the “Do No Significant Harm” principle according to which the project’s R&I activities should not support or carry out activities that cause a significant harm to any of the six environmental objectives of the EU Taxonomy Regulation.

Topics under this destination will have impacts in the following areas:

- “Climate change mitigation and adaptation”;

- “Clean and healthy air, water and soil”;
- “Enhancing ecosystems and biodiversity on land and in water”;
- “Sustainable food systems from farm to fork on land and sea”;
- “High quality digital services for all”;
- “A Competitive and secure data-economy”.

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. In this cluster, it is envisaged that topics will be coordinated with European Space Agency (ESA) actions so that ESA space data and science can be proactively integrated into the relevant research actions of the WP.

## Call – Innovative governance, environmental observations and digital solutions in support of the Green Deal 2021

### Innovating with governance models and supporting policies

Topic ID and title	<a href="#">HORIZON-CL6-2023-GOVERNANCE-01-5: Revitalisation of European local (rural / peri-urban) communities with innovative bio-based business models and social innovation</a>				
Budget	EUR 5 million	Opening date	22 December 2022	Deadline 1	23 March 2023
Budget per project	EUR 5 million			Deadline 2	/
Type of action	Research and Innovations Actions (RIA)				
FTP subsector	F&F, WW, P&P (Value Chain)				
Keywords	business models, local/regional scales				
FTP comments	This topic has indirect relevance on the rural forest-based economy, job creation and sustainability.				
FTP SIRA 2030 Challenges addressed	3A, B, E	FTP relevance		Indirect	
		Starting TRL		/	
		End TRL		/	

#### Expected Outcome:

Successful proposals 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. Furthermore, it will contribute to strengthened EU and international science-policy interfaces to achieve the Sustainable Development Goals.

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

- Higher impact of bio-based innovation to accelerate the transition from a linear fossil-based economy, which leads to overuse and depletion of natural resources, into a resource-efficient and circular bio-based systems operating within safe planetary boundaries.
- Improved and informed public awareness, governance and especially social innovation contributing to reduced resource consumption and increased innovation capacity of all actors, in respect to circular bio-based sectors, reduced risk of leaving anyone behind, particularly in the areas and communities in need of revitalization (focus on rural and peri-urban areas).

- Higher level of innovation at local scale and inclusive engagement of all actors (especially focusing on the 'social enterprise' model relevant for vulnerable populations).

Scope:

- Proposals will benefit from social creativity and economic opportunities at local/regional scale unleashed for bio-based systems, taking care of their high environmental performances, in terms of local bio-based feedstock, resources, processes, skills, materials and products. Impacts and trade-offs, such as lower carbon footprint and environmental impacts of the whole value chains shall be part of the assessment of the bio-based systems.
- Communication and dissemination activities need to take into account the inclusive nature of engagement of local actors (e.g., use of languages, mutual learning process, trust building measures), to achieve exchange of best practice at European level, and connection to appropriate local governance structure.
- Integration of regional, local, or macro-regional policy makers is considered essential, as is the involvement of civil society (NGOs, consumer organisations, etc). This should include the assessment of robustness of existing governance schemes, to allow replication across Europe (taking into account the issues such as the income generation for all stakeholders, labour conditions, environmental indicators, social engagement, innovation parameters etc).
- The development of novel bio-based models shall involve economic actors, primarily SMEs, but also rural entrepreneurial structures (e.g., cooperatives, professional associations). Digital solutions to connect and inform all stakeholders, including consumers, shall be given due consideration.
- Projects should build on past or parallel activities, e.g., Horizon 2020 projects Power4Bio, BE-Rural or the projects funded under the call HORIZON-CL6-2021-GOVERNANCE-01-09: Revitalisation of European local communities with innovative bio-based business models and social innovation, as well as the past/on-going projects under the Bio-based Industries Joint Undertaking (BBI JU), seeking synergies and links with upcoming activities of the Circular Bio-based Europe Partnership, as well as Horizon Europe calls.
- In order to avoid the risk of duplication of efforts and to limit the focus to rural and periurban actions, the present topic excludes blue (marine and maritime) bio-based activities from its scope.
- International cooperation should be considered, aiming at exchange of best practice.
- 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



- Proposal should explore intersectionality approaches and consider aspects like gender, ethnicity, migrant or refugee status, social class, sexual orientation and disability to ensure inclusion of marginalised groups in citizen engagement and the development of tools and guidelines.
- 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.

Topic ID and title	<a href="#">HORIZON-CL6-2023-GOVERNANCE-01-7: Integrated assessment of land use and biomass demands to contribute to a sustainable healthy and fair bioeconomy</a>				
Budget	EUR 4 million	Opening date	22 December 2022	Deadline 1	23 March 2023
Budget per project	EUR 4 million			Deadline 2	/
Type of action	Research and Innovation Actions (RIA)				
FTP subsector	F&F, WW, P&P (Value Chain)				
Keywords	biomass, land use, policy, ecosystem services, biomass availability				
FTP comments	This topic will support policy developments related to land-use and biomass availability. As such it is of strategic importance to the forest-based sector and stakeholders should get involved.				
FTP SIRA 2030 Challenges addressed	2E - 3D, E	FTP relevance		High	
		Starting TRL		/	
		End TRL		/	

### 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 aim to develop or improve land use models and tools, enabling sustainability assessments to support better-informed policy- and decision-making processes, particularly on a national and regional level. European Green Deal related policy domains will benefit from further deployment and exploitation of this Environmental Observation data.

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

- Better understanding, methods and tools for determining the potential and limits of land and biomass to contribute to the climate, biodiversity, environmental, as well as social and economic objectives of the European Green Deal.
- Enhanced knowledge on the policy pathways for maximising the climate benefit of bioeconomy solutions within ecological boundaries and improved decision-making for ensuring policy coherence on the national and regional level.

### Scope:

- Improve understanding of direct and indirect implications of current and future regional, national or EU policies and targets on land and biomass use, including an assessment of existing and emerging trade-offs, using and improving existing databases with high resolution data.
- Develop methodologies as well as tools for national and regional policy- and decisionmakers to carry out integrated bioeconomy land and biomass use assessments. The assessments will integrate existing and future EU, national and

regional climate, environmental and food policies with projections on industrial biomass demand, and assess their implications on land and biomass use, taking into account trade-offs and synergies.

- Using the methodologies, quantify and project the land and biomass use and its climate mitigation potential, including the substitution effect of bio-based products and land impacts of diets, in at least four case study regions covering different socio-economic situations and climate/ecological zones in the EU and associated countries. The data should also cover, but not be excluded to, land use intensity and management types and their respective areas as well as biomass stocks and flows.
- Take into account as far as possible biophysical, legal and socioeconomic constraints determining possible land use and biomass potentials.
- Seek to understand and identify factors determining land management practices and enabling nature-based solutions that maximise the co-production of ecosystem services, biodiversity restoration and preservation, and net primary production.
- Seek to understand and identify optimum/sustainable land-dependent and land independent food supply for healthy, safe and sustainable diets.

The proposals must use the 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. The project requires an active collaboration with the JRC on the development of the necessary methods and approaches for the activities described in the scope of the topic.