

FTP CALL TOPICS MANUAL HORIZON EUROPE 2023-2024

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



Version 1.0 – 16/12/2022

Forest-based Sector
Technology Platform



Table of Contents

Introduction.....	9
Pillar II : Global challenges and European industrial competitiveness Pillar.....	15
Cluster 4: Digital, Industry and Space	15
Destination 1: Climate neutral, circular and digitised production	15
Call – Twin green and digital transition 2023.....	21
Energy Intensive Process Industries.....	21
HORIZON-CL4-2023-TWIN-TRANSITION-01-31: Energy efficiency breakthroughs in the process industries (Processes4Planet partnership) (RIA).....	21
HORIZON-CL4-2023-TWIN-TRANSITION-01-33: Electrification of high temperature heating systems (Processes4Planet Partnership) (IA)	23
A new way to build, accelerating disruptive change in construction.....	26
HORIZON-CL4-2023-TWIN-TRANSITION-01-36: Modelling industry transition to climate neutrality, sustainability and circularity (Processes4Planet Partnership) (RIA)	26
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)	29
HORIZON-CL4-2023-TWIN-TRANSITION-01-40: Sustainable and efficient industrial water consumption: through energy and solute recovery (Processes4Planet partnership) (RIA)...	32
Integration of Renewable and Electrification in process industry	35
HORIZON-CL4-2023-TWIN-TRANSITION-01-42: Circular economy in process industries: Upcycling large volumes of secondary resources (Processes4Planet partnership) (RIA)	35
Call – Twin green and digital transition 2024.....	38
Energy Intensive Process Industries.....	38
HORIZON-CL4-2024-TWIN-TRANSITION-01-32: Optimisation of thermal energy flows in the process industry (Processes4Planet partnership) (IA)	38
Call – Twin green and digital transition 2024 two stage	40
Manufacturing Industry.....	40
HORIZON-CL4-2024-TWIN-TRANSITION-01-01: Bio-intelligent manufacturing industries (Made in Europe Partnership) (RIA)	40
Destination 2: Increased autonomy in key strategic value chains for resilient industry	43
Call – Resilient value chains 2023 two stage.....	49
Strategic innovation markets driven by advanced materials.....	49
HORIZON-CL4-2023-RESILIENCE-01-32: Bioinspired and biomimetic materials for sustainable textiles (IA).....	49

Call – Resilient value chains 2024 two stage	52
Strategic innovation markets driven by advanced materials	52
HORIZON-CL4-2024-RESILIENCE-01-35: Biodegradable polymers for sustainable packaging materials (IA)	52
A new way to build, accelerating disruptive change in construction.....	55
HORIZON-CL4-2024-RESILIENCE-01-36: Advanced biomaterials for the Health Care (IA).....	55
Cluster 5: Climate, Energy and Mobility	58
Destination 1: Climate sciences and responses for the transformation towards climate neutrality	58
Call – Climate sciences and responses 2023	61
HORIZON-CL5-2023-D1-01-06: Broadening the range of policy options in transition pathway analysis	61
HORIZON-CL5-2023-D1-01-07: Modelling for local resilience - Developments in support of local adaptation assessments and plans	65
Call – Climate sciences and responses 2024	68
HORIZON-CL5-2024-D1-01-07: Quantification of the role of key terrestrial ecosystems in the carbon cycle and related climate effects	68
Destination 3: Sustainable, secure and competitive energy supply	71
Call – Sustainable, secure and competitive energy supply 2023	77
Global leadership in renewable energy.....	77
HORIZON-CL5-2023-D3-01-01: Renewable Energy Valleys to increase energy security while accelerating the green transition in Europe.....	77
Call – Sustainable, secure and competitive energy supply 2023	80
Global leadership in renewable energy.....	80
HORIZON-CL5-2023-D3-02-01: Development of near zero-emission biomass heat and/or CHP including carbon capture	80
Call – Sustainable, secure and competitive energy supply 2024	82
Global leadership in renewable energy.....	82
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	82
Destination 4: Efficient, sustainable and inclusive energy use	84
Call – Efficient, sustainable and inclusive energy use 2023	88
Highly energy-efficient and climate neutral EU building stock	88
HORIZON-CL5-2023-D4-01-01: Innovative cost-efficient solutions for zero-emission buildings	88
HORIZON-CL5-2023-D4-01-02: Future-proofing historical buildings for the clean energy transition	91

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.....	93
Call – Efficient, sustainable and inclusive energy use 2023	95
Highly energy-efficient and climate neutral EU building stock	95
HORIZON-CL5-2023-D4-02-01: Innovative uses of lifecycle data for the management of buildings and buildings portfolios (Built4People Partnership).....	95
HORIZON-CL5-2023-D4-02-02: Solutions for the identification of vulnerable buildings and people-centric built environment, and for improving their resilience in disruptive events and altered conditions in a changing climate (Built4People Partnership)	98
HORIZON-CL5-2023-D4-02-03: Demonstrate built-environment decarbonisation pathways through bottom-up technological, social and policy innovation for adaptive integrated sustainable renovation solutions (Built4People Partnership).....	101
HORIZON-CL5-2023-D4-02-04: Fast-tracking and promoting built environment construction and renovation innovation with local value chains (Built4People Partnership)	104
HORIZON-CL5-2023-D4-02-05: Supporting the creation of an accessible and inclusive built environment (Built4People Partnership)	107
Call – Efficient, sustainable and inclusive energy 2024.....	110
Highly energy-efficient and climate neutral European building stock.....	110
HORIZON-CL5-2024-D4-01-01: Low-disruptive renovation processes using integration of prefabricated solutions for energy-efficient buildings.....	110
Industry	112
HORIZON-CL5-2024-D4-01-03: Alternative heating systems for efficient, flexible and electrified heat generation in industry.....	112
Call – Efficient, sustainable and inclusive energy 2024.....	114
Highly energy-efficient and climate neutral European building stock.....	114
HORIZON-CL5-2024-D4-02-01: Industrialisation of sustainable and circular deep renovation workflows (Built4People Partnership).....	114
HORIZON-CL5-2024-D4-02-02: Robotics and other automated solutions for construction, renovation and maintenance in a sustainable built environment (Built4People Partnership)	116
HORIZON-CL5-2024-D4-02-03: BIM-based processes and digital twins for facilitating and optimising circular energy renovation (Built4People Partnership).....	118
HORIZON-CL5-2024-D4-02-04: Design for adaptability, re-use and deconstruction of buildings, in line with the principles of circular economy (Built4People Partnership)	121
Cluster 6 : Food, Bioeconomy, Natural Resources, Agriculture and Environment	124
Destination 1: Biodiversity and ecosystem services	124
Call – Biodiversity and Ecosystem Services 2023	127

Biodiversity protection and restoration	127
HORIZON-CL6-2023-BIODIV-01-4: Nature protection: better methods and knowledge to improve the conservation status of EU-protected species and habitats	127
Biodiversity friendly practices in agriculture, forestry and aquaculture.....	130
HORIZON-CL6-2023-BIODIV-01-15: Integrative forest management for multiple ecosystem services and enhanced biodiversity	130
Interconnection of biodiversity research and policies	133
HORIZON-CL6-2023-BIODIV-01-18: Additional activities for the European Biodiversity Partnership: Biodiversa+	133
Call – Biodiversity and Ecosystem Services 2024	136
Understanding and addressing the main drivers of biodiversity loss	136
HORIZON-CL6-2024-BIODIV-01-1: Invasive alien species	136
Biodiversity protection and restoration	139
HORIZON-CL6-2024-BIODIV-01-2: Digital for nature	139
Mainstreaming biodiversity in society and the economy	145
HORIZON-CL6-2024-BIODIV-01-3: Dependence of society and the economy on pollinators	145
Biodiversity friendly practices in agriculture, forestry and aquaculture.....	148
HORIZON-CL6-2024-BIODIV-01-8: Conservation and protection of carbon-rich and biodiversity-rich forest ecosystems.....	148
Destination 2: Fair, healthy and environment-friendly food systems from primary production to consumption.....	151
Call - Fair, healthy and environmentally-friendly food systems from primary production to consumption 2024.....	157
Enabling sustainable farming systems	157
HORIZON-CL6-2024-FARM2FORK-01-1: Agro-pastoral/outdoor livestock systems and wildlife management	157
Call - Fair, healthy and environmentally-friendly food systems from primary production to consumption 2024 two stage	160
Enabling sustainable farming	160
HORIZON-CL6-2024-FARM2FORK-02-3-two-stage: Tools to increase the effectiveness of EU imports controls for plant health	160
HORIZON-CL6-2024-FARM2FORK-02-4-two-stage: Tackling outbreaks of plant pests	162
Destination 3: Circular economy and bioeconomy sectors.....	165
Call – Circular economy and bioeconomy sectors 2023.....	169
Enabling a circular economy transition.....	169

HORIZON-CL6-2023-CIRCBIO-01-7: Symbiosis in the bio-based industrial ecosystems	169
HORIZON-CL6-2023-CIRCBIO-01-8: Eco-friendly consumer products – low-toxicity/zero pollution construction bio-based materials	172
HORIZON-CL6-2023-CIRCBIO-01-9: Business models that balance the share of power and profit in the bioeconomy.....	175
Safeguarding and sustainably innovating the multiple functions of EU forests	178
HORIZON-CL6-2023-CIRCBIO-01-12: Optimising the sustainable production of wood and non-wood products in small forest properties and development of new forest-based value chains.....	178
HORIZON-CL6-2023-CIRCBIO-01-13: Capturing market trends and societal perceptions for tailor-made forest services.....	181
HORIZON-CL6-2023-CIRCBIO-01-14: Monitoring the multi-functionality of European forests	184
Call – Circular economy and bioeconomy sectors 2023 two stage.....	187
Enabling a circular economy transition.....	187
HORIZON-CL6-2023-CIRCBIO-02-2-two-stage: Novel, sustainable and circular bio-based textiles	187
Call – Circular economy and bioeconomy sectors 2024.....	191
Enabling a circular economy transition.....	191
HORIZON-CL6-2024-CIRCBIO-01-3: Innovative circular solutions for furniture.....	191
Innovating for sustainable bio-based systems, biotechnology and the bioeconomy.....	195
HORIZON-CL6-2024-CIRCBIO-01-6: Digital information systems for bio-based products ...	195
Call – Circular economy and bioeconomy sectors 2024 two-stage	197
Enabling a circular economy transition.....	197
HORIZON-CL6-2024-CIRCBIO-02-1-two-stage: Circular solutions for textile value chains through innovative sorting, recycling, and design for recycling	197
HORIZON-CL6-2024-CIRCBIO-02-4-two-stage: New circular solutions and decentralised approaches for water and wastewater management.....	201
Innovating for sustainable bio-based systems, biotechnology and the bioeconomy.....	204
HORIZON-CL6-2024-CIRCBIO-02-5-two-stage: Circular design of bio-based processes and products.....	204
HORIZON-CL6-2024-CIRCBIO-02-6-two-stage: From silos to diversity - small-scale bio-based demonstration pilots	207
Destination 4: Clean environment and zero pollution.....	210
Call – Clean environment and zero pollution 2023.....	213

Increasing environmental performances and sustainability of bio-based processes and products.....	213
HORIZON-CL6-2023-ZEROPOLLUTION-01-4: Environmental sustainability and circularity criteria for industrial bio-based systems.....	213
HORIZON-CL6-2023-ZEROPOLLUTION-01-5: Industrial biotechnology approaches for improved sustainability and output of industrial bio-based processes.....	217
Reducing the environmental impact and pollution in food systems.....	219
HORIZON-CL6-2023-ZEROPOLLUTION-01-7: Strategies to prevent and reduce plastic packaging pollution from the food system.....	219
Call – Clean environment and zero pollution 2023 two stage.....	222
Increasing environmental performance and sustainability of processes and products.....	222
HORIZON-CL6-2023-ZEROPOLLUTION-02-2-two-stage: Safe-and-sustainable-by-design bio-based platform chemicals, additives, materials or products as alternatives.....	222
Call – Clean environment and zero pollution 2024.....	225
Halting pollution of air, soil and water.....	225
HORIZON-CL6-2024-ZEROPOLLUTION-01-1: Demonstrating how regions can operate within safe ecological and regional nitrogen and phosphorus boundaries.....	225
Call – Clean environment and zero pollution 2024 two stage.....	228
Increasing environmental performance and sustainability of bio-based processes and products.....	228
HORIZON-CL6-2024-ZEROPOLLUTION-02-2-two-stage: Innovative technologies for zero pollution, zero-waste biorefineries.....	228
Destination 5: Land, ocean and water for climate action.....	230
Call – Land, ocean and water for climate action 2024.....	234
HORIZON-CL6-2024-CLIMATE-01-4: Land use change and local / regional climate.....	234
HORIZON-CL6-2024-CLIMATE-01-5: Climate-smart use of wood in the construction sector to support the New European Bauhaus.....	236
Destination 6: Resilient, inclusive, healthy and green rural, coastal and urban communities.....	239
Call – Resilient, inclusive, healthy and green rural, coastal and urban communities 2024 two stage.....	245
HORIZON-CL6-2024-COMMUNITIES-02-1-two-stage: Innovating for climate-neutral rural communities by 2050.....	245
Destination 7: Innovative governance, environmental observations and digital solutions in support of the Green Deal.....	248
Call – Innovative governance, environmental observations and digital solutions in support of the Green Deal 2021.....	253
Innovating with governance models and supporting policies.....	253

HORIZON-CL6-2023-GOVERNANCE-01-5: Revitalisation of European local (rural / peri-urban) communities with innovative bio-based business models and social innovation	253
HORIZON-CL6-2023-GOVERNANCE-01-7: Integrated assessment of land use and biomass demands to contribute to a sustainable healthy and fair bioeconomy	256
Deploying and adding value to Environmental Observations	258
HORIZON-CL6-2023-GOVERNANCE-01-12: Empowering citizens to monitor, report and act in partnership with relevant public authorities to protect their environment in the context of environmental compliance assurance.....	258
Digital and data technologies as key enablers	260
HORIZON-CL6-2023-GOVERNANCE-01-15: Digitalisation in agriculture and forestry: markets for data, and digital technologies and infrastructure – state of play and foresight in a fast changing regulatory, trade and technical environment.....	260
HORIZON-CL6-2023-GOVERNANCE-01-16: Digital technologies supporting plant health early detection, territory surveillance and phytosanitary measures	263
Call – Innovative governance, environmental observations and digital solutions in support of the Green Deal 2024.....	266
Strengthening agricultural knowledge and innovation systems (AKIS)	266
HORIZON-CL6-2024-GOVERNANCE-01-11: Biodiversity thematic networks to compile and share knowledge ready for practice.....	266
HORIZON-CL6-2024-GOVERNANCE-01-12: Developing EU advisory networks on forestry.	269
Missions.....	272
Mission: Adaptation to Climate Change.....	272
Call – Demonstration of climate resilience solutions in support of the implementation of the Adaptation to climate change mission.....	274
HORIZON-MISS-2023-CLIMA-01-01: Testing and demonstrating transformative solutions increasing climate resilience of the agriculture and/or forestry sector.....	274
Mission: Restore our Ocean and Waters by 2030	280
Call – Actions for the implementation of the Mission Restore our ocean and waters by 2030 ..	282
HORIZON-MISS-2023-OCEAN-01-04: European natural lakes: demonstration of integrated approaches for protection and restoration of natural lake ecosystems and their biodiversity	282
Mission: A Soil Deal for Europe	286
Call – Research and Innovation and other actions to support the implementation of mission A Soil Deal for Europe.....	290
HORIZON-MISS-2023-SOIL-01-01: Discovering the subsoil.....	290
HORIZON-MISS-2023-SOIL-01-04: Innovations to prevent and combat desertification.....	293
HORIZON-MISS-2023-SOIL-01-08: Co-creating solutions for soil health in Living Labs	296

HORIZON-MISS-2023-SOIL-01-09: Carbon farming in living labs 301

Missions’ Joint Calls 306

 Joint Call between Mission Restore our Ocean and Waters by 2030, Mission Adaptation to
 Climate Change and Mission A Soil Deal for Europe 306

 HORIZON-MISS-2023-CLIMA-OCEAN-SOIL-01-01: Mission Climate adaptation, Mission Ocean
 & waters and Mission Soil Deal for Europe - Joint demonstration of an integrated approach
 to increasing landscape water retention capacity at regional scale 306

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 forest-based sector

	Number of Calls	Funding (million EUR)
Cluster 4 - Digital, Industry and Space	11 (1 indirect)	328,67
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
Cluster 5 - Climate, Energy and Mobility	20 (4 indirect)	204
Destination 1 - Climate sciences and responses for the transformation towards climate neutrality	3 (1 indirect)	42
Destination 3 - Sustainable, secure and competitive energy supply	3	55
Destination 4 - Efficient, sustainable and inclusive energy use	14 (3 indirect)	137
Cluster 6 - Food, Bioeconomy, Natural Resources, Agriculture and Environment	39 (7 indirect)	428
Destination 1 - Biodiversity and ecosystem services	7 (3 indirect)	128
Destination 2 - Fair, healthy and environment-friendly food systems from primary production to consumption	3 (1 indirect)	26
Destination 3 - Circular economy and bioeconomy sectors	13	132
Destination 4 - Clean environment and zero pollution	6	71
Destination 5 - Land, ocean and water for climate action	2	26
Destination 6 - Resilient, inclusive, healthy and green rural, coastal and urban communities	1 (indirect)	10
Destination 7 - Innovative governance, environmental observations and digital solutions in support of the Green Deal	7 (2 indirect)	35
MISSIONS	7 (1 indirect)	131
Mission: Adaptation to climate change	1	30
Mission: Restore our Ocean and Waters by 2030	1 (indirect)	12
Mission: Soil health and food	4	74
Joint Mission Call	1	15
Total all Calls	77 Calls (13 indirect)	1091,67 mln EUR
Total (High, Medium, Low)	64 Calls	908,61 mln EUR

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 Space¹

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.

¹ [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 2022,⁴ 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.⁵

- **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) concepts⁶, 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	HORIZON-CL4-2023-TWIN-TRANSITION-01-31: Energy efficiency breakthroughs in the process industries (Processes4Planet partnership) (RIA)				
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	HORIZON-CL4-2023-TWIN-TRANSITION-01-33: Electrification of high temperature heating systems (Processes4Planet Partnership) (IA)				
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	HORIZON-CL4-2023-TWIN-TRANSITION-01-36: Modelling industry transition to climate neutrality, sustainability and circularity (Processes4Planet Partnership) (RIA)				
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 sector³². 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	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)				
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% CO₂ 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	HORIZON-CL4-2023-TWIN-TRANSITION-01-40: Sustainable and efficient industrial water consumption: through energy and solute recovery (Processes4Planet partnership) (RIA)				
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	HORIZON-CL4-2023-TWIN-TRANSITION-01-42: Circular economy in process industries: Upcycling large volumes of secondary resources (Processes4Planet partnership) (RIA)				
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,³⁷ which were the subject of the WP 2021-22,³⁸ 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	HORIZON-CL4-2024-TWIN-TRANSITION-01-32: Optimisation of thermal energy flows in the process industry (Processes4Planet partnership) (IA)				
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 more 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	HORIZON-CL4-2024-TWIN-TRANSITION-01-01: Bio-intelligent manufacturing industries (Made in Europe Partnership) (RIA)				
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.⁷²

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)⁷³.

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 Plan⁷⁵:

- 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	HORIZON-CL4-2023-RESILIENCE-01-32: Bioinspired and biomimetic materials for sustainable textiles (IA)				
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 CO₂-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	HORIZON-CL4-2024-RESILIENCE-01-35: Biodegradable polymers for sustainable packaging materials (IA)				
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 biodegradable 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	HORIZON-CL4-2024-RESILIENCE-01-36: Advanced biomaterials for the Health Care (IA)				
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 Mobility²

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;

² [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	HORIZON-CL5-2023-D1-01-06: Broadening the range of policy options in transition pathway analysis				
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, relocalisation 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.

Topic ID and title	HORIZON-CL5-2023-D1-01-07: Modelling for local resilience - Developments in support of local adaptation assessments and plans				
Budget	EUR 12 million	Opening date	13 December 2022	Deadline 1	18 April 2023
Budget per project	EUR 12 million			Deadline 2	/
Type of action	Research and Innovation Actions (RIA)				
FTP subsector	F&F				
Keywords	EU Strategy on Adaptation to Climate Change, science-based decision making, adaptation modelling, risk assessment				
FTP comments	This is a topic for research community and policy makers and the scope is huge. However it offers the opportunity to develop forest-related climate change adaptation strategies				
FTP SIRA 2030 Challenges addressed	1A, D	FTP relevance	Indirect		
		Starting TRL	/		
		End TRL	/		

Expected Outcome:

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

- Support to the implementation of the EU Strategy on Adaptation to Climate Change and the Mission on Adaptation to Climate Change, by enabling better informed adaptation plans and strategies at the regional and local level.
- Strengthen science-based decision-making when it comes to resilience and disaster risk management, including on the role of nature-based solutions.
- Stronger local adaptive capacity.
- Improved synergies between national, regional and local Green Deal objectives, in particular adaptation action.
- Better coordinated and more impactful R&I activities on adaptation modelling and risk assessment.

Scope:

The EU strategy on Adaptation to Climate Change stresses the need to increase local resilience, as one of its key implementation actions. The Horizon Europe Mission on Adaptation to Climate Change has been launched in September 2021 with the aim to support at least 150 European regions and communities to become climate resilient by 2030. Yet resources and tools to address adaptation at the local level are often scarce. To improve the support to local adaptation action it is essential to increase the availability, reliability, accessibility and resolution of climate information, in combination with non-climatic natural and anthropogenic drivers, at local and regional scale considering local specificities.

Therefore, actions should:

- Develop and test user-friendly high-resolution climate physical risk assessments models. This could include improvements in data acquisition, modelling, tools and methods to increase resolution of global climate models and regional climate models in combination with local natural and anthropogenic stressors that underpin risk assessment modelling. Utilize and test relevant resilience models and assessment methods developed in previous R&I programme projects (including FP7 and Horizon 2020).
- Consolidate information and data on cost and effectiveness of adaptation actions (including from FP7 and Horizon 2020 projects) at local level, in particular actions that integrate both adaptation and mitigation and in particular nature-based solutions that address both biodiversity and climate crisis. Carry out work to close the remaining knowledge gaps, particularly in bridging climate models with other earth system (natural and anthropogenic) processes. This should also feed into the knowledge basis of the Mission on Adaptation to climate change and be made available to all EU regions and communities. This work could include improvements in modelling, the design of adaptation pathways and other relevant tools in this domain.
- Facilitate quick access and operational guidance to knowledge from adaptation – including:
 - Economic and social implications associated to climate risks.
 - Cross-sectoral impacts of climate change and their associated uncertainties.
 - The cost-effectiveness of adaptation actions, and the co-benefits or regrets associated to the actions.
 - Impact and risk modelling for decision-makers and other stakeholders, in particular to support the development of robust decision-making under uncertainty.
- Draw-up a roadmap of R&I priorities on adaptation and associated economic modelling, risk assessment, cost-effectiveness valuation and management tools towards a 2030-2035 timeframe.

To ensure assessments and tools developed by the projects are truly user-friendly, projects should consider participatory approaches to test such assessments and develop comprehensive and non-technical guides to use the results and outputs of the project(s), at regional and local level in representative cases of the climate regions of Europe.

The use of environmental observations and Earth systems models innovations funded by EU R&I programmes (FP7, Horizon 2020) is encouraged. This should include using data from the Copernicus Climate Change Services, and other relevant sources (such as GEOSS).

The project should closely coordinate with and integrate the results of the existing studies and evidence-based research, namely from projects from topic HORIZON-MISS-2021-CLIMA-02-03 "Towards asset level modelling of climate risks and adaptation", HORIZON-MISS-2021-CLIMA-02-01 "Development of climate change risk assessments in European regions and communities based on a transparent and harmonised Climate Risk Assessment approach"⁵⁴, and the Study on Adaptation Modelling for Policy Support.

Proposals should include a mechanism and the resources to establish operational links with the Mission Adaptation to Climate Change Implementation Platform and Climate-ADAPT platform (run by the European Environment Agency (EEA) together with DG CLIMA) so project results can be fed into the platform for them to be used by Mission participants, namely regions and communities.

Coordination with the Destination Earth initiative should be explored to ensure the timely development of "climate replicas" building on the new state-of-the-art IT infrastructure, including access to EU high performance computing resources and an operational platform to upload and integrate the models and data developed in the course of the projects.

The participation of social sciences and humanities is key to address the socio-economic, decision-making and local governance aspects of this topic. Furthermore, projects should consider the involvement of citizens and societal actors, to produce meaningful and significant effects enhancing the societal impact of the related research activities.

Call – Climate sciences and responses 2024

Topic ID and title	HORIZON-CL5-2024-D1-01-07: Quantification of the role of key terrestrial ecosystems in the carbon cycle and related climate effects				
Budget	EUR 20 million	Opening date	12 September 2023	Deadline 1	05 March 2024
Budget per project	EUR 10 million			Deadline 2	/
Type of action	Research and Innovation Actions (RIA)				
FTP subsector	F&F				
Keywords	terrestrial carbon cycle, satellite observation, remote sensing technology, forestry, wind throw, drought, pest, fire				
FTP comments	This is a topic for research community and the scope is huge. The main scope is to better characterise and reduce uncertainties regarding the terrestrial carbon cycle				
FTP SIRA 2030 Challenges addressed	1A,C, D	FTP relevance	Medium		
		Starting TRL	/		
		End TRL	/		

Expected Outcome:

A comprehensive assessment and quantification of the role of terrestrial biogeochemical dynamics and the role of vegetation in the carbon cycle, compared to pre-industrialisation situation, building on dedicated in situ data collection, novel satellite data development, and advanced carbon cycle modelling.

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

- Enhanced understanding and characterisation of the terrestrial carbon pools and fluxes, including through taking account of hydrological exchanges, with unprecedented accuracies and spatial scales, building on the advent of a new generation of satellite missions (e.g., ESA’s BIOMASS, FLEX, Sentinel missions, NASA’s NISAR, GEDI, ICESat-2 etc...), that radically change the way the terrestrial carbon cycle can be observed.
- Improved methods for the monitoring of key ecosystems state in Europe, regarding terrestrial carbon, including e.g. forestry, croplands, peatlands, inland water, extensive grasslands, tundra, tidal marshes, seagrass, and mangroves, and tackling key gaps in observations e.g. age-structure, species richness, canopy structure (including use of Terrestrial Laser Scanning), observations of wood density, interaction with hydrology and exchange with atmosphere in particular observations of biological volatile organic compounds, CO₂, CH₄, N₂O, and black carbon/particulates emissions.
- Improved handling of anthropogenic management practices (land use including forestry) in terrestrial carbon modelling, including lateral transfers of carbon (notably

in the form of harvested biomass including exports, imports, and use as well of land-water exchange).

- Improved understanding of impacts on carbon cycle of extreme events (wind throw, drought, pest outbreaks, fire), the impacts of anthropogenic disturbance including degradation and behaviour and recovery of forest post-disturbance.
- Improved consistency between top-down methods such as atmospheric inversions and bottom-up approaches based on land-surface models, in-situ and satellite observation, flux measurements, and national and global statistics.
- Assessment of the consistency of observation and advanced models through benchmarking activities at multiple scales including point measurements, and satellite observations at multiple temporal and spatial resolutions.
- Novel monitoring frameworks combining remote and proximate sensing techniques with machine learning and edge computing.

Scope:

The main challenge of this topic is to develop an enhanced capacity to better characterise and reduce uncertainties of the carbon cycle related to key terrestrial European ecosystems as a function of anthropogenic emissions, environmental forcing conditions, and management practices. In order for this challenge to be met, actions should be performed at spatial resolutions required to represent the mechanisms by which human interventions necessary to move towards net-zero carbon balance, can be quantified. Further, the dynamics and response of vegetation to climate change, short- and long-term stress, natural dynamics (e.g. fire), and especially change in frequency, form and severity of extreme events, need to be better understood and quantified.

Proposals should address the above challenges through:

- Coordinated European effort to expand dedicated campaigns to collect in situ-data, including from citizen observations, on land cover, land use and related changes, and on the main processes caused by these, to support the modelling of these changes based on current and historical trends, and to develop empirically based scenarios connecting land use and land cover change to carbon emissions, and sequestration potential.
- Advances in land surface and carbon modelling supported by high-performance computing capacity, allowing models to be run at unprecedented resolutions, and accuracy, through improved data assimilation workflow from remotely sensed data and vegetation models. The emphasis should be on area wide effect of the

ecosystem's microbiome, and consistency across spatial and temporal resolution and with satellite observation processes.

- Extending and complementing satellite observations with elements linked to the LUCAS survey of Eurostat, to the EU Soil Observatory (EUSO) initiatives on integrated soil monitoring systems, and to research infrastructure e.g. eLTER and ICOS, as well as through comparison with past data and through coordination with Earth observation efforts (spectral signature characterisation, biophysical and biogeochemical observations commensurate with satellite resolutions, aircraft / unmanned aerial vehicle campaigns).
- Specific efforts to develop carbon and land surface models consistent with specific variables or outputs that can be directly interfaced or compared with satellite observations e.g. above ground biomass, soil moisture, solar induced fluorescence, disturbance dynamics e.g. fire, and inclusion of additional key processes (coupling with Nitrogen and Phosphorus cycles and water, CO₂ fertilisation, assimilation of photosynthesis rates from global observation for direct gross primary production estimation).
- A significant coordination effort and collaboration with the relevant activities of major international scientific groups (e.g., IPCC, Global Carbon Project) and ESA Carbon Science Cluster.

This topic is part of a coordination initiative between the European Space Agency (ESA) and the EC on Earth System Science. Under the EC-ESA Earth System Science Initiative, both institutions aim at coordinating efforts to support complementary collaborative projects, funded on the EC side through Horizon Europe, and on the ESA side through the ESA FutureEO programme as part of the ESA Carbon Science.

Proposals should address the collaboration with ongoing or future ESA projects, including those that will be funded through dedicated coordinated invitations to tender, and should towards this end include sufficient means and resources for effective coordination.

Applicants should ensure coordination with complementary projects funded under the ESA Carbon Science Clusters of the FutureEO programme including relevant ESA activities related to the use of the novel BIOMASS and FLEX missions and potentially the Copernicus CO₂M mission in the future.

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 CO₂ 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 CO₂ emission mitigation option in electricity generation and industry applications (including also conversion of CO₂ 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 CO₂ sources with potential bankable storage sites and installations using CO₂, providing greater confidence for decision makers and investors.

- Proven feasibility of integrating CO₂ capture, CO₂ storage and CO₂ 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 CO₂ capture being still the most relevant stumbling block for a wider application of CCUS. Develop innovative technology for CO₂ 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 CO₂ capture technologies in combination with CO₂ 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	HORIZON-CL5-2023-D3-01-01: Renewable Energy Valleys to increase energy security while accelerating the green transition in Europe				
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 Repository¹⁵¹ 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	HORIZON-CL5-2023-D3-02-01: Development of near zero-emission biomass heat and/or CHP including carbon capture				
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 emissions				
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_x, SO_x, 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	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				
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 autonomy¹⁸⁷ 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	HORIZON-CL5-2023-D4-01-01: Innovative cost-efficient solutions for zero-emission buildings				
Budget	EUR 10 million	Opening date	13 December 2022	Deadline 1	20 April 2023
Budget per project	EUR 5 million			Deadline 2	/
Type of action	Innovations Actions (IA)				
FTP subsector	WW				
Keywords	zero emission buildings, construction, indoor air quality, circularity, Energy Performance of Buildings Directive				
FTP comments	This topic is not specifically adapted for the building with wood industries but we believe that this sector and material value-chain has a strong competitive advantage due to the properties of wood. The text mentions for instance construction materials acting as carbon sinks. The topic requires demonstration of at least three real-life construction projects in three different countries and this might be difficult to organise.				
FTP SIRA 2030 Challenges addressed	8			FTP relevance	High
				Starting TRL	/
				End TRL	6-8

Expected Outcome:

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

- Increased number of solutions and approaches for construction of zero-emission buildings.
- Enhanced productivity of construction compared to standard practice.
- Reduced embodied emission and increased carbon storage, enhanced energy performance.
- Improved comfort, Indoor Air Quality and Indoor Environmental Quality.
- Increased awareness on zero-emission construction best practices.
- Enhanced circularity of construction.

Scope:

To demonstrate that high-quality and affordable zero-emission buildings, in line with the Proposed Revision of the Energy Performance of Buildings Directive, can be delivered and mainstreamed. With new buildings already required to be nearly-zero energy buildings, the focus is on how to achieve zero or positive energy standards and how to reduce embodied

emissions, also storing CO₂ where possible (using recycled, zero-carbon, or sustainably sourced construction materials acting as carbon sinks).

Proposals are expected to address all of the following:

- Demonstrate innovative construction approaches solutions based on integrated existing solutions into standardised packages for a cost-effective construction of (new) zero-emission buildings, in line with the Energy Performance of Buildings Directive.
- Ensure the approaches demonstrated:
 - Allow to achieve zero or positive energy standards and to reduce embodied emissions, also storing carbon where possible, using recycled, zero-carbon or sustainably sourced carbon-storing construction materials.
 - rely on mature construction products and materials, and technical building systems, seeking to deliver solutions that are ready for application and use.
 - address all components of buildings (envelope, technical building systems, on-site¹⁹⁹ renewable energy – e.g. BIPV – and, where relevant, electric vehicle charging points).
 - are rooted in local and regional value chains for sourcing of buildings components and for involvement and upskilling of local and regional businesses.
 - are tailored for the applicable regulatory framework: EU, national, and (where relevant) regional and local level.
 - have strong potential for replication across Europe, in particular by construction SMEs.
- Demonstrations that include at least three real-life new construction projects, of which one at least should target public buildings.
- Ensure that the demonstrations:
 - Cover at least three countries, with diverse climatic conditions and architectural patterns.
 - Involve local and regional values chains, in particular SMEs, based on participatory approaches to increase innovation acceptability.
 - Lead to clear and, where relevant, quantified and measurable indicators on the results achieved.

- An ambitious EU-wide dissemination roadmap addressing all relevant stakeholders (in particular businesses and authorities) to:
 - promote the zero-emission buildings innovative construction approaches demonstrated.
 - share guidance and recommendations on best practices for zero-emission construction.
 - provide feedback to policy makers at EU, national, and (where relevant) regional and local level.

Topic ID and title	HORIZON-CL5-2023-D4-01-02: Future-proofing historical buildings for the clean energy transition				
Budget	EUR 9 million	Opening date	13 December 2022	Deadline 1	20 April 2023
Budget per project	EUR 4,5 million			Deadline 2	/
Type of action	Research & Innovations Actions (RIA)				
FTP subsector	WW				
Keywords	Buildings energy efficiency, Indoor Environmental Quality, maintenance costs, historical buildings, cultural heritage				
FTP comments	Renovation approaches that improve energy performance and indoor performance and still take into account architectural restrictions is a growing market. This topic represents an opportunity for actors in the woodworking value-chain that aim to address this growing market				
FTP SIRA 2030 Challenges addressed	8	FTP relevance		Medium	
		Starting TRL		/	
		End TRL		4-5	

Expected Outcome:

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

- Reduction of energy demand by at least 60%, preserving historical and cultural heritage values.
- Reduction of on-site construction waste.
- Improved lifetime renovation cost effectiveness compared to conventional renovation.
- Improved comfort, Indoor Air Quality and Indoor Environmental Quality.
- Significant reduction in maintenance costs.
- Where possible, increased potential of successful installation of RES and improvement of smart readiness, in a way that respects the specificities of historical buildings.
- Increased effectiveness and potential for replicability of the proposed solutions.

Scope:

Around a quarter of the existing building stock in Europe was built prior to the middle of the last century. Many such buildings not only reflect the unique character and identity of European cities, but also include essential infrastructure for housing, public buildings etc. A significant number of these have a poor energy performance, continue to use conventional and inefficient fossil fuel-based energy systems and are costly to renovate. Furthermore, changes in building use and higher indoor comfort expectations than in the past are driving

up energy demand, a particular challenge when historical buildings are used or converted for residential, educational, retail, office or other purposes. Many recently developed renovation approaches are not adapted to the specific requirements of historical buildings. The process of future-proofing these buildings for the clean energy transition faces additional challenges compared to newer buildings, as it has to take into account architectural restrictions, as well as the specificities of the materials used in their construction, which does not respond well to renovation techniques used in modern buildings.

Proposals are expected to address all of the following:

- Deliver standardised renovation approaches and solutions for the deep renovation of historical buildings to improve their energy performance, smart readiness, indoor air quality, comfort, and climate resilience, while respecting their architectural and cultural specificities, materials and traditional construction techniques.
- Target building types constructed prior to 1945 that have restrictions regarding changes of their envelope (walls, window, doors, and/or roof). (Buildings of nationally or internationally recognised significant cultural heritage built after this date may also be considered.).
- Standardised renovation approaches and solutions that are directly replicable for other buildings of the same building type, which should represent a share of at least 1% of buildings in the specific country where they are located.
- Solutions that reduce energy demand in a cost-effective way.
- Explore both internal and external insulation solutions, and where possible incorporating adaptable interventions, plug and play technical building systems, and/or renewable energy services.
- Employ both novel and traditional construction materials and techniques, exploring ways to combine, adapt and improve them.
- Improve the comfort of occupants and lower the maintenance costs for building owners.
- Where applicable, involve relevant conservation authorities.
- Validation of the solutions in a relevant environment (real-life or close to real-life) that:
 - Covers at least three different countries, with diverse climatic conditions.
 - Results in clear and, where relevant, quantified and measurable indicators on the effectiveness and the potential for replication of the solutions.

Topic ID and title	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				
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 use 2023

Highly energy-efficient and climate neutral EU building stock

Topic ID and title	HORIZON-CL5-2023-D4-02-01: Innovative uses of lifecycle data for the management of buildings and buildings portfolios (Built4People Partnership)				
Budget	EUR 10 million	Opening date	04 May 2023	Deadline 1	05 September 2023
Budget per project	EUR 5 million			Deadline 2	/
Type of action	Innovations Actions (IA)				
FTP subsector	WW				
Keywords	Building lifecycle, Lifecycle Data, indoor environment quality, energy performance indicators				
FTP comments	The topic is funded under the Built4People Partnership and focuses on improving the collection and monitoring of data from buildings and demonstrating solutions in at least three demo buildings. We foresee that woodworking companies could participate in the project consortium. Observe this funding of this call will be awarded as a lump sum.				
FTP SIRA 2030 Challenges addressed	8	FTP relevance		Low	
		Starting TRL		/	
		End TRL		6-8	

Expected Outcome:

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

- Increase in the availability of key energy and environmental performance indicators from new or improved building management systems that go beyond energy management to life-cycle approach (e.g. environmental performance, circularity, comfort and well-being, indoor environmental quality, accessibility, safety, structural performance, resilience and climate risk vulnerability).
- Improved tools for the planning and management of building assets and portfolios of buildings including energy management, environmental performance, renovation optimisation and investment planning.
- Increased availability and access to lifecycle data of buildings and buildings portfolios and enhanced interoperability and synergies among data sharing platforms.

Scope:

European buildings are producing an increasing amount of data on energy and non-energy uses. More and better data can lead to enhanced consumer information, contribute to an effective management of energy grids and support the creation of innovative energy services, new business models and financing schemes for distributed clean energy. Data is also a key enabler for reliable and effective policymaking, e.g. for climate policies. Several

recent projects have focused on developing big data facilities and data analytics tools to monitor the energy performance of buildings based on energy related data. More work is needed to integrate energy data with lifecycle data (e.g. GHG emissions and removals, materials, water, health, comfort, life cycle cost and value, etc.), in order to optimise the performance of buildings and buildings' portfolios across the board and support the decision making of owners/tenants/developers to transform existing and planned physical assets (buildings or buildings' assets, e.g. distributed energy generation, e-mobility recharging infrastructure, micro-grids, building systems).

Proposals are expected to address at least two of the three following points:

- Develop new or upgrade existing building management systems enhanced with data analytics and real-time digital twinning tools. The developed systems should take into account buildings monitoring data (e.g. from embedded sensors/actuators), users' preferences (e.g. related to comfort and well-being, safety, and energy flexibility), and surrounding environmental conditions (e.g. urban density, micro-climate, etc.) in order to optimise operational energy and environmental performance.
- Develop new or upgrade existing decision support tools for the management of building assets and portfolios of buildings. The developed tools should be able to deliver energy (e.g. energy monitoring, renovation optimisation) and non-energy services (investment planning, risk assessment – e.g. risk-related, fault detection, predictive maintenance, surveillance & safety, comfort, occupancy satisfaction). The tools should be co-developed with the potential users (e.g. facility managers, fund managers etc.) and tested in real market conditions.
- Develop new or upgrade existing data sharing platforms including lifecycle data of buildings or buildings portfolios. The platforms should connect relevant market actors (technology providers, developers, aggregators, DSOs, ESCOS) with relevant user groups (consumers, energy communities), policy makers and the financial sector and offer innovative services (e.g. flexibility, prediction, investment planning etc.). The platforms should be co-developed with the participation of the potential user groups and tested in real market conditions linking, where relevant, to digital logbooks and to and other relevant initiatives (e.g. the Smart Readiness Indicator under the Energy Performance of Buildings Directive).

Proposals should contribute to the activities of the Built4People partners and to the Built4People network of innovation clusters.

Proposals are expected to implement at least three large -scale pilots to demonstrate the chosen system. The pilots should cover a variety of building typologies (residential,

commercial, public etc.) and use cases (energy monitoring, renovation optimisation, investment planning, risk assessment etc.)

This topic implements the co-programmed European Partnership on 'People-centric sustainable built environment' (Built4People). As such, projects resulting from this topic will be expected to report on results to the European Partnership 'People-centric sustainable built environment' (Built4People) in support of the monitoring of its KPIs.

Topic ID and title	HORIZON-CL5-2023-D4-02-02: Solutions for the identification of vulnerable buildings and people-centric built environment, and for improving their resilience in disruptive events and altered conditions in a changing climate (Built4People Partnership)				
Budget	EUR 10 million	Opening date	04 May 2023	Deadline 1	05 September 2023
Budget per project	EUR 5 million			Deadline 2	/
Type of action	Innovations Actions (IA)				
FTP subsector	WW				
Keywords	Building improvement, natural disasters				
FTP comments	The topic is funded under the Built4People Partnership and focuses on identification of buildings vulnerable to natural disasters and climate change and offer solutions often found in wood construction. Sensors, data and data analysis will play key roles.				
FTP SIRA 2030 Challenges addressed	8			FTP relevance	Low
				Starting TRL	/
				End TRL	6-8

Expected Outcome:

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

- Increased awareness of approaches for the identification and categorisation of the vulnerability of existing and future buildings and infrastructures.
- Increased number of demonstrated innovative solutions to improve safety and resilience of the built environment, to extreme climatic events, and other natural disasters, as well as to altered conditions due to climate change.
- Increased use of relevant data such as weather forecasts or catastrophe warnings by monitoring and management systems in the built environment (e.g. to launch automatic emergency protocols to warn and protect buildings users).
- Improved understanding of new business models allowing to optimise the costs of resilience, taking into account asset management and lifecycle approaches.
- Increased awareness of building occupants and other key stakeholders on the available solutions in case of extreme climatic events, and natural disasters.

Scope:

Buildings should contribute to an integrated approach for a safe and healthy people-centric built environment at block, district and urban level. The built environment needs to be adapted, designed, and constructed for combating the effects of Global Warming (increased heat island effect, increased cooling demands, water scarcity, etc.) and for providing safety and resilience to adverse climatic events at a larger scale, whilst ensuring their connection and integration with energy, ICT and transport infrastructures.

Proposals are expected to address all of the following:

- Develop approaches and tools for the identification and categorisation of the vulnerability of existing, and future, buildings and built environment, where possible using and/or further developing existing vulnerability assessment methodologies.
- Develop innovative designs, materials and solutions to improve safety (e.g., fire safety) and resilience of the built environment to extreme climatic events (heat waves, floods, category 5 storms, etc.), and which may also be relevant in other natural disasters, such as earthquakes depending on the geographical location of the buildings.
- Ensure, if applicable, that the proposed solutions also improve accessibility for persons with disabilities, improve the local environment, and minimise any negative impacts on biodiversity, e.g. relying on nature-based solutions
- Where appropriate, ensure the proposed approaches and solutions address deep renovation, linking to relevant instruments for awareness and advice of building owners (e.g. renovation passports) in order to gradually adapt buildings to climate change in an adaptation pathways approach.
- Explore the use of relevant data, such as weather forecasts and / or catastrophe warnings, by monitoring and management systems in the built environment (e.g. to launch automatic emergency protocols to warn and protect buildings users).
- Investigate the potential of asset management and life cycle approaches to optimise costs of resilience (e.g. to climate and environmental factors).
- Ensure that the whole value chain from design over construction to end of life is covered.
- Demonstrate the solutions in at least two demonstrators, involving diverse building typologies, at block or district level and including where appropriate the connections to energy, ICT and transport infrastructures, in diverse geographical areas, with various local environmental, social, and economic conditions.
- Contribute to the activities of the Built4People partners and to the Built4People network of innovation clusters.

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.

This topic implements the co-programmed European Partnership on 'People-centric sustainable built environment' (Built4People). As such, projects resulting from this topic will be expected to report on results to the European Partnership 'People-centric sustainable built environment' (Built4People) in support of the monitoring of its KPIs.

Topic ID and title	HORIZON-CL5-2023-D4-02-03: Demonstrate built-environment decarbonisation pathways through bottom-up technological, social and policy innovation for adaptive integrated sustainable renovation solutions (Built4People Partnership)				
Budget	EUR 12 million	Opening date	04 May 2023	Deadline 1	05 September 2023
Budget per project	EUR 6 million			Deadline 2	/
Type of action	Innovation Actions (IA)				
FTP subsector	WW				
Keywords	Renovation, Circularity, construction value-chain, decarbonisation, wood-based products				
FTP comments	This topic specifically mentions wood-based products and is of high relevance to the woodworking sector. The topic itself might not have that much to do with the core business of the companies in the sector.				
FTP SIRA 2030 Challenges addressed	5C – 8A, C, D			FTP relevance	High
				Starting TRL	/
				End TRL	6-8

Expected Outcome:

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

- Increased number of innovative solutions and packages for sustainable construction and renovation.
- Increased number of options for built-environment decarbonisation pathways towards zero-emission buildings considering the whole value chain at local or regional level.
- Increased engagement and participation of the whole value chain in local and regional innovation clusters.
- Reduced time from first demonstration to market of sustainable renovation solutions.
- Increased awareness and improved access at a local or regional level to information on construction products for reuse and circular businesses.
- Creation of new business opportunities with reduced risk for investment in the circular economy.
- Enhanced engagement amongst communities, businesses, local and regional governments, and the extended construction value chain, e.g. materials and equipment, manufacturers, construction companies.

Scope:

To improve the energy efficiency, circularity and sustainability of the built environment there is a need to develop and apply integrated approaches that demonstrate, in practice, achievable pathways for decarbonisation of the building stock through a whole life carbon approach, including temporary carbon storage in built works (e.g. thanks to wood-based products). This means developing and integrating new design techniques allowing for deconstruction and reuse; new products and components that can be dismantled and reused; and new products and components for construction works that incorporate reused and recycled elements and materials. In addition, there is a need to deploy and test through a value chain approach the enabling conditions that facilitate the integration of the innovations outlined above in planning, design, budgeting, procurement, construction practice, insurance, and related administrative and regulatory processes.

Proposals are expected to address all of the following:

- Demonstrate a value chain approach and pilot decarbonisation pathways in at least two deconstruction/re-use/construction demonstrators and supply chain approaches of market-scale renovations.
- Demonstrate low disruptive and simpler construction and retrofitting processes, which facilitate a life cycle-based approach that fosters alignment with EU Level(s) framework indicators.
- Test the enabling conditions (technological, social, and policy) that can boost innovation and reduce time from research to market of sustainable renovation solutions.
- Establish and operate demonstrative regulatory sandboxes that allow to deploy and test innovation pathways for decarbonisation of buildings at a meaningful scale with the involvement of the whole value chain at local level.
- Where relevant, explore fast tracking of cost-effective standardisation and certification of innovative sustainable renovation solutions.
- Where relevant, investigate non-standard contractual relationships within the design-construction-client project team, including 'as a service' approaches for the built environment.
- Develop solutions that can stimulate the market for reused construction products at a regional level in support of the Renovation Wave and which can contribute to increased rate and depth of renovation in order to reach climate neutrality by 2050, in particular in critical segments of the building stocks such as e.g. public buildings or social housing.

- Develop design solutions that address inclusion and accessibility and leading to documented improvements in comfort and health aspects, whilst reducing emissions from the built environment and enhancing climate change resilience.
- Contribute to the activities of the Built4People partners and to the Built4People network of innovation clusters.

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 (including social innovation), in order to produce meaningful and significant effects enhancing the societal impact of the related research activities.

This topic implements the co-programmed European Partnership on 'People-centric sustainable built environment' (Built4People). As such, projects resulting from this topic will be expected to report on results to the European Partnership 'People-centric sustainable built environment' (Built4People) in support of the monitoring of its KPIs.

Topic ID and title	HORIZON-CL5-2023-D4-02-04: Fast-tracking and promoting built environment construction and renovation innovation with local value chains (Built4People Partnership)				
Budget	EUR 2 million	Opening date	04 May 2023	Deadline 1	05 September 2022
Budget per project	EUR 2 million			Deadline 2	/
Type of action	Coordination & Support Actions (CSA)				
FTP subsector	WW				
Keywords	Built with local value chains, local community engagement				
FTP comments	The project funded under Built4Planet Partnership and is a complementarity of action with the project funded under the HORIZON-CL5-2021-D4-02-03 topic. The aims should mainly be to enhance engagement amongst communities, businesses, local and regional governments, and the construction industries and associated supply chains and create new business opportunities.				
FTP SIRA 2030 Challenges addressed	8C,D			FTP relevance	High
				Starting TRL	/
				End TRL	/

Expected Outcome:

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

- Expansion and strengthening of the Built4People network of Construction Innovation Clusters.
- Increased awareness and improved access at a local or regional level to research outcomes for sustainable built environment construction and renovation.
- Increased engagement and participation of the whole value chain in local and regional construction innovation clusters.
- Strengthened, long-lasting and multi-disciplinary networking and collaboration on locally rooted, bottom-up innovative holistic solutions for a sustainable built environment.
- Enhanced engagement amongst communities, businesses, local and regional governments, and the construction industries and associated supply chains.
- Establishment and reinforcement of European value chains in sustainable construction and renovation.
- Creation of new business opportunities with reduced risk for investment in innovative built environment construction and renovation.
- Reduced time from research to market of innovative sustainable construction and renovation solutions.

- Increased public and private co-financing of innovation in the field of innovative sustainable built environment.

Scope:

For effective fast-tracking and promotion of built environment construction and renovation innovation with local value chains, nascent construction innovation clusters need to link with regional/national innovation hubs and clusters. This will strengthen multi-disciplinary networking and collaboration amongst all actors of local and regional construction ecosystems and reinforce European value chains. A long-term network structure is needed, based on an appropriate business model and governance, to support these clusters and give them capacity to nurture and help deliver public and private investments in sustainable construction and renovation innovation also supporting digitalisation of the value chain.

Proposals are expected to address all of the following:

- Delivery of a long-term network structure for the Built4People construction innovation clusters.
- Support adoption of the enabling conditions (technological, social, and policy) that can boost innovation and reduce time from research to market of sustainable renovation solutions.
- Deliver methods and tools for the reliable assessment of innovation maturity and potential impacts (e.g. potential of replication).
- Monitor growth of Built4People construction innovation clusters and assess their effectiveness for reducing the time from research to market of sustainable renovation solutions.
- Stimulate co-financing of innovation in the field of innovative sustainable built environment.
- Disseminate exemplary practices for fast tracking of cost-effective standardisation and certification of innovative sustainable renovation solutions.
- Prepare the value chain at a local/regional level for uptake of innovative sustainable construction and renovation solutions in support of the Renovation Wave and the increased rate and depth of renovation, also post 2030, in order to reach EU-wide climate neutrality by 2050.
- Stimulate engagement in Built4People innovation clusters of the stakeholders that can lead the transformation of the building stocks at local and regional level (e.g. cooperative and social housing developers).

- Promote design solutions that address inclusion and accessibility and leading to documented improvements in comfort and health aspects, whilst reducing emissions from the built environment and enhancing climate adaptation resilience.
- Ensure the project's dissemination activities include actions that contribute to the activities of the NEB Community, and to sharing information, best practices and results within the NEB Lab.
- Seek to ensure consistency and complementarity of action with the project funded under the HORIZON-CL5-2021-D4-02-03 topic.

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 (including social innovation), in order to produce meaningful and significant effects enhancing the societal impact of the related research activities.

This topic implements the co-programmed European Partnership on 'People-centric sustainable built environment' (Built4People). As such, projects resulting from this topic will be expected to report on results to the European Partnership 'People-centric sustainable built environment' (Built4People) in support of the monitoring of its KPIs.

Topic ID and title	HORIZON-CL5-2023-D4-02-05: Supporting the creation of an accessible and inclusive built environment (Built4People Partnership)				
Budget	EUR 10 million	Opening date	04 May 2023	Deadline 1	05 September 2023
Budget per project	EUR 5 million			Deadline 2	/
Type of action	Innovations Actions (IA)				
FTP subsector	WW				
Keywords	Inclusive buildings, disability, improved comfort, noise reduction				
FTP comments	The topic probably is out of scope for most actors in the woodworking-chain. However, it focuses on innovative planning and design tools. It presents an opportunity to promote the benefits of building with wood for the comfort and inclusiveness of "fragile people"				
FTP SIRA 2030 Challenges addressed	8C,D			FTP relevance	Indirect
				Starting TRL	/
				End TRL	6-8

Expected Outcome:

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

- Improved accessibility of the built environment for persons with disabilities and older persons, following a ‘design for all’ approach.
- Improved comfort for larger shares of the population.
- Increased uptake of accessible and inclusive active mobility solutions (walking and cycling) in support of healthy and sustainable lifestyles, while catering solutions for persons with reduced mobility.
- Improved sense of inclusiveness and social cohesion in larger shares of the population.
- Availability of a common evaluation and certification framework for accessibility and inclusiveness of the built environment.
- Improved consideration of accessibility and inclusiveness in the transformation of the built environment towards sustainability, climate change mitigation and adaptation, in line with energy and climate ambitions.
- Reduced energy consumption and lifecycle GHG emissions of the facilities of the built environment.

Scope:

The focus will be on the different facilities of the built environment (buildings, multi-modal hubs, public spaces and other infrastructure for people’s use) that are open to the public. Built environment professionals require support to design, plan, build and operate facilities

that are accessible and inclusive. Design concepts should make these facilities accessible for persons with disabilities and fragile people, following an inclusive, 'design for all' approach.

Proposals are expected to address all of the following:

- Develop innovative methods to ensure and facilitate the implementation of accessibility at all stages of design and construction processes, as well as the monitoring and testing of results.
- Demonstrate (and where applicable produce) innovative planning and design tools for new and existing buildings and/or multi-modal hubs and/or public spaces and/or other infrastructure for people's use with the triple aim of:
 - improving comfort (e.g. improving air quality, reducing noise or vibrations);
 - making them accessible and inclusive for persons with disability and/or older persons;
 - transforming the built environment towards sustainability (including social sustainability), climate change mitigation and adaptation, e.g. relying on nature-based solutions.
- Address the adaptability of the built environment over its lifecycle, to ensure flexibility for accessibility adaptations (e.g., in the case of changing needs of people with increasing disabilities and reducing mobility).
- Make the facilities of the built environment under consideration more energy efficient overall, therefore reducing GHG emissions.
- Ensure the involvement of persons with disabilities by means of a participatory approach.
- Consider the possible creation of new job opportunities that are concerned with implementing, monitoring and maintaining accessibility of the facilities of the built environment.
- Demonstrate the solutions in at least two demonstrators.
- Where applicable, investigate solutions aiming at removing barriers, , improving storage of (cargo-)bicycles, improving charging possibilities for electric (cargo-)bicycles in an inclusive way (e.g., considering the specific needs of older persons, multi-generational groups, and persons with disabilities).

- Where applicable, design public spaces to promote soft and active modes of mobility through attractive, safe, and green infrastructure for healthier and environmentally friendly lifestyles, therefore lowering carbon emissions and noise pollution.
- Where applicable, develop solutions to ensure the mobility of person with disabilities (including visually impaired users) inside buildings in an autonomous, ubiquitous, and pervasive way.
- Where new digital tools are used in the built environment (including to address energy efficiency and comfort in buildings), ensure their accessibility for persons with disabilities and older persons.
- Ensure the project's dissemination activities include actions targeted to contributing to the activities of the NEB Community, and to sharing information, best practice and results within the NEB Lab

Infrastructure such as motorways is excluded from the scope.

Participation of / co-creation with relevant societal stakeholders should be part of the action. To this end, 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 (including social innovation), to produce meaningful and significant effects enhancing the societal impact of the related research activities.

Proposals are expected to contribute to the activities of the Built4People partners and to the Built4People network of innovation clusters.

This topic implements the co-programmed European Partnership on 'People-centric sustainable built environment' (Built4People). As such, projects resulting from this topic will be expected to report on results to the European Partnership 'People-centric sustainable built environment' (Built4People) in support of the monitoring of its KPIs.

Call – Efficient, sustainable and inclusive energy 2024

Highly energy-efficient and climate neutral European building stock

Topic ID and title	HORIZON-CL5-2024-D4-01-01: Low-disruptive renovation processes using integration of prefabricated solutions for energy-efficient buildings				
Budget	EUR 10 million	Opening date	07 December 2023	Deadline 1	18 April 2024
Budget per project	EUR 5 million			Deadline 2	/
Type of action	Innovation Actions (IA)				
FTP subsector	WW				
Keywords	renovation, prefabricated modules, retrofitting				
FTP comments	This topic could be a significant opportunity for producers of prefabricated construction modules for retrofitting and renovation				
FTP SIRA 2030 Challenges addressed	8	FTP relevance		High	
		Starting TRL		/	
		End TRL		6-8	

Expected Outcome:

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

- Reduction of on-site construction activities to 1-2 days per dwelling/building unit.
- Cost reduction of at least 25% compared to conventional renovation processes.
- Significant reduction of dust, noise and waste on the construction site compared to conventional renovation processes.
- Significant reduction in occupant disturbance during the renovation.
- Improved levels of occupancy comfort (e.g. Indoor Air Quality and Indoor Environmental Quality) after renovation.
- Reduction of negative impacts of renovation on biodiversity, considering adaptability as well (e.g. to climate change, different use, evolving societal needs, etc.) and resilience of buildings to disruptive events.

Scope:

Low-disruptive renovation processes, using prefabricated modules that are quick and easy to apply can play an important role in increasing the renovation rate of the European building stock. Renovation processes should cover the whole workflow from design to offsite manufacture, installation, compliance checking on site and end strategies for maintenance, operation and end of life.

Proposals are expected to address all of the following:

- Develop streamlined processes for deep energy-efficient renovation to at least NZEB performance levels using prefabricated modules.
- Use relevant available technologies to reduce quality gaps between the off-site manufacturing and on-site deployment of prefabricated modules.
- Develop processes for seamless integration of prefabricated solutions into a variety of existing constructions (e.g. various existing wall materials, presence of balconies and overhangs, existing piping in the way etc.).
- Ensure the processes minimize the disturbance for building owners, tenants and users, through a considerable time reduction of on-site construction activities, reduced impact in terms of the unavailability of the building and its main functionalities, and a minimal impact on occupancy comfort during the renovation process.
- Include at least three demonstrations covering different building categories (residential or tertiary) and various building typologies, such as single or multi-storey, single or multi-use, etc.
- Demonstrate less-disruptive retrofitting processes that are more attractive and more cost-effective for building owners, tenants and users.

Industry

Topic ID and title	HORIZON-CL5-2024-D4-01-03: Alternative heating systems for efficient, flexible and electrified heat generation in industry				
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).

Call – Efficient, sustainable and inclusive energy 2024

Highly energy-efficient and climate neutral European building stock

Topic ID and title	HORIZON-CL5-2024-D4-02-01: Industrialisation of sustainable and circular deep renovation workflows (Built4People Partnership)				
Budget	EUR 16 million	Opening date	07 May 2024	Deadline 1	05 September 2024
Budget per project	EUR 8 million			Deadline 2	/
Type of action	Innovations Actions (IA)				
FTP subsector	WW				
Keywords	Renovation, indoor comfort, LCA, sustainability, carbon sinks, BIM				
FTP comments	Funded projects should demonstrate innovations in at least three demonstration sites. It requests many of the advantages provided for by build with wood				
FTP SIRA 2030 Challenges addressed	8	FTP relevance	High		
		Starting TRL	/		
		End TRL	6-8		

Expected Outcome:

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

- Streamlining resource-efficient nearly zero-energy performance renovation processes.
- Renovations with reduction of at least 30 % waste, 25% cost, and 30% work time (to 1-2 days per dwelling/building unit), compared to current deep renovation processes.
- Reduced energy performance gap between as-built and as-designed (difference between theoretical and measured performance), and higher construction quality.
- Innovative, tailored business models for deep renovation, generating economies of scale and contributing to an increased rate of renovation.
- Improved comfort, Indoor Air Quality and Indoor Environmental Quality.

Scope:

In line with the Renovation Wave and in order to meet long-term climate and energy targets, more action is needed to increase the rate and depth of building renovation. Several recent projects and calls have focused on prefabrication for deep renovation, but more work is needed to develop innovative, seamless workflows from design to off-site prefabrication, to installation, construction on-site, maintenance and future dismantling, reuse and recycling of prefabricated elements, duly considering life cycle performance, sustainability, and the potential to use the buildings as carbon sinks.

Proposals are expected to address all of the following:

- Investigate innovative approaches for industrialised deep circular renovation, covering the whole workflow from design through to off-site prefabrication, installation, construction on-site and strategies for maintenance, operation and end of life.
- Ensure the proposed approaches aim to achieve the highest level of energy performance (at least NZEB level) with a view toward zero-emission buildings, ensuring a high level of indoor environment quality, keeping costs in an attractive range for owners and investors.
- Make use of innovative processes and technologies, including those delivered by previous research, such as design based on circularity principles, prefabricated components, and digital tools that allow to optimise workflows (cost, time, quality, resource use).
- Demonstrate a seamless integration of the proposed approaches with state-of-the-art digital technologies for construction and renovation (Building Information Modelling, Digital Twins, etc.).
- Select processes and technologies that can be easily tailored to give a maximum potential for rapid and broad deployment at European level.
- Investigate innovative business models (e.g. as-a-service models), accounting for potential market and regulatory barriers, in view of mass deployment and Europe-wide impact.
- Apply the proposed workflows to at least three demonstrations to assess the proposed approaches for different buildings typologies representative of the European building stock, ensuring the most adequate coverage of the respective climatic conditions. The demonstrations can be either single buildings or clusters of buildings, and at least one of the demonstrations has to address residential buildings.
- Contribute to the activities of the Built4People partners and to the Built4People network of innovation clusters.

This topic implements the co-programmed European Partnership on ‘People-centric sustainable built environment’ (Built4People). As such, projects resulting from this topic will be expected to report on results to the European Partnership ‘People-centric sustainable built environment’ (Built4People) in support of the monitoring of its KPIs.

Topic ID and title	HORIZON-CL5-2024-D4-02-02: Robotics and other automated solutions for construction, renovation and maintenance in a sustainable built environment (Built4People Partnership)				
Budget	EUR 8 million	Opening date	07 May 2024	Deadline 1	05 September 2024
Budget per project	EUR 4 million			Deadline 2	/
Type of action	Research and Innovation Actions (RIA)				
FTP subsector	WW				
Keywords	Robotics, 3D printing, workers safety				
FTP comments	Funded projects should demonstrate innovations in at least three demonstration sites. It focuses on the construction work environment and lowering the costs of construction.				
FTP SIRA 2030 Challenges addressed	5C - 8A, C	FTP relevance	Medium		
		Starting TRL	/		
		End TRL	4-5		

Expected Outcome:

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

- Reduction of construction and renovation time on-site (at least 40% reduction).
- Reduction of errors in construction and renovation works.
- Improved resource efficiency.
- Reduction of construction and renovation costs.
- Reduction of greenhouse gas emissions resulting from, and improved energy efficiency of the works on-site.
- Reduced environmental impact of construction works, including pollution, particulate matter and noise, in the immediate vicinity.
- Reduction of waste generated from the works on-site.

Scope:

The transformation of the built environment should take place in a way that minimises the environmental impact of the works themselves. With the increasing rollout of highly energy efficient, sustainable buildings and deep renovation, there is a growing need for the development of robotic and automated solutions to support sustainable building construction, renovation and maintenance processes that are less disruptive, cleaner and faster.

Proposals are expected to address all of the following:

- Investigate the use of robotic systems (including those used for 3D printing) and automation for construction and deep renovation, in order to reduce time of construction and renovation works, reduce construction errors, as well as facilitate maintenance, also minimising the impact of the works on the surrounding built environment.
- Explore the potential for lower construction costs through automation and robotics resulting from increased speed, improved resource efficiency and avoidance of errors.
- Develop robotic and automated design and construction techniques that increase energy efficiency and reduce greenhouse gas emissions from construction and renovation works on-site.
- Develop approaches that use digitally assisted design to improve resource efficiency and safety, reduce waste, and reduce construction time.
- Investigate the use of automated technologies for surveying, inspection and monitoring of the site.
- Investigate the use of automated support to augment workers' capability and safety (e.g., lift robots, exoskeletons, automated construction site monitoring, use of augmented and virtual reality).
- Test and validate the prototyped solutions in at least three prototypes to assess the proposed approaches for a variety of buildings typologies representative of the European building stock. These prototypes should be validated in a lab or another relevant environment. The testing and validation are expected to address both new construction and renovation.
- Contribute to the activities of the Built4People partners and to the Built4People network of innovation clusters.

This topic implements the co-programmed European Partnership on 'People-centric sustainable built environment' (Built4People). As such, projects resulting from this topic will be expected to report on results to the European Partnership 'People-centric sustainable built environment' (Built4People) in support of the monitoring of its KPIs.

Topic ID and title	HORIZON-CL5-2024-D4-02-03: BIM-based processes and digital twins for facilitating and optimising circular energy renovation (Built4People Partnership)				
Budget	EUR 8 million	Opening date	07 May 2024	Deadline 1	05 September 2024
Budget per project	EUR 4 million			Deadline 2	/
Type of action	Innovations Actions (IA)				
FTP subsector	WW				
Keywords	BIM, Building lifecycle, Digital twins				
FTP comments	The topic supports developments of BIM and Digital Twins concepts to support the whole buildings life cycle from design to deconstruction and reuse				
FTP SIRA 2030 Challenges addressed	8A, C			FTP relevance	Medium
				Starting TRL	/
				End TRL	6-8

Expected Outcome:

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

- Reduced buildings construction and renovation time and costs.
- Increased buildings material reuse and recycling.
- Improvement of buildings performance (energy, sustainability including whole life-cycle carbon and the potential to store carbon in built works, comfort, health and well-being, and accessibility).
- Enhanced, interoperable and accessible buildings information across the lifecycle.
- Improvement of interoperability with existing Building Information Modelling (BIM) and Digital Twin solutions.
- Broader application of BIM and Digital Twin solutions, in particular within SMEs.

Scope:

To improve Building Information Modelling and Digital Twinning over the full life cycle of buildings, including construction and renovation of buildings, towards enhanced energy efficiency and sustainability and in compliance with circular economy and resource efficiency principles.

Proposals are expected to address all of the following:

- Develop and integrate solutions based on BIM and Digital Twins to support the whole buildings life cycle from design to deconstruction and reuse, including operation.
- Ensure the solutions developed address all the following aspects:

- Supporting optimal, adaptable and reversible building design for energy efficiency, circularity and sustainability.
 - Allowing to track buildings materials and construction products, and supporting cost-effective deconstruction and reuse, recycling and recovery of building materials at end of life.
 - Integrating buildings monitoring data (e.g. from sensors and IoT devices) into an interoperable Digital Twin for automated, optimised building performance monitoring and management, and preventive maintenance.
 - Enabling buildings data interoperability, quality and integrity across the life cycle, in particular to reliably assess and track building performance over the lifecycle, enabling tailored data access for all life cycle's stakeholders (architects, engineering companies, contractors, building owners, financing institutions, etc.).
 - Relying where possible on open BIM standards and linking, where relevant, to digital logbooks and relevant initiatives (e.g. the Smart Readiness Indicator under the Energy Performance of Buildings Directive).
 - Easiness of use and cost effectiveness, in particular for SMEs and companies with limited experience in digital solutions, and high potential for replication and commercialisation.
- Apply the solutions delivered on a set (at least two) of real-life residential and non-residential building construction and renovation projects which, taken together, allow to demonstrate the potential of the solutions across all aspects listed in the topic and across the life cycle.
 - Ensure that the demonstrations of the solutions delivered:
 - Cover at least two different countries, with diverse climatic conditions.
 - Involve local and regional values chains, in particular SMEs, based on participatory approaches to increase innovation acceptability.
 - Result in clear and, where relevant, quantified and measurable indicators on the improvements due to the use of the solutions, for all aspects listed in the topic and across the life cycle.
 - Contribute to the activities of the Built4People partners and to the Built4People network of innovation clusters.

This topic implements the co-programmed European Partnership on 'People-centric sustainable built environment' (Built4People). As such, projects resulting from this topic will be expected to report on results to the European Partnership 'People-centric sustainable built environment' (Built4People) in support of the monitoring of its KPIs.

Topic ID and title	HORIZON-CL5-2024-D4-02-04: Design for adaptability, re-use and deconstruction of buildings, in line with the principles of circular economy (Built4People Partnership)				
Budget	EUR 8 million	Opening date	07 May 2024	Deadline 1	05 September 2024
Budget per project	EUR 4 million			Deadline 2	/
Type of action	Research & Innovations Actions (RIA)				
FTP subsector	WW				
Keywords	Building recycling, disassembly, reuse				
FTP comments	This call is launched under the Built4People Partnership and funded projects should demonstrate innovations in at least two countries with different climate conditions. It focuses on disassembly and reuse of buildings and all building elements. To increase the reuse of wood in buildings is of high importance				
FTP SIRA 2030 Challenges addressed	8C			FTP relevance	Medium
				Starting TRL	/
				End TRL	5-6

Expected Outcome:

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

- Improved adaptability of buildings and building units to new uses.
- Increased reuse and recycling of building elements and products.
- Extended service life of buildings.
- Increased awareness on best practices for design for adaptability, reuse and deconstruction.

Scope:

Based on the integration of innovative tools, products and techniques, to enable construction and renovation that embeds the principle of extending the service life of buildings, and facilitate adaptability to changing user needs (e.g. for optimal use of indoor space or to improve working and living conditions), reuse, and deconstruction, in a life-cycle optimisation and circular economy perspective.

Proposals are expected to address all of the following:

- Validate construction and renovation solutions based on the integration of innovative tools, products, techniques, processes and methods, that facilitate deconstruction and reuse, based on life-cycle approaches across the value chain.
- Ensure the solutions validated:

- Consider the adaptability and reversibility of buildings and building units to changing uses, and to other relevant factors (e.g. evolution of surroundings).
- Improve the ease of reuse of construction elements and products from existing buildings, also facilitating recycling when reuse is not possible.
- Develop building elements and products that can be disassembled and reused, including those made from CO₂-storing materials such as sustainably sourced long-lived bio-based materials and products and, innovative lower emission materials /aggregates.
- Address all components of buildings, including structural elements, envelopes, interior fixtures and fittings, and technical building systems.
- Are rooted in local and regional value chains, based on participative approaches for social acceptability of innovation, in particular with regard to the workforce's practices and skills.
- Can flexibly adapt to local / regional sourcing of innovative products and materials to increase replication.
- Address climate change mitigation, minimising emissions.
- Allow to minimise any negative impacts of pollution and biodiversity loss from renovation and construction works.
- Validation of the solutions in a relevant environment (real-life or close to real-life) that:
 - Covers residential and non-residential projects, half of which at least should be renovation projects.
 - Covers at least two different countries, with diverse climatic conditions.
 - Involves local and regional values chains, in particular SMEs, based on participatory approaches to increase innovation buy-in from users.
 - Results in clear and, where relevant, quantified and measurable indicators on the improvements due to the use of the solutions.
- Deliver guidance and recommendations for technology providers, regulatory authorities, certification and standardisation bodies, and define and implement ambitious dissemination actions, to promote the approaches demonstrated and support their replication.

- Where relevant, contribute through specific and targeted actions to standardisation and regulatory evolutions that can foster reuse and deconstruction of buildings materials and products.
- Contribute to the activities of the Built4People partners and to the Built4People network of innovation clusters.

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.

This topic implements the co-programmed European Partnership on 'People-centric sustainable built environment' (Built4People). As such, projects resulting from this topic will be expected to report on results to the European Partnership 'People-centric sustainable built environment' (Built4People) in support of the monitoring of its KPIs.

Cluster 6 : Food, Bioeconomy, Natural Resources, Agriculture and Environment³

Destination 1: Biodiversity and ecosystem services

The biodiversity and ecosystem services destination of the 2023-2024 Cluster 6 work programme will support R&I for the EU environment and biodiversity protection framework and the European Green Deal. It is based on the vision developed in the EU biodiversity strategy for 2030 and will support its implementation, furthering the orientations of the 2021-2022 work programme. It will also take into account new European Green Deal initiatives, notably i) the EU forest strategy 2030, ii) the EU action plan: 'towards zero pollution for air, water and soil', iii) the EU climate adaptation strategy and iv) the EU soil strategy for 2030. Connections are expected to be made with the EU proposal for a nature restoration law, which includes binding targets and environmental reporting, and the new approach for a sustainable blue economy in the EU.

It will support R&I activities benefitting ecosystems in good ecological condition and a clean and healthy environment for the EU, including water, soil and air. This will contribute to the implementation of relevant policies such as health, climate adaptation and mitigation, disaster risk reduction, sustainable circular bioeconomy and blue economy. The R&I activities will also reflect the strong interconnections between, e.g. the EU biodiversity strategy for 2030 and the farm to fork strategy, as well as the pollinators initiative.

R&I supported under this destination will ensure that mainstreaming biodiversity in society and the economy takes into account justice, fairness and global aspects. This is to ensure the “just transition” emphasised in the European Green Deal is ensured.

R&I activities supported by Cluster 6 will complement and ensure synergies with activities supported under several Horizon Europe partnerships, in particular: i) the European biodiversity partnership Biodiversa+; ii) the European partnership water security for the planet “Water4All”; iii) the European partnership on accelerating farming systems transition: agroecology living labs and research infrastructures; iv) the European partnership on animal health and welfare and; v) the European partnership for a climate-neutral, sustainable and productive blue economy. R&I activities should also specifically address the strong interconnections between biodiversity and the emergence of infectious diseases by complementing the activities of with the European partnership for pandemic preparedness and the European Partnership for One Health/AMR Antimicrobial Resistance (AMR).

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

Synergies will also be ensured with the following Horizon Europe missions: “Restore our ocean, seas and waters by 2030”, “A soil deal for Europe” and “Adaptation to climate change”.

Projects supported under this destination are expected, where appropriate, to provide timely scientific contributions to major science-policy bodies such as the Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services (IPBES), the Intergovernmental Panel on Climate Change (IPCC), and the Convention on Biological Diversity. They are also expected to cooperate with the Science Service project Bio-agera. Where appropriate, the following existing platforms and information-sharing mechanisms should be used for dissemination and exploitation: the EC Knowledge Centre for Biodiversity, Biodiversity Information System for Europe (BISE), and Oppla.

This destination will also help achieve the twin green and digital transitions. Where relevant, advantage will be taken of the development and use of advanced digital technologies.

This destination will continue to support the EU leadership in the relevant international fora in line with the Commission priority “A stronger Europe in the world” and international cooperation will be key to addressing global challenges in many topics in this destination. The EU's outermost regions (defined in article 349 TFEU), where biodiversity is high and threats multiply, should be given special consideration.

Expected impact

Proposals for topics under this destination should set out a credible pathway resulting in the strategic plan having the following impact: *“Biodiversity is back on a path to recovery, and ecosystems and their services are preserved and sustainably restored on land, inland water and at sea through improved knowledge and innovation”*. More specifically, one or more of the following impacts should materialise:

- **Direct drivers of biodiversity decline** will be understood and addressed – land and sea use change, natural resource use and exploitation, climate change, pollution, invasive alien species – as well as indirect drivers – demographic, socio-economic, technological, etc.
- **Protected areas** and their networks will be planned, managed and expanded and the status of species and habitats will be improved based on up-to-date knowledge and solutions.

- **Biodiversity, ecosystem services and natural capital will be mainstreamed in the society and economy:** e.g. they will be integrated into public and business decision-making; approaches for enabling transformative changes to tackle societal challenges will be built including by deploying nature-based solutions (NBS).
- **Practices in agriculture, forestry, fisheries and aquaculture will be developed and improved** to support and make sustainable the use of biodiversity and a wide range of ecosystems services.
- **Biodiversity research and support policies and processes will be interconnected** at EU and global levels, making use of advanced digital technologies and societal engagement where appropriate.
- **The biodiversity and health nexus will be understood, in particular at the level of ecosystems.** This will be achieved by using the one-health approach, in the context of climate change and globalisation and by addressing contributions and trade-offs.

The impacts have been revised compared with the 2021-2022 work programme in order to take into account R&I activities included in the 2021-2024 strategic plan, but that are yet to be addressed. This was the case, for instance, for several direct drivers of biodiversity loss. The new drafting of the impacts makes clear that they are within the scope of the work programme.

Call – Biodiversity and Ecosystem Services 2023

Biodiversity protection and restoration

Topic ID and title	HORIZON-CL6-2023-BIODIV-01-4: Nature protection: better methods and knowledge to improve the conservation status of EU-protected species and habitats				
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 and Innovation Actions (RIA)				
FTP subsector	F&F				
Keywords	EU Birds and Habitats Directives, conservation, Red List, restoration				
FTP comments	Projects funded under this proposal will look at how the EU can ensure the recovery of habitats and species in unfavourable status or in decline in accordance with the Bird and Habitats Directive. As such, it might greatly influence forest management in the future and it is important that relevant scientific and practical expertise from the forest-based sector is represented				
FTP SIRA 2030 Challenges addressed	1	FTP relevance	Medium		
		Starting TRL	/		
		End TRL	/		

Expected Outcome

In line with the objectives of the European Green Deal, the EU biodiversity strategy for 2030, and existing EU nature legislation (Birds and Habitats Directives), project results will contribute to the following impact of destination “biodiversity and ecosystem services”: “to plan, manage and expand terrestrial and marine protected areas and improve the conservation status of species and habitats, based on up-to-date knowledge and solutions”. More specifically, project results will improve the setting of conservation objectives and measures for EU-protected habitats and species, thereby also ensuring that the network of Natura 2000 sites enable the maintenance or restoration of favourable conservation status.

Results of individual projects are expected to contribute to at least one of the following expected outcomes:

- Favourable conservation status for species and habitats covered by the EU Birds and/or Habitats Directives, and clarification of what is needed on an EU or biogeographical scale or other ecologically relevant scale (e.g., major basin, major flyway) in line with the relevant parameters and their values on the basis of which Member States define favourable conservation status.
- Better implementation of the EU Birds Directive specifically in relation to the 42 huntable bird species listed in Annex II of the directive which are not in a secure status, by filling scientific knowledge gap in relation to the amount and quality of

habitat that is needed for these species (with a focus on their breeding habitats), and to ensure that their hunting is carried out sustainably.

Scope

Proposals should address Area A or Area B as follows. The Area should be clearly indicated on the application.

Area A: Improving the conservation status of habitats and species protected under the Habitats and/or Birds Directive.

Successful proposals should:

- improve the definition of “favourable conservation status” of groups of habitats and/or species protected under the EU Birds and/or Habitats Directives, provide guidance on how to improve the monitoring of habitats and species and/or the setting of favourable reference values and favourable reference conditions in Member States. The focus of this work should be on data-deficient habitats and species, on habitats and species in the worst status (conservation status and/or EU Red list status), or with declining trends and/or on those species the recovery of which has created tensions with stakeholders (e.g., large carnivores, some geese species, cormorants, etc.). A specific focus could also be placed on habitats and species which depend on the maintenance of sustainable agricultural land management.
- ensure the recovery of habitats and/or species in unfavourable status and/or with a declining trend according to the reporting under the EU Birds and/or Habitats Directive (2019) by providing methodologies and recommendations on how to identify recovery needs for populations or restoration needs for habitats, including with regard to geographical location, quantity and quality of habitat to be restored.

Area B: Improving the conservation status of huntable bird species listed in Annex II of the Birds Directive.

Successful proposals should:

- Identify habitat management and restoration needs for huntable bird species in nonsecure status, with a focus on agricultural habitats, evaluate the impact of hunting and provide recommendations for an adaptive harvest management of these species, considering the available species-specific data on habitat quality and quantity impacting their fecundity and breeding success and survival rate for these species. Preparatory work done by the Commission Services should be taken into account.

Proposals should closely follow and ensure consistency with any ongoing or future relevant policy developments, with a particular focus on the voluntary EU targets for improving the status of species and habitats and increasing the coverage of protected areas, as well as in relation to the upcoming Commission proposal for legally binding restoration targets.

Proposals should earmark the necessary resources for cooperation and networking activities. They are expected to link with relevant projects such as EuropaBON, LIFE Integrated Projects and LIFE Strategic Nature Projects as well as with relevant projects under Horizon Europe topics, such as HORIZON-CL6-2021-BIODIV-01-02: Biodiversity and Ecosystem Services Collaboration with the European partnership on biodiversity Biodiversa+ should be explored, as needed.

The possible participation of the JRC would help ensure that the methodologies proposed can support environmental compliance assurance, particularly by leveraging geospatial intelligence.

Biodiversity friendly practices in agriculture, forestry and aquaculture

Topic ID and title	HORIZON-CL6-2023-BIODIV-01-15: Integrative forest management for multiple ecosystem services and enhanced biodiversity				
Budget	EUR 7 million	Opening date	22 December 2022	Deadline 1	28 March 2023
Budget per project	EUR 7 million			Deadline 2	/
Type of action	Coordination and Support Actions (CSA)				
FTP subsector	F&F				
Keywords	Forest management, biodiversity, conservation, climate change, ecosystem services				
FTP comments	A successful application should present a collaboration and sharing of knowledge among the conservation and forestry bodies, forest managers, research institutions and other interested stakeholders to exploit synergies and minimise trade-offs. This topic is of high strategic importance to forest-owners and managers as it aim to support practical guidelines addressing possibly conflicting objectives of forest management.				
FTP SIRA 2030 Challenges addressed	1 -2 - 3			FTP relevance	High
				Starting TRL	/
				End TRL	/

Expected Outcome:

In line with the European Green Deal, EU climate policy, and the EU forest and biodiversity Strategies, this topic promotes research-based and evidence-based forest conservation and management approaches that apply an understanding of the structure, function, and dynamics of natural and sustainably managed forest ecosystems to achieve integrated environmental, economic, and social outcomes.

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

- Intensive collaboration, mutual learning and sharing of knowledge among the conservation and forestry bodies, forest managers, research institutions and other interested stakeholders to exploit synergies and minimise trade-offs in forest management.
- Contribution to the development of computer models to be used as operational tools for examining the effects of climatic change on forest functioning.
- Practical recommendations and guidelines addressing multiple, possibly conflicting objectives of forest management, to promote forest conservation and resilience and mitigate the impacts of various forest disturbances, while supporting the socio-economic goals of forests through the support of an efficient utilisation of forest resources and services.
- Contribution to the achievement of EU forest related policy targets (biodiversity, bioeconomy, climate mitigation and adaptation).

- Diversification of forest management methods and their mutual balance and appropriate use in the given context (“context-dependent integrative forest management”) through the combination of different scientific disciplines, strong involvement of practitioners, researchers and advisors, biodiversity monitoring systems based on expert taxonomic knowledge combined with technologies, decision support tools and sustainability indicators. Application of context-dependent and site-appropriate, multi-stakeholder participatory and interdisciplinary methods.
- Enhanced knowledge on ecological forestry practices and their impacts on climate change adaptation and biodiversity conservation/restoration.

Scope:

This topic addresses integrative forest management strategies that optimise actively managed forest ecosystems in such a way that the ecological and socio-economic functions are sustainable and economic viable.

The aim is to achieve a better understanding how integrative forest management concepts (e.g. close-to-nature forestry, continuous cover forestry, retention forestry, etc.) are currently applied in Europe, their implications on the environment and biodiversity, society, and forest-based economy as well as to accelerate the implementation of innovative approaches through targeted and evidence-based guidelines and tools.

Proposals should:

- Provide an in-depth analysis of current concepts and principles of integrative forest conservation, management and utilisation strategies and assess their socio-economic and ecological impacts;
- Establish a network of living labs for integrative forest conservation, management and utilisation approaches inspired by best practices and covering different socio-cultural and bio-geographical conditions;
- Develop applicable evidence-based guidelines and tools for the upscaling of integrative forest conservation, management and utilisation approaches;
- Consider a strong stakeholder involvement and supportive policies;
- Support exchange of knowledge, dialogue and good practices among stakeholders and institutions, including science-based dialogues.

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

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

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

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

Interconnection of biodiversity research and policies

Topic ID and title	HORIZON-CL6-2023-BIODIV-01-18: Additional activities for the European Biodiversity Partnership: Biodiversa+				
Budget	EUR 60 million	Opening date	22 December 2022	Deadline 1	28 March 2023
Budget per project	EUR 60 million			Deadline 2	/
Type of action	Co-fund Action				
FTP subsector	F&F				
Keywords	Biodiversity, European Partnership, BioDiversa+				
FTP comments	This call aims to support the European Biodiversity Partnership Biodiversa+ for seven years. As such it is relevant for researchers on forest ecology and biodiversity to be aware of the Partnership and its future support to trans-national coordination. The call topic will however not of immediate relevance to the stakeholders of FTP.				
FTP SIRA 2030 Challenges addressed	1	FTP relevance	Indirect		
		Starting TRL	/		
		End TRL	/		

Expected Outcome

The second instalment of the partnership is expected in continuation to contribute to expected outcomes specified in topic HORIZON-CL6-2021-BIODIV-02-01: European partnership rescuing biodiversity to safeguard life on Earth, for continuation of the activities and the continuation of already agreed outcomes.

Scope

The objective of this action is to continue to provide support to the European Partnership Biodiversa+ identified in the Horizon Europe Strategic Plan 2021-2024 and first implemented under the topic HORIZON-CL6-2021-BIODIV-02-01: European partnership rescuing biodiversity to safeguard life on Earth, and in particular to fund additional activities (which may also be undertaken by additional partners) in view of its intended scope and duration, and in accordance with Article 24(2) of the Horizon Europe Regulation.

The consortium which applied to and received funding under HORIZON-CL6-2021-BIODIV-02-01: European partnership rescuing biodiversity to safeguard life on Earth is uniquely placed to submit a proposal to continue the envisioned partnership. Not only did this consortium submit the proposal leading to the identification of the partnership in the Horizon Europe strategic planning 2021-2024, it has also implemented the partnership through co-funded calls in years 2021 and 2022 based on this planning and further to topic HORIZON-CL6-2021-BIODIV-02-01. In this context, the current consortium has particular expertise in relation to the objectives of the Partnership, the activities to be implemented in particular FSTP calls or other calls/scope of calls clearly

required/envisioned pursuant to initial proposal/partnership, and other relevant aspects of the action. In practice, another consortium could not continue the activities of the Partnership underway without significant disruption to the ongoing activities, if at all.

The scope of the application for this call on the European partnership for Biodiversity Biodiversa+ should focus on the flagship programmes 2023-27 according to the partnership's co-created strategic research and innovation agenda for seven years, which includes calls for research projects, biodiversity- and ecosystems monitoring and science-based policy advisory activities, and all horizontal activities to allow the Partnership to operate and to achieve its five specific objectives.

It is expected that the partnership continues to organise joint calls on an annual base and therefore it should factor ample time to run the co-funded projects. It should build on, and widen, the data availability in European Research Infrastructures federated under the European Open Science Cloud.

The partnership should collaborate closely with the EC 'Knowledge Centre for Biodiversity' and with the Science Service project 'Bio-Agora', and seek to collaborate with EU space programmes (Copernicus, Galileo) to foster the use of emerging or operational space technologies for policy development. Moreover, the partnership should describe specific activities foreseen in order to strengthen the synergies with other related Missions and Partnerships.

While the award of a grant to continue the Partnership in accordance with this call should be based on a proposal submitted by the coordinator of the consortium funded under HORIZON-CL6-2021-BIODIV-02-01 and the additional activities (which may include additional partners) to be funded by the grant should be subject to an evaluation, this evaluation should take into account the existing context and the scope of the initial evaluation as relevant, and related obligations enshrined in the grant agreement.

Taking into account that the present action is a continuation of topic HORIZON-CL6-2021-BIODIV-02-01 and foresees an amendment to an existing grant agreement, the proposal should also present in a separate document the additional activities and additional partners, if any, to be covered by the award in terms of how they would be reflected in the grant agreement.

The partnership should pool the necessary financial resources from the participating national (or regional) research programmes with a view to implementing joint calls for transnational proposals resulting in grants to third parties.

The Commission envisages to include new actions in future work programme(s) to continue providing support to the partnership for the duration of Horizon Europe.

Call – Biodiversity and Ecosystem Services 2024

Understanding and addressing the main drivers of biodiversity loss

Topic ID and title	HORIZON-CL6-2024-BIODIV-01-1: Invasive alien species				
Budget	EUR 12 million	Opening date	17 October 2023	Deadline 1	22 February 2024
Budget per project	EUR 6 million			Deadline 2	/
Type of action	Innovation Actions (IA)				
FTP subsector	F&F				
Keywords	Invasive species, EU Biodiversity Strategy for 2030, EASIN, public awareness, red list				
FTP comments	The focus on invasive species and how to detect and monitor and model their spread is an important topic. However, under this umbrella, the scope is wide which includes their spread via harbours and airports. Applicants to this topic will likely be the research community and certain public authorities				
FTP SIRA 2030 Challenges addressed	1	FTP relevance	Indirect		
		Starting TRL	/		
		End TRL	6-7		

Expected Outcome

In line with the European Green Deal and in particular with the objectives of the EU biodiversity strategy for 2030, projects will contribute to the following impact of destination “Biodiversity and ecosystem services”: “Understand and address direct **drivers of biodiversity decline**... invasive alien species...”.

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

- The establishment of alien species accidentally introduced in the EU environment is minimised and where possible they are eradicated,
- Early warning systems to inform relevant stakeholders of the introduction of invasive alien species, building upon EASIN,
- The introduction of invasive alien species is effectively prevented and established ones are systemically managed,
- Public awareness, literacy and engagement, on invasive alien species monitoring and management are supported and improved,
- Pressure on species on the Red List threatened by invasive alien species is reduced contributing to the following key commitment of the EU biodiversity strategy for 2030 “ a 50% reduction in the number of Red List species threatened by invasive alien species”.

Scope

Invasive alien species are one of the five main direct drivers of biodiversity loss. Besides inflicting major damage to nature and the economy, many invasive alien species also facilitate the outbreak and spread of infectious diseases, posing a threat to humans and native wildlife. The rate of new introductions of invasive alien species has increased in recent years. Without effective control measures, risks to our nature and health will continue to rise. Climate change and land-use changes facilitate the spread and establishment of many alien species and create new opportunities for them to become invasive. This topic is therefore contributing to the adaptation to climate change.

Regulation (EU) 1143/2014 on invasive alien species (IAS) entered into force on 1 January 2015. It establishes a list of Invasive Alien Species of Union concern (the Union list). The IAS Regulation provides for a set of measures to be taken across the EU in relation to invasive alien species included on the Union list. EASIN (European Alien Species Information Network) facilitates information on Alien Species and officially supports the EU Regulation 1143/2014.

Successful proposals should:

- Develop models based on dynamic data, accessible to end users, to prioritise species, manage pathways and sites most vulnerable by the introduction of invasive alien species;
- Develop methods for the identification, early detection and surveillance of invasive alien species, such as sensors for biophysical signals (sounds, ultrasounds, volatile organic compounds, thermal etc.), DNA-based including barcoding and application of environmental DNA, artificial intelligence, sentinel plants in ports, airports, railway stations, and logistics platforms. The use of robotics (both aerial and non-aerial), especially in marine environments, could be considered.

Proposals should address Area A: terrestrial ecosystems or Area B: aquatic (including marine) ecosystems. The Area should be clearly indicated on the application.

Proposals should build synergies with on-going projects supported under Horizon 2020 and other projects supported under Horizon Europe. The project “Natural Intelligence for Robotic Monitoring of Habitat” could provide hints about the usage of mobile robotic sensors.

Cross-articulation with the other data spaces, and notably with the European Open Science Cloud shall be foreseen, exploiting synergies and complementarities of the different approaches.

Participatory approaches, such as citizen science, could be appropriate modes of research for this action.

In area B in particular, projects results funded under the following topics should be considered: HORIZON-CL6-2021-BIODIV-01-03: Understanding and valuing coastal and marine biodiversity and ecosystems services, Topic HORIZON-CL6-2021-BIODIV-01-04: Assess and predict integrated impacts of cumulative direct and indirect stressors on coastal and marine biodiversity, ecosystems and their services and HORIZON-CL6-2022-BIODIV- 01-01: Observing and mapping biodiversity and ecosystems, with particular focus on coastal and marine ecosystems. In addition, in area B, projects should coordinate their activities with objective 1 of the Mission “Restore our ocean and waters”.

Proposals should include specific tasks and allocate sufficient resources to coordinate with existing platforms and information sharing mechanisms, in particular the EC Knowledge Centre for Biodiversity. Collaboration with the European partnership on biodiversity Biodiversa+ should be explored, as needed.

This topic should involve contributions from the social sciences and humanities disciplines.

The possible participation of the JRC in the project would ensure that the approach proposed is compatible with the IAS policy implementation and that data and information generated is shared through EASIN.

International cooperation is encouraged.

Biodiversity protection and restoration

Topic ID and title	HORIZON-CL6-2024-BIODIV-01-2: Digital for nature				
Budget	EUR 16 million	Opening date	17 October 2023	Deadline 1	22 February 2024
Budget per project	EUR 8 million			Deadline 2	/
Type of action	Innovation Actions (IA)				
FTP subsector	F&F				
Keywords	forest monitoring, data collection				
FTP comments					
FTP SIRA 2030 Challenges addressed				FTP relevance	Medium
				Starting TRL	/
				End TRL	6-7

Expected Outcome

In line with the European Green Deal and in particular with the objectives of the EU biodiversity strategy for 2030 projects' results will contribute to the following impacts of the destination "biodiversity and ecosystem services": "Plan, manage and expand **protected areas** and improve the conservation status of species and habitats based on up-to-date knowledge and solutions"; "to understand and address **drivers of biodiversity decline** and "mainstream **biodiversity, ecosystem services**, including through the development of **Nature-based Solutions**".

The projects results are expected to contribute to all of the following expected outcomes:

- A better monitoring (in terms of the number of species and habitats, more exhaustive territory coverage, more frequent in time, more accurate and cost-effective) of biodiversity in the EU by high-throughput methods (for example environmental DNA, sound/image/spectral analysis, lidar, usage of mobile platforms, etc.), leading to a better implementation of the nature directives.
- A better understanding of the state of nature and of the drivers of biodiversity loss (linked to direct human activity, to climate change, etc...) and of the state of conservation of nature through a better usage of existing data, and through the bridging of data gaps in order to support the implementation of the EU biodiversity strategy for 2030 and therefore to reverse biodiversity loss and to restore and protect ecosystems.
- A more complete view of the state of nature and its evolution which is needed to support policy implementation and policy making, including the Member States' reporting obligations, supporting the definition and implementation of prevention and restoration measures and the monitoring of the achievement of their objectives,

the extension of protected areas, the monitoring of invasive alien species, and the implementation of Nature based solutions and the assessment of their performance.

Scope

As quoted in a recent paper in Nature Communications, the growing amount of the collected environmental data is not optimally used: “there is a mismatch between the evergrowing volume of raw measures (videos, images, audio-recordings) acquired for ecological studies and our ability to process and analyse this multi-source data to derive conclusive ecological insights rapidly and at scale”. In the European Union, there is already a range of group of experts monitoring species and habitats, including in the view of reporting under the Birds and Habitats directives. However, the generated datasets are not sufficiently accessible (too many small, isolated communities of practice, different servers, different data access methods, different formats, rarely accessible through web-services) and too often not well known or advertised outside of their original circle of experts: the access to the results (consolidated data, statistics, maps) of these field surveys should be significantly concentrated behind single entry points. Also, the access to modern technologies (e.g., image recognition, sound analysis, high-throughput DNA-based techniques, usage of AI, usage of space, etc.) too often represents an important effort for each group of experts, beyond their environmental expertise. As a result, the technological developments remain an important effort for each group, while the solutions should better be provided as a service (to be configured to the need of each group) and mutualised. The natural domain being very large and sometimes difficult to access, the existing databases are still not dense enough, in terms of spatial and temporal coverage: many species and habitats are insufficiently covered (and sometimes not monitored at all), resulting in information gaps. Also, scarce samplings do not allow to distinguish non-presence from a lack of/insufficient/inadequate fields visit. A massive use of automated, and potentially mobile, sensor technologies (such as, but not limited to, images, video, sounds/ultra-sounds recording, spectral signatures, structure description by lidar, environmental DNA sampling, etc) and associated with processing algorithms (in particular, but not limited to, deep learning and AI processing algorithms) is therefore needed. The goal of this topic is to facilitate the access to data, encourage the usage of automated/robotic data collection systems for data collection, encourage community approaches for the exchange of data and good practices (in particular for data processing).

Proposals should address Area A or Area B as follows. The Area should be clearly indicated on the application.

- Area A: a project focussing on data harvesting through high-throughput methods (as described in the introduction, eg. environmental DNA, sound/image analysis, lidar,

spectrometry, usage of mobile platforms, etc.), analysis and interoperability solutions, with the goal of concentrating the information in a single access point, and lowering the technical hurdle for the biologist and managers of natural sites, offering the best solutions in a ready-to-use form;

- Area B: a project focussing on new robotic solutions, including mobile, to improve the efficiency of biodiversity related solutions, allowing to improve the performance of the field campaign, with denser information of species and habitats.

Area A: data harvesting, analysis and interoperability solutions

The successful proposal is expected to address the needs in terms of IT solutions, to increase information density, in terms of species and habitats sampled, territory coverage, timeliness, and accuracy.

As a result, much denser data collections should be available through a common data portal. The successful proposal should demonstrate the feasibility to combine different sources of information, for example to assess the conservation status of habitats or species. In that respect, several approaches could be tested, from data combinations defined by expert rules, and data storage formats, to machine learning or data-mining technologies. Such digital solutions could support the definition of conservation measures and management plans, and the monitoring and forecast (through model ingesting in-situ observations) of their progress to their objectives, at site, regional and national levels. Furthermore, the results could be used by member states for their formal monitoring and reporting obligations, or to check and enhance the performance of Nature Based Solutions.

The successful proposal should:

- Ensure interoperability of available data, enabling EU-scale information systems by developing solutions to connect and harvest data from already existing data bases. This will guarantee information fusion and support third party usage of the data.
- Develop cost-effective and easy-to use tools and software to collect and analyse different existing data sources and formats (in vivo data, photographs, sound recordings, lidar, spectrometry, eDNA, satellite images etc.), to facilitate cost-effective data analysis, map and link existing databases and provide algorithms to better analyse them.
- Develop data hosting and data processing solutions to extract information on populations (such as diversity, counts, trends), habitats (such as identification, area covered, and area change in time), assessment of conservation status and trend, information of species and habitats health conditions, degradations, and destructions

(natural or human-driven). The accumulation of information should allow synoptic analysis of species and habitats, allowing to detect hot spot of issues and trends. Innovative solutions, such as data mining and AI approaches need to be considered.

- Develop a solution to host, process, analyse and search available data in relation to protected habitats and species (including protected sites management information, their conservation objectives and measures, and restoration actions).
- Analyse and define infrastructure solutions, that would let biologists and managers of natural sites quickly create a dedicated working framework, furnished with all data harvesting, processing, sharing solutions. In this approach, the future European Green Deal data space should be considered as a potential common solution, or part of the solution.
- Develop tutorials for practitioners, based on academics and industry knowledge, on how to best use existing databases and data harvesting, data analysis and data sharing solutions. The tutorials should help the users to quickly set up and use their working environment.
- Propose easy-to-use solutions to utilise robotic sensors and Internet of Things (IoT): automated sensors, automated sampler, including mobile sensors (terrestrial, aerial and under-water) and animals tagging solutions, data sharing through wireless communication systems, to support a systematic data collection. Such approach should help better mapping the known/unknown and significantly increase the density of collected data, spatially and temporally.
- Analyse the conditions under which data, raw data acquired from sampling, data coming from existing databases and data resulting from processing can be shared. A clear data sharing framework, accommodating special needs, simple to use in practice, and enabling the broadest usage whilst encouraging the largest community to contribute, should be defined. Special attention will be paid to endangered species and sensitive species (in the sense of the Birds and Habitats Directives) for which the shared data needs to be controlled, and methods for effective detection of invasive species by high throughput search would be encouraged.
- Enable EU Member States, associated countries, and accession countries to coherently set conservation objectives, preparing management plans, manage shared habitat types and species, deal with similar conflicts and socio-economic dimensions, permitting procedures, spatial planning, with a focus on implementing the Birds and Habitats Directives and their Natura 2000 network.
- 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,

- Contribute to a web of FAIR data and supporting services that enable an interconnected disciplinary ecosystem that allows stakeholders to share digital objects and build on them in a seamless fashion.
- The architecture for a unified EU web-GIS with all the data collected from the Directives should be considered. In that matter, the proposed system should allow the member states sharing their habitats and species maps, and in particular the habitats maps used to designate their Natura 2000 sites, as well as subsequent updates. Also, the platform should help collecting information to update habitats and species maps, in order to obtain a common knowledge database about habitats and species, and their evolution, in relation to the Birds and Habitats Directives.
- Automatic translation functions should be offered by the platform to better connect EU Member States, associated countries and accession countries to support them in the implementation of the legislation on nature protection (such as the Birds and Habitats directives, the Invasive Alien Species regulation or the Marine Strategic Framework Directive).

Proposals should consider the possibilities offered by the future “Green data spaces” (CNECT). The DEP CSAs on the “preparatory actions for the European Green Deal Data Space” (exploring cloud-to-edge solutions, platforms and initiatives for data storage, exchange, and analysis as good practices for setting up the data spaces) are expected for Q4 2022-Q2 2024 and the “data spaces support centre” will start delivering on architectural blueprints in late 2023 and onward.

Proposals should earmark the necessary resources for cooperation and networking activities. Proposals should link to other relevant Horizon 2020 and Horizon Europe projects and initiatives, such as BiCIKL, EuropaBON, BioDT and connect to existing European Biodiversity data infrastructures including DiSSCo, eLTER and LifeWatch, where relevant. Proposals should also connect with relevant projects under Horizon Europe topics, such as HORIZON-CL6-2021-BIODIV-01-01: European participation in global biodiversity genomics endeavours aimed at identifying all biodiversity on Earth.”, HORIZON-CL6-2021- BIODIV-01-02: Data and technologies for the inventory, fast identification and monitoring of endangered wildlife and other species groups, HORIZON-CL6-2021-BIODIV-01-07: Ecosystems and their services for an evidence-based policy and decision-making and HORIZON-MISS-2021-OCEAN-02: Protect and restore marine and fresh water ecosystems and biodiversity. Projects using satellite data should link to HORIZON-CL6-2021-GOVERNANCE-01-14: User-oriented solutions building on environmental observation to monitor critical ecosystems and biodiversity loss and vulnerability in the European Union.

The possible participation of the JRC would help ensure that the methodologies proposed can support environmental compliance assurance, particularly by leveraging geospatial intelligence.

Collaboration with the European partnership on biodiversity “Biodiversa +” should be explored, as needed.

Area B: new robotic sensors for biodiversity

To increase the density of species and habitats observations across the EU territory, new robotic, and possible mobile, solutions need to be developed.

The proposed innovative solutions should:

- Be ready to use, easy to deploy and operate in natural environment.
- Consider automated solutions, and mobile platforms (land, air, water and under water) carrying sensors (such as, but not limited to, image, sound, lidar, spectrometry, eDNA, etc.) should be designed with fields campaigns in mind, in particular in terms of autonomy (energy, autonomy of moving and sampling decisions). Improvements in terms of species tagging, and species-carried tracking or telemetry devices should also be considered.
- The project should focus on innovative sensors that would allow significantly increasing knowledge in biodiversity, or bringing new information about the species and habitats conservation status, and increase spatial and temporal coverage, and to facilitate access to environments that are difficult to sample.
- Propose a large degree of data collecting automation and compatibility with the system described in project 1.
- The project should generate at least 1 innovative prototype of robotic/automated sensor and 1 innovative prototype of mobile solution, demonstrating improved performances compared to the currently available solutions.
- The project should analyse the conditions and costs of the production of the robotic system, as well as the conditions and costs of its usage and maintenance.

The project “Natural Intelligence for Robotic Monitoring of Habitat” could provide hints about the usage of mobile robotic sensors.

International cooperation is encouraged.

Mainstreaming biodiversity in society and the economy

Topic ID and title	HORIZON-CL6-2024-BIODIV-01-3: Dependence of society and the economy on pollinators				
Budget	EUR 13 million	Opening date	17 October 2023	Deadline 1	22 February 2024
Budget per project	EUR 6,5 million			Deadline 2	/
Type of action	Research and Innovation Actions (RIA)				
FTP subsector	F&F				
Keywords	pollinators, ecosystem services, Red List				
FTP comments	The focus is to learn more about the functional roles of pollination ecology and the role of pollinators in natural as well as human-modified ecosystems. This is a topic of interest to the academic community and the outcomes might inform forest managers about a potential provision of ecosystem services				
FTP SIRA 2030 Challenges addressed	3A, B			FTP relevance	Indirect
				Starting TRL	/
				End TRL	/

Expected Outcome

In line with the European Green Deal and in particular with the objectives of the EU biodiversity strategy for 2030 and the EU pollinators' initiative, projects will contribute to mainstream **biodiversity in society and the economy**.

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

- Direct and indirect dependences of our society and the economy on pollinators are better understood and quantified;
- Monetary and non-monetary valuation of ecosystem services provided by pollinators are advanced, and used to improve ecosystem accounting;
- Tools for mainstreaming pollinator conservation into the food, health, energy, materials and land management sectors are developed, tested and promoted with public authorities, businesses and the general public;
- Risks of reversible and irreversible cascading effects in natural and modified ecosystems due to pollinator decline, and their impacts on human wellbeing, are better understood and forecasted, and integrated into models for participatory scenario planning.

Scope

The importance of pollinators for humankind is common knowledge, featuring prominently outside of the scientific realm in popular culture and arts. Yet, even well-known benefits provided by pollinators such as crop pollination are still inadequately understood. Other

benefits remain for the most part obscure, and thus unacknowledged, due to the lack of research targeting the complexity of pollinator niches and plant-pollinator networks. Amid the dramatic decline of pollinating species in Europe, these gaps hinder understanding of the character and full magnitude of threats to human wellbeing. Moreover, the gaps hinder mainstreaming of the conservation of pollinators, and more broadly biodiversity, in the public and private sector and thereby impede an effective societal response. This topic aims to address fundamental knowledge gaps in functional roles of pollinators in natural (natural plant-pollinators networks) and human-modified ecosystems (e.g. agro-ecosystem), and building on that i) advance research on far reaching consequences of their decline and scenario planning and ii) develop and disseminate tools that enable systematic mainstreaming in key sectors.

The proposed projects should build on the Assessment Report on Pollinators, Pollination and Food Production of IPBES, the first ever EU-wide Ecosystem Assessment 2020, the INCA project, the European Red List assessments, and knowledge and experience gained through past projects supported under the EU Framework Programme for Research and Innovation. Furthermore, the projects should liaise with relevant ongoing projects under Horizon Europe and EU funded monitoring initiatives.

The proposals should show how their results would contribute to the EU policies, as well as to the global sustainable development agenda (UN Sustainable development Goals

Proposals should include specific tasks and envisage sufficient resources to develop joint deliverables (e.g., activities, workshops, as well as joint communication and dissemination) with all projects funded under this topic and to facilitate cooperation with the European biodiversity partnership Biodiversa+ and other platforms such as the EC Knowledge Centre for Biodiversity.

For the implementation of the eligibility condition on the 'multi-actor approach', proposals should ensure adequate involvement of researchers, farmers and other land managers, businesses involved in the food, medicine, energy and/or materials sectors, decision-makers at local and/or regional level, civil society organisations and other relevant actors.

Successful proposals should:

- Investigate essential functional roles of pollinators in natural and human-modified ecosystems, and associated ecosystem services. This should encompass ecosystem services underpinned by pollinators both directly and indirectly;
- Fill knowledge gaps on animal pollination ecology (what pollinates what, how much, where and when) and investigate the full spectrum of animals that pollinate wild and cultivated plants in Europe, going beyond the well-known insects (bees, hoverflies,

butterflies, moths). The structure and functionality of plant-pollinator networks should be analysed. The research scope should include the European continent as well as EU overseas territories;

- Build a platform that will serve one-stop shop for information on animal pollination ecology. A database with systematised information on plant-pollinator interactions, including the spatial dimension of plant-pollinator networks, should be part of the platform. The platform should build on what already exists and should be devised in close collaboration with researchers and other potential users. Options to integrate this deliverable into the already existing platforms should be explored, with a view to ensure its long-term viability;
- Assess the dependency of society and the economy on ecosystem services underpinned directly and indirectly by pollinators, quantify and map the risks associated with pollinator decline. Monetary and non-monetary valuation of those ecosystem services should be advanced, including their tangible and less tangible elements, and utilised to improve ecosystem accounts and scale up their use in the public and private sector;
- Investigate biomass supply chains dependent on pollinators, build tools for businesses to assess their vulnerability to pollinator decline and improve guidelines on how they can help to reverse the decline and thereby mitigate future risks. This should in particular cover the food (including production of plants with mandatory cross-pollination), medicine, energy and materials sectors;
- Build tools for land managers and planners to support spatial decision-making with regard to the conservation of pollinators and protection of the local flow of ecosystem services that they deliver, e.g., digital atlases, maps, applications. In particular, tools for farmers should be developed, enabling assessment of impacts on their income and overall business performance of farms, early warning of pollination-deficit as well as social impacts on farming communities;
- Investigate the dependency of sustainable nutrition on pollinators and potential risks due to their decline. Particular attention should be paid to food with invaluable and irreplaceable properties for human health (e.g. with regard to micronutrients);
- Investigate risks of cascading effects in natural (natural plant-pollinators networks) and human-modified ecosystems due to pollinator decline and their impacts on human wellbeing, and undertake scenario forecasting towards 2050 in the case of an unmitigated pollinator decline. Uncertainty and irreversibility of the effects should be well integrated in the build-up of models.

Biodiversity friendly practices in agriculture, forestry and aquaculture

Topic ID and title	HORIZON-CL6-2024-BIODIV-01-8: Conservation and protection of carbon-rich and biodiversity-rich forest ecosystems				
Budget	EUR 12 million	Opening date	17 October 2023	Deadline 1	22 February 2024
Budget per project	EUR 6 million			Deadline 2	/
Type of action	Research & Innovation Actions (RIA)				
FTP subsector	F&F				
Keywords	Forest management, forest ecosystems, carbon-rich, biodiversity				
FTP comments	The topic has a very wide scope but focuses indirectly on forest-ecosystems and carbon-rich forests. It is of high strategic importance to forest owners and forest managers				
FTP SIRA 2030 Challenges addressed	1 -2 - 3			FTP relevance	High
				Starting TRL	/
				End TRL	/

Expected Outcome

In line with the EU biodiversity and climate objectives, successful proposals will support the protection of biodiversity-rich forest ecosystems, at the species' distribution rear edges and margins that are at high risk of collapse in light of a rapidly changing climate.

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

- Improved knowledge on the cross-impacts between biodiversity and climate change: drivers of biodiversity loss and the interrelation with forest-based adaptation and mitigation needs; impacts of climate change on forest biodiversity and forest species migration; and links between forest species diversity and forest resilience to climate change.
- Identification of win-win management practices (including non-intervention, climate smart forestry) and development and implementation of ecosystem protection and restoration methods and tools for resilient, carbon rich and biodiversity supportive forests.
- Better understanding of the drivers and barriers for natural co-migration of forest communities and development of approaches and guidelines to foster co-migration.
- Improved tools and indices for the joint monitoring of biodiversity and climate aspects on forests.
- Empirical analysis of the current forest management and conservation practices in European forests of high ecological value, including governance (regulations and their impact), management responses to climate change and an assessment of drivers that determine management on the ground.

- Strict protection of primary and old-growth forest in Europe by 2030.

Scope

Biodiversity-rich forest ecosystems, in particular at the species' distribution edges, are at a high risk in light of a rapidly changing climate. When not being in their optimal climate conditions, they are more fragile to biotic and abiotic damages and do not provide ecosystem services in an optimal manner.

While for tree species assisted migration and assisted gene flow is considered as a possibly solution in actively managed forests, the dependent forest communities (e.g., plants, fungi, insects, soil microorganisms etc.) might fail to follow the speed of habitat shifts what in turn may result in a loss of biodiversity. In addition, migration failure of mutualistic species (fungi, mycorrhiza) can jeopardize the success of tree migration.

Protected areas without the option for assisted migration, will particularly depend on the larger landscape context for community migration and adaptation, as many of them have not been designed to account for the long-term and large-scale dynamics.

Proposals will:

- Set up case studies in European forests or tropical forests; particularly targeting forests of high ecological value, such as primary and old-growth forests, Mediterranean forests, peat swamp forests or mangroves.
- Improve existing or develop new predictive models of biodiversity changes, advance the understanding of species connection with the forest habitat, and analyse to what extent species can survive in a changed and fragmented habitat with a view to establishing protected forest networks.
- Analyse directions of assisted tree migration to maximize dynamic gene conservation (as form of ex situ conservation)
- Assess the risk for biodiversity loss in protected areas and develop protection strategies that consider the larger landscape and regional context to allow for natural species and community migration.
- Develop approaches and guidelines for forest managers and conservationists in a context of forest ecosystem migration and map scenarios of potential forest ecosystem migration routes.
- Connect with relevant institutions at regional, national and EU-level as well as relevant stakeholders to regularly disseminate the research results.

- Improve monitoring techniques, including remote-sensing and field-data methods integrating technologies such as AI, IoT, robotics or blockchain, to better assess biodiversity and climate aspects of forests.

Due to the scope of this topic, international cooperation is strongly encouraged.

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

JRC will contribute with dataset on forest tree species distribution and support the development of satellite monitoring of forest metrics.

Destination 2: Fair, healthy and environment-friendly food systems from primary production to consumption

National, EU and global food systems are facing sustainability challenges, from primary production to consumption that could jeopardise food and nutrition security. The farm to fork strategy, and its follow-up initiatives, aim to address these challenges and supports transition to more resilient and environmentally, socially and economically sustainable food systems on land and at sea that provide healthy diets for all and respect planetary boundaries. It is key to the success of the fit for 55 package, the European Green Deal and achievement of the UN sustainable development goals (SDGs). Research and innovation (R&I) under this destination will steer and accelerate the transition to sustainable, safe, healthy and inclusive food systems from farm to fork, ensuring food and nutrition security for all and delivering co-benefits for the environment, health, society and economy.

Sustainable, climate neutral and biodiversity friendly farming systems provide economic, social (including health), environmental and climate benefits, and are the main prerequisite for food and nutrition security. For farmers, who are the backbone of food systems and the immediate managers of natural resources, the new common agricultural policy (CAP) and the European Green Deal ambitious targets and objectives concerning the sustainability and safety of feed, food and non-food production. These targets and objectives are included in the core European Green Deal policy priorities, in particular the farm to fork strategy, the EU biodiversity strategy 2030, zero pollution ambition and climate action, and their follow up initiatives. R&I in line with the strategic approach to EU agricultural research and innovation will be key enablers for achieving these ambitious targets and objectives.

The **partnership on ‘Accelerating farming systems transition: agroecology living labs and research infrastructures’** will unlock the potential of agroecology to make agri-food systems environment-friendly and regenerative, climate-neutral, inclusive, competitive and resilient. It will enable farmers and value chain actors to successfully apply agroecology principles thanks to: i) a stronger R&I system integrating science and practice; ii) increased knowledge on the benefits, challenges and potential of agroecology for farming, food and society; iii) improved sharing of and access to knowledge, place-based tailored solutions and innovations; and iv) improved and transformative governance and policies.

Besides the partnership, R&I under the destination will support farmers in monitor and managing natural resources (e.g., soil, water, nutrients, biodiversity, etc.) in innovative, sustainable ways by, among other things, boosting organic food and farming in line with the action plan for the development of organic production. New knowledge and innovative solutions will also promote plant health, reduce farmer’s dependency on pesticides and reverse biodiversity loss.

Through the **partnership on 'Animal health and welfare'**, farmers and other actors will be better equipped to protect animals against infectious diseases, including zoonoses, and to improve animal welfare, while reducing the dependency on antimicrobials, maintaining productivity, improving food safety and quality, and protecting the environment and public health. In addition to the partnership, sustainable livestock production will be enhanced by improved knowledge on nutritional requirements and innovative on-farm practices and technologies for optimised production and use of local feedstuffs. A common EU approach to optimise the management of the co-existence of outdoor livestock systems and wildlife will be implemented by integrating science, local knowledge and practice on the preservation, protection and valorisation of wildlife and agro-pastoral systems.

Synergies will be created with other destinations and instruments. Under the Mission 'A Soil Deal for Europe', 100 living labs and lighthouses will be established to lead the transition towards healthy soils by 2030. Thanks to R&I, farming systems will also maximise the provision of a wide range of ecosystem services from more sustainably managed EU agro-ecosystems and landscapes and help reverse the loss of biodiversity while ensuring resilient primary production (Destination '*Biodiversity and ecosystem services*'). R&I under the Destination '*Land, ocean and water for climate action*' will better equip farmers to make a significant contribution to climate-neutrality and become more resilient to climate change. Farmers will be empowered and interconnected by means of advanced digital and data technologies (e.g. AI, IoT, and robotics) that support sustainable farming approaches (Destination '*Innovative governance, environmental observations and digital solutions in support of the Green Deal*'). New sustainable business models and strengthened EU quality schemes will improve the position of farmers in value chains and enable them to seize opportunities provided by the green transition (Destination '*Resilient, inclusive, healthy and green rural, coastal and urban communities*'). Effective agricultural knowledge and innovation systems (AKIS) will speed up innovation and the uptake of R&I results from farm to fork (Destination '*Innovative governance, environmental observations and digital solutions in support of the Green Deal*').

Better evidence-based knowledge and analytical capacity will help policymakers develop and implement effective policies, in particular the CAP post 2027, the contingency plan and sustainable food systems framework law, enabling farmers to transition to sustainable and resilient farming and food systems (Destination '*Innovative governance, environmental observations and digital solutions in support of the Green Deal*'). Furthermore, knowledge and innovative solutions generated under Horizon Europe will be circulated and tested in local innovation projects and networks that are financed by rural development programmes, and which are managed by the European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-AGRI).

Sustainable fisheries and aquaculture contribute directly to environmentally friendly, resilient, inclusive, safe and healthy food production by providing highly nutritional proteins, lipids and micronutrients for a healthy diet. Sustainable aquatic production can and should account for a much bigger proportion of our overall food consumption. Following the farm to fork strategy, production methods should make the best use of nature-based, technological, digital and space-based solutions, optimising the use of inputs (e.g., nutrients and antimicrobials), therefore increasing climate-neutrality and resilience and safeguard aquatic biodiversity. R&I in fisheries and aquaculture will contribute to the relevant Food 2030 pathway for action ‘food from oceans and freshwater resources’. It will support the ‘strategic guidelines for a more sustainable and competitive EU aquaculture for the period 2021 to 2030’, that propose specific actions on, e.g. i) access to space and water, ii) human and animal health, iii) environmental performance, iv) climate change, v) animal welfare, vi) the regulatory and administrative framework, and vii) communication on EU aquaculture. In addition, the new EU algae initiative - to unlock the full potential of sustainable algae-based food and alternative feed sources - can support the transition to sustainable food systems. R&I will also contribute to the success of the common fisheries policy and deliver compliant, inclusive, diversified ecosystem-based fisheries approaches to allow fisheries management to adapt to different realities, including in the international context. The destination will also support the new policy initiative on the sustainable blue economy and its offshoot initiatives, including the Sustainable Blue Economy Partnership.

R&I will help fisheries and aquaculture become more precise, technologically advanced, and fully embedded in the natural and socio-ecological context including by reducing the footprint on aquatic biodiversity. It will better equip fisheries and aquaculture to become more resilient to the adverse consequences of climate change and to make a significant contribution to climate neutrality. It will enable the European aquaculture industry to achieve its full potential to ensure global food security in terms of volume, methods, variety of species, aquatic species welfare, safety and quality of products and services.

R&I will help to provide a better understanding of the impacts of climate change in terms of habitat change and ecological functioning and the consequent repercussions on stock shifts, species composition, health, and altered growth and reproduction rates. This will help in the adaptation of fishing vessels, fishing gear and catch methods to reduce their carbon footprint as well as help in their adaptation to the changing climate regime. It will also enable aquaculture to: i) become more sustainable – by using resources in a highly efficient manner - and climate-neutral; and ii) adapt to a changing climate and its consequences, such as temperature rise, acidification, altered water quality and availability, extreme weather events, and other emerging risks, notably in geographical areas particularly vulnerable to climate change impacts such as the EU's outermost regions (defined in article 349 TFEU).

Sustainable, healthy and inclusive food systems rely on systemic, cross-sectoral and participatory, multi-actor approaches and on integration between policy areas at all levels of governance. Food systems are to be understood as covering, 'from farm to fork', all the sectors, actors and disciplines relevant to and connecting i) environment protection requirements, ii) natural resources, iii) primary production on land and at sea, iv) food processing and packaging, v) food distribution and retail, vi) food services, vii) food consumption, viii) food safety, ix) nutrition and public health, and x) food waste streams. An important driver for transforming food systems should be the integration of sectors, actors and policies. This should occur in order to better understand the multiple interactions between the actors and components of current food systems, the lock-ins and potential leverage points for synergistic changes and of the interdependencies of outcomes (linkages between nutritional climate and sustainability outcomes). Such implementation/approaches can provide solutions that maximise co-benefits with respect to the four priorities of the Commission's Food 2030 R&I initiative:

- nutrition and health, including food safety;
- climate and environmental sustainability;
- circularity and resource efficiency;
- innovation and empowering communities.

This destination will deploy solutions to the 10 Food 2030 pathways for action and will help build innovation ecosystems to bring together relevant public and private sector actors, researchers and society. R&I will provide food-related businesses, including those involved in food processing and packaging, retail, distribution, and food services, with opportunities and incentives to stimulate environmentally friendly, healthy, circular and diversified practices, products and processes that are biodiversity-friendly, climate-neutral and less reliant on fossil fuels. It will also help devise tools and approaches that enable the shift to healthy, sustainable diets and responsible consumption for everyone, boosted also by social innovation, technology, behavioural change and marketing standards, and by inclusively engaging with different consumers, citizens and communities. R&I will accelerate the transition to sustainable, healthy and inclusive food systems by:

- eradicating micronutrient deficiencies in vulnerable population groups;
- developing new high quality, healthy, minimally processed and sustainable food products and processes;
- assessing innovative and novel foods based on sustainable alternatives sources of proteins;
- preventing and reducing food loss and waste to tackle environmental and climate challenges, including through improved marketing standards;
- unlocking and maximising the potential of the microbiome to improve food safety, fight food waste and develop alternative sources of proteins;

- networking and exchanging knowledge on food fraud and food safety and exploring the influence of climate change on food safety;
- developing new strategies and detection methods on products derived from new genomic techniques, and strengthening the resilience of European food systems;
- promoting citizen science and creating smart tools to improve diets.

R&I will also:

- reduce the environmental impacts of and pollution from food value chains (see Destination *'Clean environment and zero pollution'*);
- help transform urban food systems, including via the use of nature-based solutions in the context of the New European Bauhaus initiative (see Destination *'Resilient, inclusive, healthy and green rural, coastal and urban communities'*); and
- improve the governance of food systems and further develop digital and data-driven innovation ecosystems for sustainable, healthy and inclusive food systems (see Destination *'Innovative governance, environmental observations digital solutions in support of the Green Deal'*).

In addition, R&I under the **partnership on 'Sustainable food systems for people, planet and climate'** will accelerate the transition towards sustainable, healthy and inclusive food systems in Europe and beyond via EU-wide targeted research and innovation. It will help to close knowledge gaps, increase health and food literacy, and deliver innovative solutions, e.g. social innovation, which provide co-benefits for nutrition, the environment, climate, circularity and communities. It will also leverage investments and align multiple actors towards common goals and targets and help further build up the European Research Area in order to support the transformation of sustainable food systems at various scales from local to global.

The EU also aims to promote a **global transition to sustainable food systems**. It's relationship with Africa is a key priority. Targeted R&I activities, in particular under the EU-Africa Partnership on Food and Nutrition Security and Sustainable Agriculture (FNSSA) and global initiatives involving international research consortia, will help achieve this ambition and contribute to the AU-EU High Level Policy Dialogue (HLPD) on Science, Technology and Innovation.

In line with the farm to fork strategy, and its promotion of global transitions on sustainable food systems, a comprehensive and integrated response to current and future challenges benefiting people, nature and economic growth in Europe and in Africa will be provided. Advances will be made particularly in the following key areas: agroecology, including agroforestry, food safety and fair trade.

In encouraging multi-actor approaches and to be more effective in achieving impact, the proposals in this destination shall, where relevant, be complementary or build on synergies with the activities of the EIT Knowledge and Innovation Communities, such as EIT Food.

Where appropriate, proposals are encouraged to cooperate with actors such as the European Commission Knowledge Centre for Global Food and Nutrition Security and the Africa Knowledge Platform, also for the purpose of dissemination and exploitation of results.

Expected impact

Proposals for topics under this destination should set out a credible pathway contributing to **fair, healthy, safe, climate- and environment-friendly, sustainable and resilient food systems from primary production to consumption, ensuring food and nutrition security for all within planetary boundaries** in Europe and across the world.

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

- enable **sustainable farming systems** that i) provide consumers with affordable, safe, healthy and sustainable food, ii) increase the provision of ecosystem services, iii) restore and strengthen biodiversity, iv) minimise pollution and pressure on ecosystems and greenhouse gas emissions, v) foster plant, animal and public health, vi) improve animal welfare, and vii) generate fair economic returns for farmers;
- enable **sustainable fisheries and aquaculture**, in marine and inland waters, increasing aquatic multi-trophic biomass production in a way compatible with the protection of aquatic ecosystems and biodiversity, and the diversification of fisheries and aquaculture products, for fair, healthy, climate-resilient and environment-friendly food systems with a lower impact on aquatic ecosystems and improved animal welfare;

accelerate the transition to **sustainable, healthy and inclusive food systems**, delivering co-benefits for climate change mitigation and adaptation, environmental sustainability and circularity, sustainable healthy diets and nutrition, food poverty reduction, empowered citizens and communities, and flourishing food businesses, while ensuring food safety and the economic sustainability of EU food systems during the transition.

Call - Fair, healthy and environmentally-friendly food systems from primary production to consumption 2024

Enabling sustainable farming systems

Topic ID and title	HORIZON-CL6-2024-FARM2FORK-01-1: Agro-pastoral/outdoor livestock systems and wildlife management				
Budget	EUR 5 million	Opening date	17 October 2023	Deadline 1	22 February 2024
Budget per project	EUR 5 million			Deadline 2	/
Type of action	Research & Innovation Actions (RIA)				
FTP subsector	F&F				
Keywords	livestock, wildlife, wildlife management, agro/pastoral, farmers, hunters, conservationists				
FTP comments	The topic can have bearing to forest management in areas where livestock farming and forestry/forest wildlife could come into conflict				
FTP SIRA 2030 Challenges addressed				FTP relevance	Indirect
				Starting TRL	/
				End TRL	/

Expected Outcome:

In line with the objectives of the Farm to Fork Strategy for a transition to fair, healthy and environmentally friendly livestock production systems, and of the EU biodiversity strategy for 2030, including the conservation status of certain habitats and species, the successful proposal will help policy makers and other actors to monitor and improve the management of farming and terrestrial wildlife relationships, thus contributing to sustainable agriculture and ecosystem services.

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

- Innovative and sustainable practices and tools at landscape level to prevent and control negative consequences of interactions between livestock and wild animals to protect wildlife and pastoral/outdoor production systems
- Recommendations/policy advice on optimal management at EU level of wildlife and agro-pastoral systems
- Decision-making process on wildlife management and land planning participated by relevant stakeholders
- Improved coordination across Europe in terms of wildlife management, surveillance and data collection systems

Scope:

Agro-pastoral/outdoor livestock farming systems, which include a large number traditional activities in Europe such as grazing systems, mountain livestock farming, transhumance, silvo-pastoral and agroforestry systems, offer beneficial effects not only to animal production, e.g., in case of scarce fodder resources, or to animal welfare, but also to habitat maintenance, carbon sequestration, biodiversity conservation and soil protection.

The increased demand for natural resources by human population with the consequent fragmentation of wildlife habitat, together with the increased population of wild animals and the change in land use have often resulted in human-wildlife conflicts. The interactions between livestock farmers and wildlife are more frequent and cause damages to both sides with conflicts in the management of farming systems and natural resources.

Wildlife population, which is worth protecting, occupies wide geographic area and extend across administrative borders, and public administrations face difficulties with regards to the reduction of the impact of wildlife on livestock farming. The implementation of a common and integrated approach at EU level is required to optimize the management of the coexistence of terrestrial wildlife (large carnivores, ungulates) and agro-pastoral/outdoor livestock systems at landscape level.

The following elements should be incorporated:

- Review of current wildlife management approaches in agro-pastoral/outdoor production systems in the different EU Member States and associated countries and assessment of the effectiveness of different prevention measures
- Map the most common types of damages caused and the positive externalities created by wild animals with respect to livestock and crops in Europe. Create an inventory of good practices and infrastructures at farms and regional levels, within a wider wildlife management approach.
- Improve or develop tools/technologies for (real time) data collection and analysis to assess, monitor and control (wild) animal behaviour and damages
- Cost/benefit analysis of current and new farming strategies that preserve, protect and valorise wildlife and pastoralism in different regions and ecosystems. Socio-economic, environmental, cultural and political aspects should be considered.
- Assess stakeholders' (farmers, hunters, conservationists, general public, policy makers...) perspectives and needs (participatory approach) and improve or develop effective instruments to reduce conflicts between livestock farming and wildlife.

Identify the most effective measures to mitigate damages and the most common (monetary, nonmonetary) compensation mechanisms across Europe.

The proposal should take into account projects funded under the LIFE programme, and interact and engage a dialogue with relevant EU organizations such as EU Platform on Coexistence between People and Large Carnivores.

Proposals must implement the 'multi-actor approach' and ensure adequate involvement of the main stakeholders involved in managing wildlife/livestock interaction (e.g., farmers, hunters, game farmers and producers, agricultural advisory services, land managers, ecology and nature conservation experts, animal behaviour scientists, social scientists and other relevant actors).

This topic should involve the effective contribution of social sciences and humanities (SSH) disciplines.

Call - Fair, healthy and environmentally-friendly food systems from primary production to consumption 2024 two stage

Enabling sustainable farming

Topic ID and title	HORIZON-CL6-2024-FARM2FORK-02-3-two-stage: Tools to increase the effectiveness of EU imports controls for plant health				
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	Innovation Actions (IA)				
FTP subsector	F&F				
Keywords	Farm to fork strategy, food systems, plant pest, plant health				
FTP comments	The topic does not exclude studies of forest-related plant diseases. However, a strong focus is put on the farm to food value chain				
FTP SIRA 2030 Challenges addressed	1	FTP relevance	Low		
		Starting TRL	/		
		End TRL	6-7		

Expected Outcome:

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

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

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

Scope:

Plant health is of global importance for agriculture, forestry, natural ecosystems, ecosystem services and biodiversity. Plant health is threatened by species injurious to plants and plant products, which now present a greater risk of being introduced into the Union territory owing to globalisation of trade and climate change. The current EU plant health legislative

landscape aims at a proactive approach ensuring safe trade and mitigating the impacts of climate change on the health of the crops and forests in Europe.

Research activities should support these measures by contributing to the development of more rapid, reliable and economic innovative solutions and devices that can assist plant health inspectors at the borders. Technologies such as e-noses, acoustic devices, scanners, and portable devices for molecular identification of plant pests¹⁹⁸ within hours/minutes of the specimen's sampling often using limited amounts of plant or plant product material, and other relevant solutions, are included within the scope of this topic.

Proposals should:

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

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

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

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

Topic ID and title	HORIZON-CL6-2024-FARM2FORK-02-4-two-stage: Tackling outbreaks of plant pests				
Budget	EUR 13 million	Opening date	17 October 2023	Deadline 1	22 February 2024
Budget per project	EUR 6,5 million			Deadline 2	17 September 2024
Type of action	Research & Innovation Actions (RIA)				
FTP subsector	F&F				
Keywords	Farm to fork strategy, food systems, plant pest, plant health, prevention and monitoring				
FTP comments	The topic does not exclude studies of forest-related plant diseases. However, a strong focus is put on the farm to food value chain				
FTP SIRA 2030 Challenges addressed	1	FTP relevance	Low		
		Starting TRL	/		
		End TRL	/		

Expected Outcome:

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

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

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

Scope:

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

Proposals should target one or more plant pest(s) that are either Union quarantine plant pests²⁰¹ present in the EU or Union quarantine pests which are priority pests in the EU, and that are of concern for agriculture and/or forestry, with the exception of plant pests targeted

in Horizon Europe. Research activities should improve methods for an effective implementation of the principles of integrated pest management (IPM), whilst reflecting the move towards innovative biological and other non-chemical control and resistance breeding.

Proposals should:

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

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

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

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

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

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 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	HORIZON-CL6-2023-CIRCBIO-01-7: Symbiosis in the bio-based industrial ecosystems				
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	HORIZON-CL6-2023-CIRCBIO-01-8: Eco-friendly consumer products – low-toxicity/zero pollution construction bio-based materials				
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	Innovations Actions (IA)				
FTP subsector	WW				
Keywords	biobased construction materials, life cycle analysis LCA, non-toxic, zero-pollution, circularity				
FTP comments	The scope of the topic targets building with wood and other biobased materials				
FTP SIRA 2030 Challenges addressed	4D – 8B, C, D - 9C			FTP relevance	High
				Starting TRL	/
				End TRL	6-8

Expected Outcome

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

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

- Higher environmental sustainability, including on the climate targets (primarily reduction of greenhouse gas emissions, and accessorially increase of carbon removals), and zero pollution demonstrated by LCA approaches of bio-based materials and products for construction applications, allowing their intensified sustainable use, under the New European Bauhaus Initiative²⁵¹ and the Renovation Wave;
- Demonstrated non-toxic and zero-pollution properties of the construction materials, as well as their recyclability and/or reusability, to respond to the higher societal demand and the objectives of the European Green Deal,
- Increased competitiveness of European industry, including SME sector, and involving various actors of bio-based value chains; while ensuring affordable and sustainable end-products for the consumers and society, including via integration of digital solutions;
- Improved innovation potential in regard to biotechnology, and its potential contribution to the sustainable, circular bio-based materials and biochemicals, with safe, environmentally-friendly and functionally performing applications; Improved societal innovation and creativity, with inclusive engagement of all societal actors, especially professional bodies, policy-makers, designers, architects, consumers and

end-users, for the bio-based construction product segments. This is expected to contribute, e.g., by developing recommendations or guidelines, or public engagement/dialogue, to the policy-feedback on innovative construction materials, and to resolving related regulatory bottlenecks.

Scope

Bio-based construction materials offer major opportunities to contribute to the climate-neutral and zero-pollution objectives of the European Green Deal, replacing fossil-based alternatives, and so, reducing the environmental footprint, while offering economic benefits to the actors involved. However, care needs to be taken to ensure sustainability of sourcing and production process, while guaranteeing safety and positive user experience. This calls for high level of innovation and creativity, ensuring full inclusiveness of participation for all actors.

Proposals will focus on:

- Identification and upscaling of bio-based materials suitable for the construction sector, understood as bio-based feedstocks, e.g., agro-forestry 253 residues, fibres, recycled organic materials, industrial by-products etc, obtained especially by higher circularity of available biomass, under the cascading use of biomass principle. However, the selected materials can also be found in other bio-based resources that, due to their specific genetic / physiological / biochemical backgrounds have functional properties, which can be further improved or upgraded by fermentation, biomanufacturing, or biotechnology approaches. Also, the hybrid integration of living organisms into traditional or bio-based construction materials (e.g., plants, algae, fungi) might be considered, if leading to higher quality and improved environmental impact. The range of final construction materials is broad and may cover composites, insulation materials, interior or exterior elements, adhesives, etc., depending on the construction value chain selected.
- Innovating in terms of bio-based production improvements (e.g., additive bio-based manufacturing, nature-based solutions, or composite materials with added functionalities), leading to new construction-oriented consumer applications. This effort should benefit from innovation developed both from the technical angle, but also from social innovation and from inclusive participation of all actors, including development of recommendations for pre-normative or/and regulatory actions, related to new (recyclable/reusable) bio-based construction materials, as appropriate.
- The safety and user experience aspects should be duly considered and included in the developed solutions.

- Communication and dissemination will form an essential part of the projects, especially as related to the sustainability, 'reconnection with nature' and inclusiveness aspects.
- Proposals should include a dedicated task, appropriate resources and a plan on how they will collaborate with other projects funded under this topic and other relevant topics.
- International cooperation is encouraged to benefit from exchange of best practices, while taking care of European (industrial) competitiveness.
- SSH aspects should be considered and covered, as well as the contribution from digital solutions.

Topic ID and title	HORIZON-CL6-2023-CIRCBIO-01-9: Business models that balance the share of power and profit in the bioeconomy				
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.

Safeguarding and sustainably innovating the multiple functions of EU forests

Topic ID and title	HORIZON-CL6-2023-CIRC BIO-01-12: Optimising the sustainable production of wood and non-wood products in small forest properties and development of new forest-based value chains				
Budget	EUR 12 million	Opening date	22 December 2022	Deadline 1	28 March 2023
Budget per project	EUR 6 million			Deadline 2	/
Type of action	Research & Innovation Actions (RIA)				
FTP subsector	F&F				
Keywords	small-scale forest owners, innovative forest management, EU Forest Strategy, carbon farming, Payment for Ecosystem Services PES, digitalisation, training				
FTP comments	This topic is of high relevance and high importance to the forest-based value chain and in particular private forest owners with small properties				
FTP SIRA 2030 Challenges addressed	1B – 2C, E – 3A	FTP relevance		High	
		Starting TRL		/	
		End TRL		/	

Expected Outcome:

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

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

- Development of regional and local management models for small-scale forest holdings in support of the EU Forest Strategy for 2030, adapted to the wide variety of contexts found in the EU.
- Better understanding of knowledge, skills, motivation and needs of small-scale forest owners, and development of targeted and innovative approaches for effective support structures and instruments for the various ownership types.
- Contribution to forest-related policy goals of the European Green Deal, including the development of a forest-based bioeconomy, the reduction of greenhouse gas emissions, the increase of carbon removals, the protection of ecosystem services and the restoration and conservation of forest biodiversity.
- Improved guidelines on carbon farming and PES (Payment for Ecosystem Services) design and implementation in Europe formulated and implemented.
- Development of lively, prosperous and resilient rural areas and integration of small-scale forests owners in the bioeconomy value chains.

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

Scope:

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

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

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

Proposals will:

- Create a better understanding of the circumstances of small forest property owners and behaviour for both traditional and non-traditional owner types.
- Explore, analyse, and develop innovative forest management approaches, including silvicultural practices, carbon farming, digital tools (for example blockchain, robotics, AI or IoT/sensors), organisational, cooperation and business models, advisory services, education and training concepts, policy frameworks and social and institutional models that take into account different ownership types.
- Assess and develop innovative and tailored support structures, programmes and instruments, covering traditional and non-traditional owner types, considering size, geographical, professional and personal backgrounds, value orientations, age, gender, etc.
- Collect, analyse, and develop targeted approaches for activating and mobilising forest owners, particularly non-traditional, non-farm, absentee, urban or women as forest owners taking into consideration existing good practice guidance and examples.
- Define sustainable production potentials for wood and non-wood forest products through improved integrated management approaches.

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

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

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

Topic ID and title	HORIZON-CL6-2023-CIRCBIO-01-13: Capturing market trends and societal perceptions for tailor-made forest services				
Budget	EUR 12 million	Opening date	22 December 2022	Deadline 1	28 March 2023
Budget per project	EUR 6 million			Deadline 2	/
Type of action	Research & Innovation Actions (RIA)				
FTP subsector	F&F				
Keywords	Payment for Ecosystem Services PES, carbon farming, resilience, business models, transdisciplinary forum, societal demands				
FTP comments	The topic look at supporting new and integrated management forest management concepts to meet the demand for not only wood but non wood products and services (e.g. carbon farming). Digital tools will play an important role.				
FTP SIRA 2030 Challenges addressed	2E - 3			FTP relevance	High
				Starting TRL	/
				End TRL	/

Expected Outcome

This topic contributes to the new EU Forest Strategy for 2030 by addressing new opportunities for primary producers to diversify income and employment opportunities and developing new sustainable business models.

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

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

Scope

Forests provide invaluable benefits to people and the planet. They are biodiversity hubs and habitats, vital for climate and water regulation, soil stabilisation and the purification of air and water. Their carbon sequestration and storage capacity make them an important ally in the fight against climate change. Also, forests and the forest-based sector provide multiple

socio-economic functions and benefits, including jobs and development possibilities in rural areas. Their role in providing food, medicines and materials and their value for recreation and learning from nature is indispensable for the transition to a circular bioeconomy and a healthy society.

However, there is an increasing demand on European forests to provide a high diversity of goods and ecosystem services at the same time. The choice of forest management can produce different outcomes for ecosystem services and productivity in the short and the long-term. Forest owners should consider possible trade-offs and synergies with regards to the multifunctional role of forests, their interaction with climate change and their role for biodiversity. Therefore, there is a need for balanced and integrative approaches to ensure ecosystem services in the long-term and to provide sufficient resources for a sustainable and circular bioeconomy, while at the same time, contributing to GHG emissions reductions and carbon removals to contribute to 2030 and 2050 EU climate targets.

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

Proposals will:

- Set-up a transdisciplinary forum at the science-policy-society interface to regularly disseminate research results, discuss options for upscaling promising approaches (including technological needs and possible solutions) and collaborate with relevant policy makers, stakeholders and the wider public.
- Explore the evolving societal demands under changing climate conditions for different forest goods and services in an interdisciplinary and integrative approach to improve the knowledge that will help to balance the demands while safeguarding forest's capacities to deliver them in the best possible way.
- Based on previous research results (.e.g., InnoForest, Sincere, etc.), improve the understanding of ecosystem service interactions at different temporal scales both short term and long-term and consider relevant social, environmental and economic interdependencies and path dependencies.
- Identify region and national specific market-driven approaches to create new or reactivate value chains and business models based on co-operation between forest owners, policymakers and users of ecosystem services with a view to develop tailor-made solutions and strengthen interdisciplinary and cross-sectoral cooperation.
- Select a set of representative European PES cases, including carbon farming cases, with sufficient implementation length and data availability for a holistic impact evaluation.

- Analyse and compare the data for contextualizing results vis-a-vis the existing literature on PES design and implementation, including carbon farming.
- Improve existing and develop new business models to determine the value and possible funding of sustainable forest management, including through the valuation of ecosystem services such as biodiversity, non-wood products, carbon sequestration and storage, clean water supply, soil protection, recreation, health amenities etc.; and develop standardized methods for their valuation where needed with the goal to maximise sustainable benefit across ecosystem services.
- Propose standards for measuring, assessing and valuating ecosystem services in different regional settings, which could lead to more efficient market mechanisms across Europe in support of forest management practices ensuring sustainable use and biodiversity conservation and restoration.
- Promote and provide advice for the set-up of adequate payment schemes through private and public funding instruments at national and EU-level (including the CAP).

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

This topic should involve the effective contribution of SSH disciplines.

Topic ID and title	HORIZON-CL6-2023-CIRCBIO-01-14: Monitoring the multi-functionality of European forests				
Budget	EUR 4 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	F&F				
Keywords	forest management, multifunctionality, database, ecosystem services, monitoring, national forest inventories, remote sensing, harmonised monitoring system, FISE				
FTP comments	Of High importance regarding monitoring system				
FTP SIRA 2030 Challenges addressed	1B – 2B – 3E			FTP relevance	High
				Starting TRL	/
				End TRL	/

Expected Outcome

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

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

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

Scope

In the context of climate change impacts, accelerated biodiversity loss and the need to adjust our socio-economic system to a more sustainable alternative, forests play increasingly a

double role as victim and part of the solution. While their resilience and potential are under threat, they help to mitigate climate change (e.g., through carbon sequestration), and contribute to climate change adaptation (buffering thermal variations or variations in water flows), harbour large parts of terrestrial biodiversity and provide feasible solutions to support the transition to a bioeconomy.

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

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

Proposals will:

- Develop a list of parameters relevant for monitoring of a range of ecosystems services provided by forests.
- Consider the latest scientific knowledge and technology (e.g., through the use of AI, IoT/sensors, robotics and blockchain) for the development, combination, and utilization of reliable data from multiple sources (e.g., national forest inventories, remote sensing, environmental monitoring, large scale societal surveys, national or smaller-scale economic data etc.)
- Assess and propose suitable solutions to make these data available, also by considering issues related to the governance and funding of a fully harmonised monitoring system at EU-level.
- Engage in a structured dialogue with institutions and stakeholders, including the European Commission, national competent authorities, representatives of the forest sector, as well as data providers to align the needs and possibilities of data collection, provision, and use.

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

Proposals may involve financial support to third parties e.g. to primary producers, academic researchers, start-ups, SMEs, data providers, national administrations, and other multidisciplinary actors, to, for instance, develop, test or validate developed applications. A maximum of € 60 000 per third party might be granted. Conditions for third parties support

are set out in Part B of the General Annexes. Consortia need to define the selection process of organisations, for which financial support may be granted. Maximum 20% of the EU funding can be allocated to this purpose. The financial support to third parties can only be provided in the form of grants.

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

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

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

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

Call – Circular economy and bioeconomy sectors 2023 two stage

Enabling a circular economy transition

Topic ID and title	HORIZON-CL6-2023-CIRCBIO-02-2-two-stage: Novel, sustainable and circular bio-based textiles				
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, worldwide²⁶².
- 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 technologies²⁶³ 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.²⁶⁴ 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

Enabling a circular economy transition

Topic ID and title	HORIZON-CL6-2024-CIRC BIO-01-3: Innovative circular solutions for furniture				
Budget	EUR 10 million	Opening date	17 October 2023	Deadline 1	22 February 2024
Budget per project	EUR 5 million			Deadline 2	/
Type of action	Innovation Action (IA)				
FTP subsector	WW				
Keywords	furniture, digitalisation, circularity, waste management, recycling, industrial symbiosis, reuse				
FTP comments	The problem this topic address is: 80% to 90% of the EU furniture waste in MSW is incinerated or sent to landfill, with ~10% recycled. To increase circularity a successful project is expected to develop unorthodox solutions, e.g: AI, robotics, industrial symbiosis and circular design. Wood furniture producers and their value-chain, could surely contribute successfully to the objectives.				
FTP SIRA 2030 Challenges addressed	4	FTP relevance	Medium		
		Starting TRL	/		
		End TRL	6-8		

Expected Outcome

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

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

- Increased deployment and demonstrated benefits of advanced digital solutions (e.g., through AI, robotics, IoT, blockchain) in circular businesses including waste management and recycling
- Emergence of new value chains using upcycled, recycled and/or biobased resources, e.g. through industrial symbiosis, with particular attention to SMEs
- Increased recycling rates and upcycling to new higher-value products
- Increased uptake of recycled and/or renewable material
- Increased deployment and market uptake of circular design, including design for easy maintenance, repair, remanufacturing and recycling
- Increased reuse and refurbishment rates and diffusion of new circular business practices, in particular in the uptake of repair, reuse and refurbishment

- Increased resource efficiency along and across value chains, causing a measurable reduction in GHG emissions, release of microplastics, other environmental pollution, and in the use of hazardous substances, and an increase of carbon removals.

Scope

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

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

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

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

aim at the user. All proposals should therefore address to some extent circular design strategies.

Projects should demonstrate and deploy at large scale innovative solutions and designs for increased quality, non-toxicity and durability of secondary and renewable materials and increased share of secondary and renewable materials in new products. Projects should demonstrate increased recovery, recycling and upcycling rates and a higher uptake of secondary materials for high value applications. Projects should also demonstrate circular business practices, in particular in the uptake of repair and reuse, remanufacture, productservice-systems, and in the full lifetime of products or services. To achieve this, targeted market size, economic feasibility, cost efficiency and social acceptance need to be addressed. To break down the barriers for this transition, it is important that proposals involve and address the different perspectives of all relevant actors, e.g., manufacturers, retailers, consumers and civil society organisations (CSOs). Proposals should consider the use of digital solutions (including technologies such as AI, robotics, IoT and blockchain) and demonstrate their benefits for increased circularity. They should also help produce harmonised and robust methods to assess the amount of recycled content in sectoral products, which is key for a future review of green claims through authorities and consumer organisations. Environmental, social and economic impacts should be assessed from a lifecycle perspective as product, organisation and consumption environmental footprints, using the respective methods developed by the European Commission (Product Environmental Footprint, PEF, should be used for the assessment of the environmental impacts) and through costing methods and a dynamic LCA; relevant data should be fed into the European Platform on Life Cycle Assessment, following the specific Environmental Footprint data and format requirements. The functional performance of technologies and secondary materials can be assessed through the EU Environmental Technology Verification (ETV) scheme. Considering the microplastics and microfiber pollution and hazardous substances that are present in the targeted waste streams, their removal from the materials used for the products in concern as well as from the recovered material is crucial, in addition to applying less-polluting production and consumption procedures. Decontamination levels need to be properly addressed and accumulation prevented. Proposals should fully incorporate the Safe and Sustainable by Design (SSbD) approach. All results should be validated using quantitative indicators and targets wherever possible.

Proposals should also envisage policy recommendations for increased warranty and cascading use. They should also provide for the development of training material to endow workers in this occupational group with the right skillset in order to deploy the new technologies developed. Proposals should consider the development of learning resources for the current and future generations of employees, with the possibility to integrate them

in existing curricula and modules for undergraduate level and lifelong learning programmes. The projects should provide contributions to relevant standards or best practices.

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

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

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

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

Topic ID and title	HORIZON-CL6-2024-CIRC BIO-01-6: Digital information systems for bio-based products				
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	HORIZON-CL6-2024-CIRCBIO-02-1-two-stage: Circular solutions for textile value chains through innovative sorting, recycling, and design for recycling				
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-CIRC BIO: 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	HORIZON-CL6-2024-CIRCBIO-02-4-two-stage: New circular solutions and decentralised approaches for water and wastewater management				
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	HORIZON-CL6-2024-CIRCBIO-02-5-two-stage: Circular design of bio-based processes and products				
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 projects²⁰⁶. 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 projects²⁰⁷, 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	HORIZON-CL6-2024-CIRC BIO-02-6-two-stage: From silos to diversity - small-scale bio-based demonstration pilots				
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	HORIZON-CL6-2023-ZEROPOLLUTION-01-4: Environmental sustainability and circularity criteria for industrial bio-based systems				
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	HORIZON-CL6-2023-ZEROPOLLUTION-01-5: Industrial biotechnology approaches for improved sustainability and output of industrial bio-based processes				
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	HORIZON-CL6-2023-ZEROPOLLUTION-01-7: Strategies to prevent and reduce plastic packaging pollution from the food system				
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	HORIZON-CL6-2023-ZEROPOLLUTION-02-2-two-stage: Safe-and-sustainable-by-design bio-based platform chemicals, additives, materials or products as alternatives				
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

Halting pollution of air, soil and water

Topic ID and title	HORIZON-CL6-2024-ZEROPOLLUTION-01-1: Demonstrating how regions can operate within safe ecological and regional nitrogen and phosphorus boundaries				
Budget	EUR 27 million	Opening date	17 October 2023	Deadline 1	22 February 2024
Budget per project	EUR 9 million			Deadline 2	/
Type of action	Innovation Actions (IA)				
FTP subsector	F&F				
Keywords	phosphor, nitrogen, fertilisers, soil, circularity, regional				
FTP comments	This topic is mostly aiming at local and regional municipalities. However, there is a component of the scope: "Test innovative practices and technologies to make use of secondary raw materials and produce N and P-based fertilisers recovered from organic waste, wastewater, biological residues or by-products and promote local and regional value chains." That with benefit could be the responsibility of participation from forest management technology providers and forest owners/managers.				
FTP SIRA 2030 Challenges addressed	1A, C	FTP relevance		Low	
		Starting TRL		/	
		End TRL		8	

Expected Outcome:

Successful proposals will deliver, to all actors involved in nitrogen (N) and phosphorus (P) emitting activities in a given region, a demonstrated set of measures to limit N/P emissions and re-balance N/P flows within safe ecological boundaries at regional and local scale, thereby contributing to restoring ecosystems in line with the European Green Deal and the EU zero pollution action plan.

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

- Best practice, including technical and governance solutions, to reduce N/P emissions into water, air and soil from all emitting sectors, in line with relevant EU limit values
- Demonstrated environmental, economic and behavioural effects of aforementioned N/P limiting solutions while promoting local and regional sustainability and circular economy schemes
- Comprehensive guidance on sustainable and circular practices to control regional N/P flows at regional level in the EU, and recommendations to relevant actors (policymakers, local administrations, practitioners, industries etc.).

Scope:

Building on recent innovations in regional N/P budgeting and quantification methodologies to ensure good status for air, water and soil ecosystems, this Innovation Action should demonstrate how to apply optimised N/P budgets, based on maximum allowable inputs of N/P at a regional/river basin scale, and create the necessary systemic and multi-actor transition pathways to ensure a sustainable integrated N/P management in the future. The aim is to show how N/P-relevant sectors (e.g., agriculture, aquaculture, forestry, industrial sectors, food/drink sector, water supply, water/waste management, bioenergy, fossil-based energy production, mining activities, transport, unintentional losses through leaching and run-off of agricultural nutrients etc.) in a given region can limit N/P emissions to air, water and soil from their activities by respecting pre-established regional N/P budgets and applying N/P balancing practices. N/P-balancing practices comprise activities that enhance the sustainability and circularity of N/P relevant resources and services between urban/industrial and rural/coastal environments and apply respective governance measures. Finally, it will be essential to develop comprehensive guidelines to disseminate best practices and techniques to all involved actors.

Proposals should:

- Implement a reliable N/P budgeting methodology to identify the maximum allowable input of N/P at regional/river basin scale and ensure good status for air, water and soil ecosystems. N/P budgets should stay within safe ecological and regional boundaries, i.e. by respecting limit values of N/P in air, water and soil, as specified in existing EU legislation 307 or based on recent scientific evidence 308 and complying with the precautionary principle.
- Demonstrate single or integrated region-specific practices in all relevant N/P sectors that help balance emissions from N and P-based fertilisers in agriculture, enhance soil health, reduce eutrophication and water pollution and limit harmful emissions to air.
- Showcase how innovative governance models can contribute to fostering ecologically responsible and sustainable use, recovery and exchange of N/P relevant resources, services and infrastructures between urban/industrial and rural/coastal environments while meeting overarching EU objectives (Farm to Fork and Biodiversity Strategies).
- Test innovative practices and technologies to make use of secondary raw materials and produce N and P-based fertilisers recovered from organic waste, wastewater, biological residues or by-products and promote local and regional value chains.
- Apply novel governance approaches and other incentives supporting practices to limit N/P emissions and develop respective guidelines and recommendations for all

concerned stakeholders (local and regional authorities, municipalities, environmental organisations, farmers and other practitioners industry, civil society etc.), to encourage behavioural change and public acceptance of recovered products as well as more effective problem solving mechanisms while envisaging regional twinning and mentoring schemes.

- Disseminate results and best practice to all stakeholders involved across the EU and Associated Countries, and provide recommendations on the design of harmonised, coherent and efficient regional policies and regulatory instruments that facilitate eliminating and preventing N/P pollution.

Applicants are encouraged to join different regional clusters per project and to diversify their proposed consortia by involving a wide range of relevant stakeholders, such as primary producers and practitioners, local and regional administrations, municipalities, related industries, environment organisations, academia, civil society, citizens, etc.

The projects funded under this topic are expected to build close links and exchange knowledge and information with the Horizon Europe Mission “Restore our Ocean and Waters by 2030”. In particular, they should link to the Mission activities under Objective 2 – “Prevent, minimise and eliminate pollution in marine and freshwater environment”, and to the Mission lighthouse activities in the Mediterranean sea basin focusing on the prevention, reduction and elimination of all kinds of pollution in marine and freshwater ecosystems, including pollution from excess nutrients (phosphorus and nitrogen).

This topic will be part of the demonstration projects for the implementation of the European Commission’s Circular Cities and Regions Initiative (CCRI) and must be carried out in close cooperation with it.

SSH aspects should be included.

Call – Clean environment and zero pollution 2024 two stage

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

Topic ID and title	HORIZON-CL6-2024-ZEROPOLLUTION-02-2-two-stage: Innovative technologies for zero pollution, zero-waste biorefineries				
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 accessorially 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 5: Land, ocean and water for climate action

Reducing greenhouse gas (GHG) emissions and increasing carbon sinks in primary production and natural systems as well as in harvested wood products and other carbon storage products are key components of the European Green Deal³⁴⁵. Achieving sustainable ocean, water and land management, and using natural resources efficiently to help mitigate climate change implies finding the right balance between productivity, climate, biodiversity and environmental goals in the agriculture and forestry sectors, with a long-term perspective. R&I activities will support **solutions for climate and environmentally friendly practices** to reduce emissions of major greenhouse gases, other pollutants and the environmental impact of ocean and land use changes and agricultural activities. R&I will rely on the application of digital technologies where relevant.

The **EU climate law** states that to reach 2030 and 2050 climate targets and to restore biodiversity, the EU needs to immediately and decisively restore and increase its natural carbon sinks. In 2021, the Commission proposed to amend **Regulation (EU) 2018/841 for land use, forestry, and agriculture** by setting an increased EU target for net removals of 310 MtCO₂eq by 2030 and allocating targets for each Member State. The proposal also includes the aim to reach climate-neutrality in the entire land sector by 2035, namely that carbon removals should balance the greenhouse gas emissions from land use, livestock and fertiliser use. At the end of 2021, the Commission published a **communication on sustainable carbon cycles**, including **carbon farming** and **certification of carbon removals**. R&I, new technologies and business models are expected to unlock the full potential of land use, land-use change and forestry (LULUCF) activities in the mitigation of climate change.

Carbon farming will be implemented in line with the communication on sustainable carbon cycles and related documentation. R&I activities under this destination, and in the work programme of the mission 'A Soil Deal for Europe' will **help coordinate** the research community and key stakeholders in **developing, testing and demonstrating carbon farming practices and in certifying carbon removals**. Results of funded activities will help in managing land and forests and in delivering of multiple services provided by agricultural land and forests, such as: i) the provision of goods and long-term carbon storage in harvested wood products, ii) protection of soils, water and biodiversity; and iii) mitigation of and adaptation to climate change.

Specific attention will be given to paludiculture, complementing the activities of Cluster 5 in the 2021/2022 work programme. R&I activities will help increase soil organic carbon, protect carbon-rich soils (e.g. grasslands and peatlands), restore peatlands and wetlands, and improve advisory services for land managers. Together with the work programme for the

mission 'A Soil Deal for Europe', R&I activities will aim to reduce the financial burden resulting from the costs of management practices in carbon farming and the uncertainty about revenue possibilities. In the livestock sector, R&I on manure management will help **implement the EU methane strategy**. R&I activities will also boost the contribution made by a forest **as a natural and man-made carbon sink** and maintain multiple ecosystem services (e.g., water replenishment, soil protection), as proposed in the **Fit for 55** package with the revised LULUCF Regulation and the new **EU forest strategy**.

Strengthening the **nexus between the ocean and climate change** is a priority for the EU. There is growing political awareness of the importance of ocean and polar regions as integral parts of the Earth's climate system and of the need to ensure the integrity and resilience of these vulnerable ecosystems in the context of climate change. The main outcomes expected are an improved understanding of the ocean's role in the Earth's climate system, resulting in the closing of the research gaps on ocean essential climate variables and improved ocean models for seasonal to decadal forecasting at local and regional scales. This in turn will support decision-making aimed at preserving the integrity of the ocean and aquatic ecosystems and the polar Regions, through a better understanding of the drivers of change and of emerging threats, including tipping points. The ocean is also a large storage system for the global reservoirs of climate-regulating factors, particularly carbon. R&I will advance knowledge innovations to develop ocean-based solutions/mitigation options, helping to close the emissions gap and stop ocean acidification and prevent the consequent biodiversity losses.

The following blue carbon ecosystem developments could be envisaged:

- more knowledge about identifying regions at risk;
- exploring, preserving, restoring or even creating new natural habitats, and providing solutions to strengthen resilience and protection of EU coastal areas against climate change;
- more knowledge and data on blue carbon quantification;
- consider nature-based solutions for carbon farming, e.g. on coastal wetlands, as well as seaweed and mollusc aquaculture.

Biodiversity protection plays an important role in all approaches for mitigation in ecosystems and Nature-based Solutions (NBS) are highly important in this context, providing further environmental, social and economic benefits. Building on the political momentum gained at COP25 where the ocean was identified as a priority, and on the latest developments at COP26, science on the climate and the ocean nexus developed under the Horizon Europe programme will contribute to and inform the dialogue under the United Nations Framework Convention on Climate Change (**UNFCCC**) on the ocean and climate change.

Other major contributions include: i) providing new scientific knowledge on polar regions for the **EU Arctic policy**; ii) supporting the new policy initiative on **sustainable blue economy** and its offshoot initiatives as well as implementing the **Marine Strategy and Water Framework Directives**; and iii) helping to achieve the **clean planet for all's** aim of neutralising all major threats to the health of the planetary ecosystem.

In line with the **climate adaptation strategy**, climate action also calls for ecosystems, primary production, food systems and the bioeconomy to adapt to climate change. Climate change is exacerbating existing risks to livelihoods, biodiversity, human and ecosystem health, infrastructure and food systems. Human activities relying on the availability and use of clean water are particularly affected by variable and extreme weather events, which may also lead to desertification. Agriculture and forestry in the EU are vulnerable to climate change. Specifically, there is growing evidence about the effects of climate change and extreme weather events, which need to be mitigated, on agricultural production, crop yields, and also on the forest sector.

In the area of forestry, R&I will improve knowledge on the interactions and interdependencies between biodiversity and climate change, and identify win-win management strategies, also addressing trade-offs in a sustainable manner. Marine and coastal areas are also threatened by the rise in sea level, saline water intrusion, biodiversity loss, ocean acidification, extreme events and a shrinking cryosphere. R&I will, therefore, be critical to stepping up adaptation and building resilience in agriculture, forestry, and activities in marine and coastal areas. They will aim to deliver on the urgent need to step up the adaptation of primary production, notably by providing farmers and other actors in bioeconomy value chains with better-adapted crop varieties and animal breeds with lower impacts on the related ecosystems.

R&I efforts are critical to avoiding, reducing and reversing desertification. They are also critical to delivering sustainable nature-based solutions that will also i) increase carbon sequestration, natural water retention, biodiversity conservation and restoration, ii) strengthen coastal protection, iii) reduce the risks of algal blooms and iv) offer ecotourism opportunities. Water adaptation strategies and approaches will be developed and tested. In this context, the innovation potential for a wide range of alternative water solutions (rainwater harvesting, storm water collection, water reuse and reclamation, brackish and sea water desalination, aquifer recharge, etc.) to be used for avoiding possible negative environmental impacts will be assessed and the European partnership for ensuring water security for the planet will be further supported. Potential trade-offs, and measures to mitigate and avoid them, will be assessed to ensure environmental sustainability and to keep the objectives of improving soil fertility, increasing carbon storage in soils and biomass to

support benefitting agricultural productivity and food security and reduce biodiversity loss. R&I will also aim at providing a better understanding of how institutions and behaviour shape vulnerability and offer opportunities for adaptation.

Expected outcomes include, by means of international cooperation, collaborative research on joint adaptation, mitigation and biodiversity reporting and monitoring of land contributing to the overall areas targeted in Cluster 6.

Expected impacts

Proposals for topics under this destination should set out credible pathways that contribute to **climate action on land - including forestland, grassland, cropland and wetland - as well as on oceans and water** and more specifically to one or several of the following impacts:

- better understanding and strengthening of the mitigation potential of ecosystems and sectors based on the sustainable management of natural resources;
- advancement of science and technology to support the **adaptation and resilience of natural and managed ecosystems**, on land, in the ocean, in water and soil systems as well as economic sectors in the context of the changing climate, including interaction with drivers of biodiversity change and zero pollution;
- efficient monitoring, assessment, modelling and data-driven decision-making support systems and projections related to **climate change impacts, mitigation and adaptation potential** in order to derive solutions for tackling existing and emerging threats and support decision-making in climate change mitigation and adaptation policies at European and global levels, including through the use of AI and other digital solutions;
- increased **climate change mitigation in the primary sectors**, including by means of reducing their GHG emissions and other pollutants, maintaining **natural and man-made carbon sinks** and increasing uptake and storage of carbon in ecosystems, taking into account trade-offs with regard to ecosystems;
- improved **capacity to climate change** of the ocean, sea, water and soil systems and related sectors to adapt to climate change, including by means of unlocking the potential of nature-based solutions;
- **sustainable management of scarce resources**, in particular soils and water, therefore mitigating climate related risks, especially desertification and erosion, thanks to informed decision-makers and stakeholders and the integration of adaptation measures in relevant EU policies.

Call – Land, ocean and water for climate action 2024

Topic ID and title	HORIZON-CL6-2024-CLIMATE-01-4: Land use change and local / regional climate				
Budget	EUR 12 million	Opening date	17 October 2023	Deadline 1	22 February 2024
Budget per project	EUR 6 million			Deadline 2	/
Type of action	Research and Innovation Actions (RIA)				
FTP subsector	F&F				
Keywords	LULUCF policy, land use, afforestation, agro-forestry				
FTP comments	The topic aim to support a better understanding of the relationships between the EU Land-use, land-use-change and forestry and local and regional strategies that deal with climate change mitigation and biodiversity. As a policy support instrument, it is highly relevant to forestry. The impact will be indirect of the call on the forest-based sector will however be indirect.				
FTP SIRA 2030 Challenges addressed	1 – 3C, D			FTP relevance	Medium
				Starting TRL	/
				End TRL	/

Expected Outcome:

Project implementation is expected to contribute to mitigation of and adaptation to climate change and to help achieve climate-neutrality in the land-use sector by 2035 (combining net removals from Land Use, Land Use Change and Forestry with biogenic emissions from agriculture) and climate neutrality of all sectors by 2050.

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

- Solutions are made available for understanding, modelling and optimising the relationships between net removals from Land Use, Land Use Change and Forestry (LULUCF) and biogenic emissions from the agriculture sector at local / regional level;
- Strategies are developed at local and regional level to deal with impacts of climate change and to maximise co-benefits for other objectives, including biodiversity protection.

Scope:

The conservation and enhancement of Earth’s natural terrestrial carbon sinks such as soils and plants in forests, on farmed lands as well as peatlands and wetlands is crucial. The European Green Deal and EU sectoral policies such as the common agricultural policy give research and innovation (R&I) a significant role to play in supporting the design and implementation of policies that will ensure the achievement of the EU’s climate objectives.

Project activities should:

- Analyse, model and project impact of past, present and future land use and land use change on the local and regional evolution of the climate;
- Develop strategies for policy-making to mitigate adverse evolutions of climate at the regional/landscape level, including with regard to trade-offs between different objectives (climate change mitigation and adaptation, food and biomass production, biodiversity protection);
- Propose solutions for improved land management, making use of afforestation, integrated land use change and management practices (e.g. hedges, agro-forestry), extensivisation and rewetting of organic soils, improved forest management and better use of biomass for long-lasting wood products, more efficient use of fertilisers, dietary changes, etc.;
- Include dedicated tasks and appropriate resources to collaborate with other projects financed under this topic as well as with projects under Destination 1, “Climate sciences and responses for the transformation towards climate neutrality”, of Horizon Europe Cluster 5, “Climate, Energy and Mobility”, and with relevant projects under the Missions “Adaptation to Climate Change” and “A Soil Deal for Europe”.

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	HORIZON-CL6-2024-CLIMATE-01-5: Climate-smart use of wood in the construction sector to support the New European Bauhaus				
Budget	EUR 14 million	Opening date	17 October 2023	Deadline 1	22 February 2024
Budget per project	EUR 7 million			Deadline 2	/
Type of action	Research and Innovation Actions (RIA)				
FTP subsector	WW				
Keywords	wood in construction, New European Bauhaus, hardwood, damage wood, circularity, Internet of Things IoT, AI, robotics, healthy living, reuse, recycling, renovation, deconstructivity, multi-story wood buildings				
FTP comments	This topic is highly relevant to the woodworking industries and mentions for instance: "Pathways for an efficient conversion of solid biomass into forms of long-term carbon storage". It will support the New European Bauhaus initiative.				
FTP SIRA 2030 Challenges addressed	8	FTP relevance	High		
		Starting TRL	/		
		End TRL	/		

Expected Outcome

This topic will support the New European Bauhaus initiative and the implementation of the new EU forest strategy by making the construction sector more renewable and circular especially for existing buildings, which includes the use of currently underused timber such as hardwoods, salvage wood and post-consumer wood for traditional and newly emerging innovative woody biomass-based applications, while including circularity as part of a broader system and design loop.

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

- Enhanced contribution of the forest-based sector with respect to climate change mitigation and adaptation, a toxic-free environment and rural development objectives.
- Pathways for an efficient conversion of solid biomass into forms of long-term carbon storage.
- Enhanced contribution of the forest-based sector to decarbonisation strategies for buildings, both in terms of operational emissions, embodied emissions, and carbon removals, in relation to the Energy Performance of Buildings Directive, the Renovation Wave Strategy, the Construction Products Regulation and other EU policies on buildings.
- A robust and transparent methodology to quantify the climate benefits of wood construction products and other building materials, reflecting the most advanced dynamic life-cycle analyses and in view of contributing to the carbon farming initiative and carbon removal certification.

- Increased resource efficiency and minimisation of environmental footprint.
- Better knowledge about the quantitative limits of global wood supply and the limits of wood as a resource.

Scope

Wood materials remain considerably under-utilised in the construction sector despite their durability and appreciation by end users. At the same time, there is a need for making the construction sector more renewable and circular, which includes the use of currently underused timber such as hardwoods, damage wood and post-consumer wood, while including circularity as part of a broader system and design loop. This requires new raw material sources, technologies, and designs for wood components, specified products and for wooden buildings. Buildings need also to be adapted to climate change, including as regards summer and winter thermic performance.

Proposals will:

- Analyse the potential market and new technologies (such as the use of AI, IoT sensors or robotics) as well as processes for the utilisation of hardwoods, low quality, damage, and post-consumer wood in the construction sector, including for the refurbishment of buildings.
- Explore the potential of zero-waste concepts by developing solutions for each source type to turn into viable products as elements and as whole buildings in the wood construction sector.
- Design wood building blueprints based on these products and other underutilised biobased materials, taking into account the reuse, adaptability and healthy living environment (e.g. avoidance of hazardous substances) into the design.
- Study and integrate human health and wellbeing aspects, as well as the cultural traditions of local crafts and design languages, as integral elements of the built space.
- Analyse and propose systems to overcome technical, logistical, legal, business, political, economic, knowledge and social barriers, challenges and opportunities and derive integrated policy recommendations and business strategies for enlarging the wood construction sector in Europe.
- Include the reuse, recycling, renovation and deconstructivity into product and building design concepts.
- Develop robust, transparent and cost-effective methodologies to quantify the carbon removal benefits of key wood construction products and other building materials.
- Develop roadmaps to mainstreaming multi-story wood buildings in Europe, which are the main market segment in living and commercial/office spaces in cities.

- Engage with relevant stakeholder in co-creation processes (e.g., the New European Bauhaus Community of Partners, policy, architects, business, insurance, investment, society, public and private sector).
- Link with other selected proposals and the NEB Lab and establish an open-access wood construction observatory in Europe, to monitor and update progress, statistics, good practice guidelines and solutions on wood construction.
- Address policy frameworks and standards that are still hindering innovation and further market development, as well international production norms and standards for assessing the ecological effects, climate adaptation and climate footprint of buildings which do not account for all benefits of wood.

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

This topic should involve the effective contribution of SSH disciplines and capitalise on previous research results (e.g., BASAJAUN, Build-in-Wood, etc.), as well as the results of the LIFE Strategic Projects from the LIFE Circular Economy and LIFE Quality and Climate Action Sub-programmes.

Proposals are encouraged to/should consider social innovation when the solutions is at the socio-technical interface and requires social change, new social practices, social ownership or market uptake.

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.

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 Statement³⁸⁴ 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 Commission³⁸⁵ 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 knowledge³⁸⁷ 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	HORIZON-CL6-2024-COMMUNITIES-02-1-two-stage: Innovating for climate-neutral rural communities by 2050				
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	HORIZON-CL6-2023-GOVERNANCE-01-5: Revitalisation of European local (rural / peri-urban) communities with innovative bio-based business models and social innovation				
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	HORIZON-CL6-2023-GOVERNANCE-01-7: Integrated assessment of land use and biomass demands to contribute to a sustainable healthy and fair bioeconomy				
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.

Deploying and adding value to Environmental Observations

Topic ID and title	HORIZON-CL6-2023-GOVERNANCE-01-12: Empowering citizens to monitor, report and act in partnership with relevant public authorities to protect their environment in the context of environmental compliance assurance				
Budget	EUR 7 million	Opening date	22 December 2022	Deadline 1	23 March 2023
Budget per project	EUR 7 million			Deadline 2	/
Type of action	Research and Innovation Actions (RIA)				
FTP subsector	F&F				
Keywords	citizens, public authorities, monitoring, data				
FTP comments	It is not fully obvious who the potential applicant for this topic is but it deals with engaging citizens in monitoring and protecting the environment, including forests				
FTP SIRA 2030 Challenges addressed	1E	FTP relevance		Indirect	
		Starting TRL		/	
		End TRL		/	

Expected Outcome:

A successful proposal will be contributing to the wide deployment of, and adding value to, environmental observations for ‘environmental compliance assurance’ by empowering citizens⁴²⁶ to promote, monitor, and act in partnership with relevant public authorities, thus contributing to the European Green Deal objectives (in particular to zero pollution, protecting biodiversity and preventing deforestation).

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

- An increase in empowered citizens, communities and intermediaries that are equipped with guidance and tools to act on protecting their environment and increase awareness among citizens of environmental compliance;
- More relevant (*in-situ*) datasets and information, to be used in the context of policy shaping and the use of geospatial intelligence for environmental compliance assurance;
- Tested FAIR data governance and management mechanisms that enable the sharing, community validation and use of citizen generated data and information in combination with authoritative data and information as part of the European Green Deal Data Space;
- Better/larger engagement of citizens and communities with regional and local authorities to develop local actions for green and digital transformation (e.g., via the Living Labs for green digital solutions) as well as Living Labs established in Missions, Partnerships and other initiatives.

Scope:

Successful proposals are expected to support citizen engagement in particular by encouraging the validation and uptake of citizen observations by relevant public authorities for environmental compliance assurance. This includes the establishment of trusted data governance approaches in the context of the European Green Deal Data Space and, where possible, creating synergies with the citizen science development efforts of the Destination Earth initiative, and with the European Open Science Cloud (EOSC) European Partnership.

Capacity building for citizens, communities and intermediaries (training the trainer) to collect data and monitor their environment in addition to the data and information collected by other means of observation (statutory reporting, space-based, airborne, etc.), should be part of the proposal (e.g., through online or local learning and training modules), as well as awareness raising activities on environmental compliance assurance.

Digital and data technologies as key enablers

Topic ID and title	HORIZON-CL6-2023-GOVERNANCE-01-15: Digitalisation in agriculture and forestry: markets for data, and digital technologies and infrastructure – state of play and foresight in a fast changing regulatory, trade and technical environment				
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 Innovation Actions (RIA)				
FTP subsector	F&F				
Keywords	forestry, digitalisation, markets development, data sharing, transparency, agriculture				
FTP comments	This topic is highly relevant and targets the digitalisation of agriculture and forestry, including their downstream value chains				
FTP SIRA 2030 Challenges addressed	2B, C, D	FTP relevance		High	
		Starting TRL		/	
		End TRL		3-5	

Expected Outcome

In line with the European Green Deal, the farm to fork strategy in particular, and the headline ambition of a Digital Age, a successful proposal will support the capacities to understand and forecast the development of markets and the use of data and digital technologies in agriculture and forestry, particularly through the development of innovative assessment and modelling approaches. It will therefore support decreasing the risk of investing into digital infrastructure, and indirectly contribute to the enhancement of the sustainability performance and competitiveness in agriculture through further deployment of digital and data technologies as key enablers, and to the development of innovative governance models.

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

- Analyses of global markets through innovative approaches including trends, potential barriers and risks associated with investments in data, digital and data technologies in the agriculture and forestry sectors.
- Increased transparency in data sharing and in the markets for digital and data technologies in the agricultural and forestry sectors in support of healthy competition.
- Contribution to an increased uptake of digital and data technologies in agriculture and forestry including through reduced investment risks; this is expected to indirectly contribute to an increase in environmental and economic performance of the sectors through increased and enhanced used of data, and digital and data technologies.
- Strengthened policy-making and -monitoring and foresight capacities.

Scope

The potential of digital and data technologies in the agricultural and forestry sectors to enhance their sustainability and economic performance and working conditions has been acknowledged. The uptake of digital technologies in the sectors and the development of supplementing data- and data-technology-based solutions in the EU are increasing. However, there is hardly comprehensive, independently collected data about the actual uptake and use of digital technologies by farmers and foresters, about the trade of sector-related data and digital technologies, and about the extent and structure of the provision of digital and data services in the agricultural and forestry supply chains, which are of global outreach.

At the same time, policies and the regulatory framework directly or indirectly influencing the deployment of digital and data technologies in the EU are evolving in a fast pace and will continue to do so. Also trade regimes are continuously changing. For stakeholder in the agricultural, forestry and the digital sectors to invest in digital and data technologies, it is important to be able to assess the possible implications of changing regulatory and market conditions on the development, purchase and use of data, and digital and data technologies. This is also supported by an increase in information on markets and related actor networks, and of the storage and the flows of goods and data, through increased transparency and strengthened the consumers` / users` position. Such information as well as capacities in modelling and in carrying out foresight analyses for the development of markets and of the situation in the agricultural sector is also one pre-requisite for tailored policy-making.

Fostering the provision of insights into markets of data, and digital and data technologies in the agricultural and forestry sectors, the proposals should address the following:

- Development of innovative approaches to assess the uptake of digital technologies and digital infrastructure (incl. platforms) in the agricultural sector globally with special attention to the situation in the EU and associated countries.
- Development of innovative approaches to forecast the markets of data, digital technologies and digital infrastructure (including platforms) and the uptake of digital technologies globally with special attention to the situation in the EU under consideration of fast-changing regulatory framing conditions in the fields of data-, digital and machinery technologies and of agricultural policies.
- Demonstration of the qualitative and quantitative implications for the use of digital and data technologies by farmers, foresters and other actors along the supply chains in a way that demonstration results can be steadily adapted to changing framing conditions. Demonstrations should allow for the reflection of scenarios and provide input to policymaking.

Project(s) are expected to consider innovation in digital technologies brought onto the market during the life-time of the project. It is expected that the project(s) are working with targeted stakeholders, including farmers, agri-businesses, farm advisors, policymakers etc. to test demonstration and communication tools.

For the assessment of the uptake of digital technologies by farmers, statistical approaches evolving in the EU are to be considered, if applicable; assessment approaches may vary between continents.

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	HORIZON-CL6-2023-GOVERNANCE-01-16: Digital technologies supporting plant health early detection, territory surveillance and phytosanitary measures				
Budget	EUR 10 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				
Keywords	plant health, pests, remote sensing, monitoring, insect traps, internet of things (IoT), robotics, Copernicus, Galileo/EGNOS, GEOSS				
FTP comments	The topic focus on agriculture but it could for instance support better monitoring of bark beetle infestations and similar pest outbreaks affecting forestry.				
FTP SIRA 2030 Challenges addressed	1B – 2B			FTP relevance	Low
				Starting TRL	/
				End TRL	/

Expected Outcome

In line with the objectives of the biodiversity and farm to fork strategies, a successful proposal will contribute to transition to fair, healthy and resilient agriculture and forestry, notably the target to reduce by 50% the overall use and risk of chemical pesticides. Proposals will support Regulation (EU) 2016/2031 on protective measures against plant pests.

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

- Increase the availability of large-scale and robust plant scanning methods to monitor plant pests, to assist territorial surveillance and help with timely eradication or optimisation of containment measures;
- Enhance innovative and cost-efficient integration of methods, including remote sensing and networks of traps that are available for surveillance of EU regulated plant pests affecting agriculture, forestry, other activities and areas (e.g., urban areas);
- Strengthen capacities to prevent entry and spread and to monitor EU regulated plant pests and support plant health territorial surveillance;
- Foster transdisciplinary cooperation in the fields of plant health, environmental sciences and earth observation.
- Support relevant EU and Associated Countries' plant health policies.

Scope

Pest monitoring is typically performed through costly and time-consuming on-site visits, resulting in certain cases in limited spatial and temporal resolution. Consequently, there is a need for more cost-effective approaches to detect and discriminate infested plants and/or trees at large spatial scales and within reasonable time frames. The advent of new

technology in remote sensing, sensor technologies, robotics, remotely piloted aerial systems (RPAS), the internet of things (IoT), and artificial intelligence (AI), opens opportunities for monitoring continuously, more widely, and remotely. These technologies have the potential to guide and help to target on site surveillance and early detection activities and other phytosanitary measures.

Proposals should:

- Develop and test early detection strategies by exploiting digital technologies, e.g., networks of sensors and remote sensing, to improve the surveillance efforts and the delimitation of affected areas by regulated pests allowing a regular and rapid monitoring of large areas that might be difficult to reach;
- Enhance and optimize the use of insect traps in a network setting for an IoT approach;
- Develop user-friendly and accessible tools or methods, including through the use of robotics to monitor a suite of known stress-processes in plants (chlorosis, changes in fluorescence, loss of transportation, etc.) that can be used in plant pest detection and/or to monitor occurrence of pests;
- Contribute to disentangle biotic and abiotic stresses, enabling the early detection of pests, by pushing further the current (and the new generation of satellite missions, e.g., FLEX) capabilities of remote sensing (measurements taken by hand-held, towers, drones, and satellite data), AI, and other digital strategies;
- Collect standardised and comprehensive data (e.g., field observations, laboratory measurements, remotely sensed data, etc.) that contribute to monitor plant health and pests and to develop an early warning surveillance system;
- Assess the cost-benefits of the proposed methods;
- Integrate citizen science as a tool to monitor pests, developing robust methods to use its data for systematic analysis, and increasing public and stakeholder engagement.

Proposals should identify common standards and common indicators to collect data, as well as interoperability and metadata standards. Proposals should develop recommendations on how to make the best use and scale up digital technologies for plant pests early detection and territorial surveillance applications.

Proposals must implement the ‘multi-actor approach’ including a range of actors to ensure that knowledge and needs from various sectors such as research, plant health services, farming/forestry sectors, other relevant authorities, and industry are brought together.

Proposals should build on the results of relevant projects funded under Horizon 2020. Proposals should specify how they plan to collaborate with other proposals selected under this and, if feasible, with other relevant topics, e.g., by undertaking joint activities, workshops

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

If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS. Other data and services may be used in addition. All in-situ data collected through actions funded from this call should follow INSPIRE principles and be available through open access repositories supported by the European Commission (Copernicus, GEOSS).

This topic is part of a coordination initiative between ESA FutureEO programme for agriculture and the EC on Earth System Science. Applicants are encouraged to coordinate with the relevant ESA projects and in particular those of the ESA Agriculture Science Cluster Activities (agriculturesciencecluster.esa.int) in their proposals. Where relevant, creating links and using the information and data of the European Earth observation programme Copernicus are encouraged.

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

Call – Innovative governance, environmental observations and digital solutions in support of the Green Deal 2024

Strengthening agricultural knowledge and innovation systems (AKIS)

Topic ID and title	HORIZON-CL6-2024-GOVERNANCE-01-11: Biodiversity thematic networks to compile and share knowledge ready for practice				
Budget	EUR 3 million	Opening date	17 October 2023	Deadline 1	28 February 2024
Budget per project	EUR 3 million			Deadline 2	/
Type of action	Coordination and Support Actions (CSA)				
FTP subsector	F&F				
Keywords	biodiversity, knowledge sharing, best practices, incentives, Birds and Habitats Directives, EIP-AGRI				
FTP comments	A topic in support of the EU Common Agricultural Policy (CAP) and AKIS but also invite foresters to engage				
FTP SIRA 2030 Challenges addressed	1A – 3E	FTP relevance	Medium		
		Starting TRL	/		
		End TRL	/		

Expected Outcome:

In support of the European Green Deal, the EU climate policy, the common agricultural policy (CAP) and the farm to fork strategy objectives and targets, the successful proposals will focus on knowledge sharing in a language that is easy to understand and targeted to farmers and foresters. They will address the necessity of primary producers for impartial and tailored knowledge on the management choices related to the needs, challenges or opportunities they experience. They will also speed up innovation and the uptake of results, and will be key to improving sustainability. They will contribute to effective Agriculture Knowledge and Innovation Systems (AKIS), thereby adding value to the knowledge and cost-effectiveness of innovative practices and techniques in and across primary production sectors, food and bioeconomy systems, and lead to more informed and engaged stakeholders and users of project results.

Despite the continued funding of scientific projects, new knowledge, innovative ideas and methods from practice are not shared and adopted. Often the research findings are not integrated into agricultural and forestry practice. Proposals, acting at EU level to remedy this situation, are essential because national and sectoral AKISs are insufficiently connected and organised to fully meet the challenge of intensifying thematic cooperation between researchers, advisors and farmers/foresters. This exchange of knowledge will foster economically viable and sustainable agriculture and forestry and build trust between the main AKIS actors.

Project results are expected to contribute to the following outcomes:

- Support the implementation of the cross-cutting objective of modernising the sector by fostering and sharing of knowledge, innovation and digitalisation in agriculture and rural areas, and encouraging their uptake⁴⁹⁹, as well as European Green Deal and Farm to Fork objectives.
- Collection and distribution of easily accessible practice-oriented knowledge on the thematic area chosen, in particular the existing best practices and research findings that are ready to be put into practice.
- Maintenance of the practical knowledge for the long-term – beyond the project period – in particular by using the main trusted dissemination channels that farmers/foresters most often consult.
- Increased flow of practical information between farmers/foresters in the EU in a geographically balanced way, creating spill-overs and taking account of the differences between territories.
- Greater user acceptance of collected solutions and a more intensive dissemination of existing knowledge, by connecting actors, policies, projects and instruments to speed up innovation and promote the faster and wider co-creation and transposition of innovative solutions into practice.

Scope:

Proposals should address the following activities:

- Tackle the most urgent needs of farmers and/or foresters related to biodiversity, including those relevant for climate change mitigation and adaptation, by summarising, sharing and presenting - in a language that is easy to understand and is targeted to farmers and foresters – the existing best practices and research findings that are ready to be put into practice, but not sufficiently known or used by practitioners. The specific objectives of the networks can be chosen in a 'bottom-up' way on condition that they tackle biodiversity issues.
- The network should cover at least the following aspects:
 - Incentives from farmers and foresters to improve biodiversity on farms/forests or across farms/forests in a collaborative way
 - EU requirements for biodiversity protection in agricultural and forest areas (Birds and Habitats Directives).

- Compile a comprehensive description of the state of current farming practices on biodiversity, including those relevant for climate mitigation or adaptation, to explain the added value of the proposal and the relevance of the theme.
- Proposals should focus on the cost/benefit aspects of the practices collected and summarised, and clarify how the project avoids duplication with ongoing or completed projects and networks.
- Deliver an extensive range of useful, applicable and appealing end-user material for farmers and foresters. This info should be easy to access and understand, making use of audio-visual material wherever possible, including also materials serving education and training;
- This range of material should feed into the existing dissemination channels most consulted by farmers and foresters in their countries.
- As many “practice abstracts” in the common EIP-AGRI format as possible, as well as other type of materials should be provided to the European Innovation Partnership (EIP-AGRI) 'Agricultural Productivity and Sustainability', as well as to national/regional/local AKIS channels and to the EU-wide interactive knowledge reservoir (HORIZON-CL6-2021-GOVERNANCE-01-24);
- Besides giving the details on the EIP Operational Groups whose involvement is strongly recommended⁵⁴⁰, wherever possible and relevant to biodiversity, provide also details on how further synergies will be built with future EIP Operational Groups and interactive innovation groups operating in the context of the EIP-AGRI.
- Proposals must implement the 'multi-actor approach', with a consortium based on a balanced mix of actors with complementary knowledge clearly building on farmers/foresters, farmers' groups and advisors; and run for a minimum of 3 years.
- In order to better reach and capture knowledge from the targeted farmers/foresters, the networks may organise 'cross-fertilisation' through sub-networks covering, for example, a region, a language or a production system.

Topic ID and title	HORIZON-CL6-2024-GOVERNANCE-01-12: Developing EU advisory networks on forestry				
Budget	EUR 4 million	Opening date	17 October 2023	Deadline 1	28 February 2024
Budget per project	EUR 4 million			Deadline 2	/
Type of action	Coordination and Support Actions (CSA)				
FTP subsector	F&F				
Keywords	forestry policy, EU advisory network, EU Forest Strategy, CAP, sustainable forest management, EIP-AGRI				
FTP comments	the successful proposal will focus on advisor exchanges across the EU to increase the speed of knowledge creation and sharing, capacity building, of demonstration of innovative solutions, as well as helping to bring them into practice, accelerating the necessary transitions				
FTP SIRA 2030 Challenges addressed	3E			FTP relevance	High
				Starting TRL	/
				End TRL	/

Expected Outcome:

In support of the European Green Deal, the EU climate policy, common agricultural policy (CAP) and new EU forestry strategy objectives, the successful proposal will focus on advisor exchanges across the EU to increase the speed of knowledge creation and sharing, capacity building, of demonstration of innovative solutions, as well as helping to bring them into practice, accelerating the necessary transitions. Agricultural Knowledge and Innovation Systems (AKIS) in which advisors are fully integrated are key drivers to speed up innovation and the uptake of research results by farmers.

Transformative changes such as the changes required within the European Green Deal are dynamic processes that require appropriate governance of AKIS actors. Advisors are key actors with a role in providing strong guidance and with a big influence over producers' decisions. A novelty in the post-2020 CAP plans⁵⁰² is that advisors now must be integrated within the Member States' AKIS, and that the scope of their actions has become much broader. They must now be able to cover economic, environmental and social domains, as well as be up-to-date on science and technology. They should be able to translate this knowledge into opportunities, and use and adapt this knowledge to specific local circumstances. This specific topic focuses on the important role advisors can play related to more sustainable forestry in the future.

Project results are expected to contribute to the following outcomes:

- Progress towards the most urgent policy objectives linked to Cluster 6, as well as the European Green Deal, and in particular the new EU Forestry Strategy and the new CAP, with a view to improve sustainability of forestry, help raise awareness and tackle societal challenges;

- Support to the CAP cross-cutting objective of modernising the sector by fostering and sharing of knowledge, innovation and digitalisation, and encouraging their uptake;
- Development of interaction with regional policymakers and of a potential EU network to discuss institutional challenges to practical forestry issues, such as bottlenecks, lock-ins, political inertia, ambiguous regulations, inequality between Member States and power imbalances;
- Production of supporting services and materials, including knowledge networks and peer-to-peer counselling, master classes, advice modules, communication and education materials, effective business models, etc. to facilitate the upscaling of sustainable forest management;
- Acceleration of the introduction, spread and implementation in practice of innovative solutions related to forestry, in particular by:
 - creating added value by better linking research, education, advisors and foresters, and encouraging the wider use of available knowledge across the EU;
 - learning from innovation actors and projects, resulting in faster sharing and implementation of ready-to-use innovative solutions, spreading them to practitioners and communicating to the scientific community the bottom-up research needs of practice.

Scope:

Proposals should address the following activities:

- Connect advisors possessing a broad and extensive network of foresters across all EU Member States in an EU advisory network dedicated to forestry, including forestry techniques which support a higher level of sustainability, with a view to sharing experiences on how to best tackle the issues, building on the outcomes of the EIP-AGRI Focus Groups and Workshops as well as the Horizon 2020 Thematic Networks related to forestry.
- Share effective and novel approaches among the EU advisory network on forestry, which are sustainable in terms of economic, environmental and social aspects.
- Fill gaps on emerging advisory topics beyond the classical sectoral advice, which is useful in particular in relation with the new obligation for Member States to integrate advisors within their AKIS and who must cover a much broader scope than in the past.
- Provide overall support related to knowledge creation, organisation and sharing.
- Take strong account of cost-benefit elements. Collect and document good examples in this regard, connecting with foresters and other actors across related value chains in Member States to be able to take into account financial aspects and local conditions. Select the best practices, learn about the key success factors, possible

quick wins and make them available for (local) exploitation, to ensure financial wins for producers, citizens and intermediate actors.

- Integrate the advisors of the EU forestry network into their Member State AKIS as much as possible. They should encourage as innovation brokers innovative projects on forestry in EIP Operational Groups. They should give hands-on training to foresters and local advisors, lead national thematic and learning networks on the subject, deliver and implement action plans to make forestry more sustainable, connect with education and ensure broad communication, support peer-to-peer consulting, develop on-farm demonstrations and demo films distributed widely via social media, and provide specific back-office support for generalist advisors within the national/regional AKIS.
- Explore if the activities of the EU advisory network on forestry can be scaled up at the level of a number of Member States under a cooperative format. Wherever possible, develop digital advisory tools for common use across the EU. Determine whether common tools can be created to incentivise the implementation of the learnings from this project.
- Include all 27 EU Member States in the EU advisory network, using local AKIS connections which can more accurately interpret the national/regional contexts to help develop the best solutions for that Member State or region. Use the support of the Member States' knowledge and innovation experts of the SCAR-AKIS Strategic Working Group to discuss project strategy and progress in the various stages of the 2 projects.
- Projects should run at least 5 years. They must implement the multi-actor approach, with a majority of partners being forestry advisors with frequent field experience.
- Provide all outcomes and materials to the European Innovation Partnership 'Agricultural Productivity and Sustainability' (EIP-AGRI), including in the common 'practice abstract' format for EU wide dissemination, as well as to national/regional/local AKIS channels and to the EU-wide interactive knowledge reservoir (HORIZON-CL6-2021- GOVERNANCE-01-24) in the requested formats.

Missions⁴

Mission: Adaptation to Climate Change

In February 2021, the European Commission adopted a **EU strategy on adaptation to climate change** that sets out how the EU can adapt to the unavoidable impacts of climate change and become climate resilient by 2050.

Pushing further on the belief that we must adjust now to tomorrow's climate, the EU has launched a specific mission to foster the resilience of all, be it regions, cities, local communities, to climate change. The **Mission Adaptation to Climate Change**, will enable Europe to prepare for unavoidable climate impacts and accelerate the transformation to a climate-resilient Europe. Its implementation plan specifies the goal and objectives as well as implementation details of the mission **"Adaptation to Climate Change"**.

Rooted in research and innovation, the Mission has set out concrete objectives and deliver tangible solutions, mainstreaming nature-based approaches, to Europeans. The work supported by the Mission will also be of particular relevance to the forthcoming Nature Restoration Law, that will set targets to restore degraded ecosystems.

A regional approach

The Mission wants to mobilise all actors, such as EU Member States, regional and local authorities, research institutes, investors and citizens to create real and lasting **impact**.

By supporting European regions, local authorities and communities to **become climate resilient**, the Mission will help them to be prepared for inevitable changes and extreme events.

While some regions, and cities in Europe are well prepared to climate change, others are striving for solutions to address their vulnerabilities. Less developed regions and local authorities that are more vulnerable to climate impacts and have low adaptive capacity will receive particular attention. The Mission approach is to ask front-runners European regions to share their experience and lessons learnt with others and accompany them in finding and possibly reapplying solutions adapted to their climatic situation and economy.

The R&I support will be provided in different ways:

1. Provide general support to European regions, local authorities and communities to better understand, prepare for and manage climate risks and opportunities
2. Accelerate transformations to climate resilience: cooperate with at least 150 regions, local authorities and communities to accelerate their transformation to a climate

⁴ [Work Programme published by the European Commission on 6 December 2022](#)

resilient future, supporting them in the co-creation of innovation pathways and the testing of solutions

3. Demonstrate systemic transformations to climate resilience: deliver at least 75 large-scale demonstrations of systemic transformations to climate resilience across European regions, local authorities and communities.

For 2023, the Mission will focus on supporting regions, local authorities and communities in demonstrating at real scale and in real life climate resilience solutions capable to address one or more of the systems locally identified as key for climate resilience building and as the most vulnerable to effects of climate change. Indeed, the Mission will support the innovation still needed to implement the solutions at scale, in the specific environment where the demonstration will take place, and to transform the key systems into a more climate resilient systems, with Nature-Based Solutions to be explored as priority. The demonstration projects would be ideally part of the adaptation roadmaps locally developed to address the identified climate risks, and in line with the National Adaptation Plan and regional adaptation pathway/strategy, where available. In the spirit of the Mission, those projects should also be co-designed, co-developed and co-implemented with the engagement and support of the local stakeholders, being them the citizens, the businesses and /or the social partners.

Engagement and commitment by the Regions and the local authorities directly in the demonstration activities will assure to maintain the solutions in place for the future, beyond the implementation duration of the project. This will contribute to the aim to deliver at least 75 large-scale demonstrations of systemic transformations to climate resilience across European regions, local authorities and communities by 2030, scaling up and fostering largescale deployment of tested innovative solutions for climate resilience, the enabling of their diffusion and the removal of barriers for their uptake. As foreseen under under the Horizon Europe Regulation, the Mission will follow a portfolio approach in its related calls, in that “the evaluation committee shall rank the proposals that have passed the applicable thresholds, according to: (a) the evaluation scores; (b) their contribution to the achievement of specific policy objectives, including the constitution of a consistent portfolio of projects. In particular, the Mission calls will foster the development of a balanced portfolio of solutions across the different climate risks, the different innovation areas as identified in the Mission Implementation Plan and the different biogeographical regions, as defined by the European Environment Agency.

Call – Demonstration of climate resilience solutions in support of the implementation of the Adaptation to climate change mission

Topic ID and title	HORIZON-MISS-2023-CLIMA-01-01: Testing and demonstrating transformative solutions increasing climate resilience of the agriculture and/or forestry sector				
Budget	EUR 30 million	Opening date	10 January 2023	Deadline 1	20 September 2023
Budget per project	EUR 8-10 million			Deadline 2	/
Type of action	Innovation Actions (IA)				
FTP subsector	F&F				
Keywords	forestry, biodiversity, regions and communities, close to nature, digital monitoring, biodiversity, tree planting, peatland, wetland				
FTP comments	This topic deals with the environmental aspects of forests and forestry and emphasise the role of the regional community in doing so. However, it is not very clear by which activities and means that the objectives are to be reached.				
FTP SIRA 2030 Challenges addressed	1B	FTP relevance		Low	
		Starting TRL		/	
		End TRL		6-8	

Expected Outcome:

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

- Regions and communities have undertaken action transforming into tangible projects their roadmaps designed with the aim of fostering a systemic approach to climate resilience towards the different and multi-risks locally identified as relevant, with particular emphasis on the development of nature-based solutions, biodiversity and climate mitigation synergies, and ecosystem restoration across a range of agricultural and/or forestry ecosystems.
- Regions and communities have taken the leadership and have been involved in development and testing of solutions that can transform the agriculture and the forestry sector, making it more resilient to foreseen climate change, while making progress in the sustainable transformation required implementing the European Green Deal.
- Solutions contribute to the implementation at the local level of the Common Agriculture Policy and the related national Strategic Plans, are well in line with the foreseen measures for drought management and/or the river basin management plans where those are in place.
- Developed solutions are close to nature, are at least neutral or support biodiversity, improve or at least do not harm water quality and availability (retentiveness in the

landscape), making both the sector and nature more resilient to climate change and supporting implementation of the EU Biodiversity Strategy for 2030.

- Solutions making the agriculture and/or forestry business more resilient to long term effects of climate change have been developed, tested and brought closer to the market.
- Potential economic, social and environmental losses caused by extreme weather events to the agriculture sector and other sectors, such as forestry, are reduced, making them more resilient through better preparation.
- Accompanying measures for enabling conditions, that would boost the outcomes, such as support instruments for environmental services, the use of digital monitoring, access to relevant data and knowledge, facilitation of financing and mobilisation or resources, are piloted.
- Agriculture and other related businesses in the sector, in particular those afferring to the food-water nexus, are better prepared to cope with the changing climate, also through climate adaptation targeted education, up- and re-skilling programmes.
- Available or emerging climate-resilient solutions particularly relevant for small farms, organic farms or farms in conversion or any type of farms looking for alternative to intensive agriculture are also made known and available to the regions and communities, contributing to the implementation of the Farm to Fork Strategy.

Scope:

This topic relates to the Mission's objectives to mobilise at least 150 regions in testing the solutions most locally needed to build climate resilience and to deliver at least 75 deep demonstrations of systemic transformations to climate resilience.

The proposal should **develop and test innovative solutions**, combining technological, social and business innovation, leading to an increase of the resilience and adaptation capacity to climate change in the involved regions and communities of the agriculture sector and the related value chains. Nature based solutions and the restoration of cropland and grassland should be explored as priority and at the very heart of the development whenever possible.

The proposed solution should address at least some of the following aspects:

- Improving resilience of the **agriculture and /or forestry sector**, improving the capacity of the sector to withstand dry periods and extreme droughts while protecting the ecological flows, preserving biodiversity in and around the catchment channels, preserving longitudinal connectivity of the flowing streams, slowing the

falling level of the groundwater table and reversing the loss of biodiversity. This should include for example exploring value of culture rotation and other means to improve soil quality, improving soil structure by circular approaches, establishment and maintenance of landscape features (such as hedges reducing wind erosion), innovative silvopasture, management of genetic resources in an agro-ecological perspective and other agro-ecology approaches in farmland, in particular in relation to droughts and water multi-usage and management;

- Exploiting **agro-ecology** as an approach to enhance the climate resilience of the farming system, its functionality and sustainability, while bringing sustainable solutions and multiple benefits, such as enhanced yields from adapted food crops, water efficiency, enhanced farmer livelihoods from income generation, increased biodiversity, improved water quality and water use efficiency, the ecological status of waters, improved soil structure and health, reduced erosion, and/or a higher level of carbon sequestration.
- Exploring integration of available **smart farming** approaches (and improvements of the same based on updated data) and the use of technologies as the AI and the Internet of Things (IoT) to improve climate resilience through the modification and improvement of nutrient and crop protection processes, such as fertilization, pest control and irrigation, to ensure sufficient crop yields both in terms of quality and quantity, while also reducing emissions, water consumption and preserving biodiversity.
- Development of **more natural ecosystems**, generating combined benefits for climate mitigation, reduction of water flooding and soil erosion, (by increasing recurring to green infrastructures, tree planting, or increasing of permeable green surfaces) and maintaining or restoring rivers, peatland, wetland and natural floodplain.
- Further demonstrate and increase awareness of the **value of maintaining and restoring existing natural systems**, preservation of cultural landscapes and socio-ecological systems as proving rich spectrum of climate services compared to other anthropogenic solutions, including integration of cultural heritage considerations as the legacy from the past, to be experienced in the present, and for transmitting to future generations. In line with the Mission Implementation Plan and the new EU Climate Adaptation Strategy, implementing nature-based solutions with adequate social and environmental standards on a larger scale would increase climate resilience. Blue-green (as opposed to grey) infrastructures represent multipurpose, “no regret” solutions, which simultaneously provide environmental, social and economic benefits and help build climate resilience, which uptake can be facilitated

by better quantification and communication of their benefits. Nature based Solutions (NBS) essential role for sustaining healthy water, oceans and soils was recognised, together with their potential to reduce costs, provide climate-resilient services, and improve compliance with Water Framework Directive requirement for good ecological status, if they were to play a bigger role in land-use management and infrastructure planning. The forthcoming Nature Restoration Law will also play an important role in requiring MS to plan restoration activities across a range of ecosystems.

As climate impacts, adaptive capacities and disaster risk reduction capabilities differ greatly across regions, the proposed development and innovation should address specific needs identified **at regional and local scale** (both at the rural, urban-rural interface and eventually in urban context) with tailor-made responses and measures, fully acknowledging place-based governance, socio-economic and identity characteristics and other place-based data.

In line with the Mission objective to **build systemic climate resilience**, the proposal should address the **multi-risks locally identified**, design and implement a systemic solution to reduce the identified vulnerabilities of the agriculture and/or forestry sector to climate change and to mitigate its negative potential impacts.

Under the Mission approach, collaborations to develop and test effective solutions between regions/local authorities/communities facing similar challenges are highly encouraged. To this purpose, the proposals **must include at least 4 demonstrations taking place in regions/local authorities/ communities**, which should collaborate in addressing the common climate change challenges identified and in testing the most suitable solutions. These at least 4 demonstrations must be **located in at least 3 different EU Member States and/ or Horizon Europe associated countries**. Involvement in the proposal of regions eligible for Cohesion funds¹¹ to conduct at least one of the proposed demonstrations shall be regarded as a positive element.

The proposals should clearly identify the biogeographical area, for which the proposed solution is relevant and to which the proposal is focussed. Moreover, the proposal should explore possible **reapplication to other regions**, starting from those located in the same biogeographical areas.

To support a large impact, the proposed solutions should be widely re-applicable. To this purpose, identification and inclusion of **at least three “replicating” regions/local authorities/communities**, interested in reapplying the lessons learnt (totally, partially or with the required adjustments) in their territories is strongly encouraged; this could take the form of inclusion in the consortium of one or more partners providing support for the technical exchanges and the knowledge uptake in the “replicating” regions.

In addition to the local/regional authorities owning the climate challenge, the consortium may include other type of partners, such as private or public research organisations, enterprises and NGOs, to ensure that all needed capabilities are available to develop and implement real life actions.

Proposals should build (when relevant) upon previous developed or existing knowledge and adaptation solutions, designed and developed from previous projects, including from beyond EU, addressing climate change adaptation and funded by European and National programmes, in particular the European Union Framework programmes for Research and Innovation (such as Horizon 2020 and Horizon Europe under their different pillars and clusters), as well as the LIFE programme. Moreover, proposals should look into opportunities to scale up the solutions demonstrated and to foster their broad deployment across in Europe through the LIFE programme, and its integrated projects in particular, and through the European Regional Development Fund programmes.

Proposals should include a mechanism and the resources to establish operational links with the Climate-ADAPT platform (run by the European Environment Agency (EEA) together with DG CLIMA) that will act as a central element for the monitoring, support and visualisation of the Mission progress in European Regions. To this purpose, projects will feed their results to the Climate-ADAPT and EEA assessments.

Projects funded under this topic are strongly encouraged to participate in the Mission Community of Practice that will be established amongst the Mission Charter signatories and and in **networking and joint activities** with other projects funded under other topics in the Mission Climate Adaptation as well as in other relevant Missions and partnerships, as appropriate. These networking and joint activities could, for example, involve the participation in joint workshops, the exchange of knowledge, the development and adoption of best practices, or joint communication activities. To this extent, proposals should provide for dedicated activities and earmark appropriate resources. Beyond the Mission, the projects funded under this topic are also encouraged to exchange and identify cooperation opportunities with other projects funded under Horizon Europe, in particular those funded under Cluster 6, the Mission A Soil Deal for Europe and the future partnership on agroecology living labs.

The European Commission intends to establish a network and coordination activities amongst all the projects funded for the implementation of the Climate adaptation Mission, under the Horizon 2020 European Green Deal call and under Horizon Europe, and that will be coordinated by the soon to be established Mission Implementation Platform. The projects under this topic will be requested to contribute to this effort. Applicants should acknowledge this request and already account for these obligations in their proposal, making adequate

provisions in terms of resources and budget to engage and collaborate with the Mission governance.

To ensure a **balanced portfolio** covering the different climate risks as identified in the Mission Implementation Plan and to maximize the footprint across all the different biogeographical areas, the best ranked proposals for each biogeographical area will be selected.

Mission: Restore our Ocean and Waters by 2030

The Mission 'Restore our ocean and waters by 2030' will provide a systemic approach for the restoration, protection and preservation of our ocean, seas and waters. The objective of this Mission is to restore, protect and preserve the health of our ocean, seas and waters by 2030. The Mission is designed to deliver on the European Union's 2030 quantified and measurable targets for protecting and restoring ecosystems and biodiversity, for zero pollution, and for decarbonisation and net greenhouse gas emissions reduction towards climate-neutrality, within the EU's ocean, seas and waters. The Mission will support many Sustainable Development Goals (SDGs): in particular restoring our ocean and waters related actions will directly contribute to SDG 14 - Life below water and SDG 6 - Clean water and sanitation, as well as to SDG13 - Climate action.

The Mission will also contribute to the UN Decade of Ocean Science for Sustainable Development by fostering research and cooperation across European sea basins, including the EU Outermost Regions and beyond, and mobilise scientists, as well as citizens for a sustainable and healthy ocean, seas and waters.

The implementation plan specifies the goal and objectives as well as implementation details of the Mission "Restore our Ocean, seas and waters by 2030".

The Mission Work Programme, under Horizon Europe, will contribute to the recovery of our ocean and waters by 2030 and more specifically to the following objectives:

1. Protect and restore marine and freshwater ecosystems and biodiversity, in line with the EU Biodiversity Strategy 2030;
2. Prevent and eliminate pollution of our ocean, seas and waters, in line with the EU Action Plan Towards Zero Pollution for Air, Water and Soil;
3. Make the sustainable blue economy carbon-neutral and circular, in line with the proposed European Climate Law and the holistic vision enshrined in the Communication on a new approach for a Sustainable Blue Economy.

The Mission will be implemented in two phases:

- In the first 'development and piloting' phase (2022-2025), research and innovation will lay the foundations for implementing the three Mission objectives and enabling actions, paving the way to further citizens participation and engagement. Research and innovation activities will support transformative and innovative solutions to be tested, piloted and validated. Enabling activities will generate new knowledge, observation and monitoring data.

- In the second ‘deployment and upscaling’ phase (2026-2030), the solutions will be further deployed, replicated and scaled up.

The Mission ocean and waters supports research and innovation in a system of European and national funding programmes sharing policy objectives. To foster synergies between R&I funding instruments (European and national), align R&I investments, ensure access to excellence and translate research results for the benefit of the society and the economy, applicants should consider and actively seek complementarities with, and where appropriate possibilities for further funding from other R&I-relevant EU, national or regional programmes for a sustainable blue economy, notably EMFF/EMFAF, LIFE, ERDF, ESF+, JTF, CEF Inland Waterways or Maritime and InvestEU, as well as private funds or financial instruments. All actions of the Mission are expected to disseminate their results according to FAIR (findable, accessible, interoperable, reusable) principles compatible with ongoing EU initiatives such as the European Marine Observation and Data Network (EMODnet) and the European Open Science Cloud (EOSC). In line with this approach, specific actions within the Mission will be devoted to widening access to data and knowledge of oceans, seas and freshwater through the Digital Twin Ocean (Mission ocean and waters digital knowledge system).

All proposals submitted to the calls listed below are required to show how their proposed activities and results will achieve the Mission’s objectives, in line with the timeframe of the Mission phases, i.e.: by 2025 for the ‘development and piloting’ phase and 2030 for the ‘deployment and upscaling phase’.

In the 2023 work programme, in addition to the call under the heading ‘Mission Restore our ocean and waters by 2030’ (Call HORIZON-MISS-2023-OCEAN-01- Actions for the implementation of the Mission Restore our ocean and waters by 2030) the Mission ocean and waters also developed 2 joint calls with Mission ‘Soil Deal for Europe’ and Mission ‘Adaptation to Climate change’ which are under the heading ‘Missions’ joint calls’:

- Joint Call between Mission Restore our Ocean and Waters by 2030, Mission Adaptation to Climate Change and Mission A Soil Deal for Europe - HORIZON-MISS-2023- CLIMA-OCEAN-SOIL-01 - Demonstration of climate mitigation and resilience solutions in support of the implementation of the Adaptation to Climate Change, Restore our Ocean and Waters by 2030 and A Soil Deal for Europe Missions;
- Joint Call between Mission Restore our Ocean and Seas by 2030 and Mission A Soil Deal for Europe - HORIZON-MISS-2023-OCEAN-SOIL-01 - Mission Ocean & waters and Mission Soil Deal for Europe Joint demonstration of approaches and solutions to address nutrient pollution in the landscape-river-sea system in the Mediterranean sea basin.

Call – Actions for the implementation of the Mission Restore our ocean and waters by 2030

Topic ID and title	HORIZON-MISS-2023-OCEAN-01-04: European natural lakes: demonstration of integrated approaches for protection and restoration of natural lake ecosystems and their biodiversity				
Budget	EUR 12 million	Opening date	17 January 2023	Deadline 1	20 September 2023
Budget per project	EUR 4 million			Deadline 2	/
Type of action	Innovation Actions (IA)				
FTP subsector	F&F				
Keywords	EU Biodiversity Strategy, restoration, protection, water ecosystems				
FTP comments	Forest-basins is the source of most of Europe’s fresh-water. It is likely that projects funded under this topic will demonstrate proposed solutions in a forest environment.				
FTP SIRA 2030 Challenges addressed	1C			FTP relevance	Indirect
				Starting TRL	/
				End TRL	5-7

Expected Outcome:

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

- Enhance the implementation of the European Green Deal, the EU Biodiversity Strategy, the EU Zero Pollution Action Plan, the EU Bioeconomy Strategy and the Water Framework Directive as well as other EU instruments and policies that concern freshwater ecosystems;
- Improved ecological and chemical status of European natural lakes;
- Demonstrated integrated and replicable approaches to protection and restoration of natural lake ecosystems, their biodiversity and healthy functioning, integrating all aspects of good ecological and chemical status of lakes under the Water Framework Directive;
- Demonstrated effective and replicable nature based solutions for restoration and protection of European lakes;
- Demonstrate improved solutions and systems for effective collaboration between, municipalities, regions and, if relevant, countries within a lake catchment area;
- Create opportunities for scaling up of solutions for protection and restoration of European lakes through involvement of ‘associated regions’.

Scope:

Natural lakes are understood for the purposes of this Work Programme as natural inland bodies of standing surface freshwater or brackish water. There are more than 500 000 natural lakes larger than 1ha in Europe. There were over 2 800 lakes in the EU with bad or poor ecological status and over 8 000 lakes with moderate ecological status in 2018. The main pressures affecting the ecological status of European lakes are hydro-morphological pressures, pollution, in particular from chemicals and nutrient enrichment, water abstraction and climate change impacts. Nutrient enrichment results in algal blooms influencing the ecological status of these waters as well as their use for drinking and recreation.

Proposals under this topic are expected to show how their activities and results will achieve the Mission objective 1 - Protect and restore marine and freshwater ecosystems and biodiversity, in line with the timeframe of the Mission phases, i.e.: by 2025 for the 'development and piloting' phase and 2030 for the 'deployment and upscaling phase'.

The proposals should design and demonstrate integrated and replicable approaches to protect and restore natural lake ecosystems and their biodiversity that result in a significantly improved ecological and chemical status and maintain it in the long-term. The integrated approaches should cover physical and biochemical elements and address in an integrated way all main pressures on the lake ecosystem, (e.g.: water level regulation, water extraction, agriculture, aquaculture and navigation, main source of pollution, barriers to connectivity, pressures on biodiversity, including invasive alien species). Proposals should also consider threats and risks associated to climate change and pressures on biodiversity.

The demonstration activities should combine measures and solutions to reduce pressures and stressors, to restore and protect the lake ecosystem and its biodiversity, in particular using effective nature-based and circular-biobased solutions in the lakes, along shorelines and across their catchments to reduce use of chemicals and retain nutrients. The demonstration sites should be located on natural lakes with a surface area exceeding 1 km².

Proposals must:

- Carry out demonstration activities in at least 3 different countries, involving and including in the consortium partners from these three countries;
- Proposals should also identify areas and locations where the solutions are replicable and draw up an action plan and roadmap to replicate and scale up the solutions and actions for the protection and restoration of natural lakes.

To address the impact-driven approach of the Mission and the nature of Innovation Actions, proposals are expected to work with and engage at least 3 'associated regions' to showcase the feasibility, replicability and scalability of the solutions developed within the projects in other areas. 'Associated regions' are understood as areas with ecosystems that can benefit from the demonstration activities (e.g. in the context of this topic, regions with another natural lake located in EU Member States and/or Associated countries) and/or less-developed regions, with the need to build capacity to implement the innovative solutions to restore freshwater ecosystems. The proposals should ensure that the associated regions are located in Member States/Associated countries other than those that are part of the project consortium. The involvement of "associated regions" that have not yet participated in Mission projects is encouraged. The partners will proactively reach out to the associated regions to enable them to follow closely the project and its demonstration activities. The projects should continuously share their outcomes and knowledge with those 'associated regions' and provide them with technical assistance to build capacity and to implement natural lake restoration and protection solutions in their territory to contribute to achieve the Mission objectives. The technical assistance to the 'associated regions' should include advice to the prepare roadmaps, plans and projects to restore and protect natural lakes, to address possible barriers and show the feasibility of implementing innovative solutions.

Proposals should outline the selection process of the third parties to which financial support would be granted based on principles of transparency, objectivity and fairness, in accordance with part G of the general annexes to this work programme.

The projects should support data and knowledge sharing through and as well benefit from the Ocean and Water Knowledge System to foster cross-regions, pan-European approaches. An European Digital Innovation Hub (EDIH) on Natural lakes – at interregional/transnational level - could be envisaged.

The proposals are expected to integrate actions within basins and across lake catchments that support social and economic transitions towards sustainable, inclusive and long-term management of the restored and protected ecosystems. These should include natural, social, economic and cultural elements and business models for generating revenue from the restored and protected ecosystems. For that purpose, demonstrations should involve local business communities, in particular SMEs, investors and other business stakeholders.

Training, upskilling and communication activities towards stakeholders, including regional and local authorities from the 'associated regions' should be included in each proposal. Local actors, including where appropriate, the European Volunteer Corps and Mission Citizen Assemblies, should be involved in ecosystem restoration and protection activities and any

actions for social and economic transitions towards sustainable inclusive and long-term management of the restored ecosystems, using activities like citizen science to encourage involvement and stewardship of lakes and their catchments.

The projects funded under this topic should:

- build links with other Mission activities and other relevant activities within the Mission lighthouses to maximize synergies, as well as with the European Blue Parks, and other Mission activities;
- build links with the Mission implementation monitoring system that will be part of the Mission Implementation Support Platform and with the lighthouse support facilities, for reporting in different basins, monitoring and coordination of all relevant implementation activities in the lighthouse area as well as with the Blue Parks technical support platform;
- support the Ocean and water knowledge system, in particular by contributing to biodiversity monitoring, modelling and knowledge creation and data.

Applicants should consider to link with other actions funded under Horizon Europe and set aside resources to engage in cooperation and networking with projects funded under the EU Framework Programme, e. g: the MERCES project¹⁰⁰ that developed ecological tools and protocols for cost-effective marine habitat restoration; the EULAKES project; the Espon project, Horizon Europe Nord-Balt-Ecosafe, H2020 MERLIN as well as ECOSTAT and EuropaBON activities. Additionally, projects should collaborate with projects funded under the topic HORIZON-INFRA-2022-EOSC-01-03 to adopt best practices regarding FAIR and open data sharing.

Proposals are expected to show how their activities and results will support the European Green Deal and how they will achieve the Mission's objectives, in line with the timeframe of the Mission phases, i.e.: by 2025 for the 'development and piloting' phase and 2030 for the 'deployment and upscaling phase'.

Mission: A Soil Deal for Europe

Life on earth depends on healthy soils. Healthy soils provide food, clean water, habitats for biodiversity and other important services while contributing to climate resilience¹⁴⁴. We take these services for granted, but in fact, soils are a scarce and a threatened resource, all over Europe and beyond. It is estimated that 60-70% of soils in the EU are unhealthy, mainly as a result of unsustainable management practices. The effects of climate change are putting further pressure on this key resource. The Mission intends to support Europe's path to sustainable soil management as part of the wider green transition, in urban as well as rural areas. The Mission's goal is to establish 100 living labs and lighthouses to lead the transition towards healthy soils by 2030 for the benefit of food, people, nature and climate.

To reach its goal and objectives, the Mission foresees actions across territories and sectors. It aims at having wide-reaching impact on practices in agriculture, forestry, the food sector and other industries (e.g. biobased and waste) as well as on land use planning in rural and urban areas. The Mission will also tap into the expertise from international partners and contribute to soil health globally.

To be successful, the Mission requires that stakeholders along the whole agri-food chain, including farmers, other land managers, industries, consumers, public authorities, research and civil society at large, acknowledge the value of soils and actively contribute to soil friendly practices, including through consumer choices.

Many of the actions to address soil health have a direct impact on some of the goals of the other Missions: carbon sequestration and storage in soil supports climate change mitigation and adaptation, and soil structure influences water-retention capacity (Climate Adaptation Mission); targeted nutrient management will lead to improvements in water quality (Ocean and Waters Mission); soils are the foundation of green urban infrastructure and nature-based solutions, e.g. for urban flood protection (Climate-neutral Cities Mission) while a reduction in soil pollution reduces the risk of cancer (Cancer Mission).

The Mission implementation plan specifies the goal and objectives as well as implementation details of the Mission 'A Soil Deal for Europe: 100 living labs and lighthouses to lead the transition towards healthy soils by 2030'. Proposals for topics under Work Programme 2023 of this Mission will be part of a wider portfolio of Mission activities. They will contribute to the Mission's goal and objectives, and more specifically to several of the following impacts:

- Increased knowledge on soils and the underlying soil processes is widely available to a range of stakeholders and the wider public, and is used to further inform science, practices and policies to reduce pressures on soils.

- Land managers¹⁴⁶, industries, consumers and society at large work together, in particular through Living Labs, to take effective action on soil health across sectors and land uses.
- A wide range of innovations – adapted to local conditions - are in place to address the manifold pressures on soils and improve soil conditions, thus contributing to the specific objectives of the Mission ‘A Soil Deal for Europe’.
- “Soil literacy”, awareness and societal engagement, and appreciation of the vital functions of soils, is increased, including awareness on the links between healthy soils, nutritious and safe food and a healthy environment.
- More sustainable methods for soil management are applied and contribute to healthy oceans and climate adaptation on land
- The successful implementation of the Mission supports several EU policy and international commitments ranging from land degradation neutrality, food and nutrition security to biodiversity (e.g. Sustainable Development Goals, United Nations Convention to Combat Desertification, United Nations Convention on Biodiversity, European Green Deal including the New Soil Strategy or the Long-term Vision for the EU’s rural areas and the Common Agricultural Policy).

Under the envisioned 2024 call of the Mission ‘A Soil Deal for Europe’, the Commission, at this stage, plans, amongst others (and on a provisional basis and subject to all relevant input and discretion) to fund actions in the areas of: soil decontamination, biodiversity, citizen engagement and citizen science.

Projects under the 2023 call are expected to liaise closely together with the Mission Secretariat and actively contribute to the development of the European Soil Observatory (EUSO), hosted by the European Commission’s Joint Research Centre (JRC). Proposals are also encouraged to build on existing research results or best practices (for instance from the EJP Soil projects).

Specific requirements for multi-actor projects:

Proposals submitted for topics requesting to follow the multi-actor approach should meet all requirements listed below.

The multi-actor approach described here, which is a form of responsible research and innovation, aims to make the research and innovation process and its outcomes more reliable, demand-driven, shared and relevant to society. A multi-actor project ensures the genuine and sufficient involvement of a targeted array of actors, which serves the objectives of the topic. For instance, actors could include but not limited to: researchers, farmers, foresters and representatives of their professional associations, advisors, land managers and owners, spatial planners, food and bioeconomy businesses, consumer associations,

local communities, educators, cultural and creative industries, citizens, civil society organisations including NGOs, and government representatives. The choice of the key actors participating in projects will depend on the objectives of the call topic and proposals. The actors are essentially the (end-) users¹⁴⁷ of the project results backed up by any other useful intermediaries and actors who can contribute with further expertise and innovative ideas relevant to the topic's objectives and support communication and dissemination. The genuine and sufficient involvement of different actors should take place all over the whole course of the project: from participation in development, planning and experiments to implementation, dissemination of results and a possible demonstration phase. Building blocks for the project proposal are expected to come from science as well as from practice: it is a 'co-creation' process. (End-) users and practitioners are to be involved, not as a study-object, but to use their practical and local knowledge and/or entrepreneurial skills to develop solutions and create 'co-ownership' of results for (end-) users and practitioners. This will contribute and speed up the acceptance and up-take of new ideas, approaches, and solutions developed in the project. Therefore, a multi-actor project proposal must describe:

- How the proposed objectives and planning are targeting the needs/problems/challenges and opportunities of the (end-)users of the project results.
- How the description of the project concept and in particular the composition of the consortium reflects a balanced choice of relevant key actors who have complementary types of knowledge (scientific, practical etc.), and will ensure a broad implementation of project results which should be ready for practice.
- How the project intends to include existing practices and tacit knowledge. This should be illustrated in the proposals with a sufficient number of high-quality knowledge exchange activities indicating the precise and active roles of the different non-scientific actors in the work. The cross-fertilisation of skills, competencies and ideas between actors should generate innovative findings and solutions that are more likely to be applied on a broad scale.
- How the project will facilitate the multi-actor engagement process by making use of the most appropriate methods and expertise.
- How the project will result in practical and ready to use knowledge, approaches, tools or products, that are easily understandable and freely accessible.
- How outputs ready for practice will feed into the existing dissemination channels most consulted by the (end-) users of the project results in the countries and regions.

In addition, to ensure EU-wide communication in all areas related to the European Innovation Partnership 'Agricultural Productivity and Sustainability' (EIP-AGRI) and the Common Agricultural Policy (CAP) specific objectives, in particular agriculture, forestry and

rural development, this knowledge must also be summarised in an appropriate number of 'practice abstracts' in the common EIP-AGRI format.

For areas falling outside the EIP-AGRI and CAP specific objectives remit, other similarly effective solutions ensuring dissemination at EU level should be sought.

Where applicable, involvement of interactive innovation groups, such as EIP-AGRI Operational Groups funded under Rural Development Programmes, is strongly recommended.

Call – Research and Innovation and other actions to support the implementation of mission A Soil Deal for Europe

Topic ID and title	HORIZON-MISS-2023-SOIL-01-01: Discovering the subsoil				
Budget	EUR 12 million	Opening date	17 January 2023	Deadline 1	20 September 2023
Budget per project	EUR 6 million			Deadline 2	/
Type of action	Research and Innovations Actions (RIA)				
FTP subsector	F&F				
Keywords	EU Soil Strategy, land managers, public authorities, sustainable soil management practices, protection, restoration, ecosystem services				
FTP comments	The subsoil can have a large impact on a soil's potential productivity and supply of ecosystem services. It is estimated, for example, that plants extract between 10 and 80% of their nutrient and water requirements from the subsoil. Forests mentioned as a type of land use to study, so this topic has relevance to forestry resilience and productivity				
FTP SIRA 2030 Challenges addressed	1A			FTP relevance	Low-Medium
				Starting TRL	/
				End TRL	/

Expected Outcome:

Activities under this topic will help to progress towards the objectives of the Mission ‘A Soil Deal for Europe’, in particular to its specific objective 2 “Conserve and increase soil organic carbon stocks” and 6 “Improve soil structure to enhance habitat quality for soil biota and crops”. Activities should also contribute to the EU Soil Strategy and to the Long-term vision for EU’s rural areas, as the Mission is one of its flagship initiatives.

Project results should contribute to all of the following outcomes:

- Improved access to data and knowledge on the spatial variations of the chemical, physical and biological conditions and dynamics in subsoils for land managers and public authorities to support the development of sustainable soil management practices as well as financial and policy incentives.
- Enhanced deployment of sustainable management practices for protecting and restoring subsoils in agricultural, forest and other types of soils, and increasing relevant soildependent ecosystem services such as the provision of food and fibre or habitats for soil biodiversity.
- Improved understanding of the role of the subsoil in climate change adaptation and mitigation, e.g. regarding carbon and water storage.

Scope:

The term “subsoil” refers to the horizons immediately below the topsoil. In the past, this layer has often been neglected as most land management practices (e.g. tillage, cover crops, forestry) are focused on the topsoil. Our understanding of subsoil issues (e.g. compaction and its persistence) in semi-natural environments (e.g. heathlands, peatlands, natural grassland) is even less developed than for agricultural and forestry subsoils. Spatial datasets on soils at both national and EU-scale have also mostly focused on topsoil.

The subsoil can have a large impact on a soil's potential productivity and supply of ecosystem services. It is estimated, for example, that plants extract between 10 and 80% of their nutrient and water requirements from the subsoil. Carbon sequestered in subsoils generally contributes to more than half of the total stocks within a soil profile. In contrast to topsoil, organic matter stored in subsoil horizons is characterised by high mean residence times. Conversely, subsoil degradation (e.g. through compaction, pollution, salinization) may limit root penetration, reduce nutrient uptake and result in plants becoming increasingly susceptible to stress such as from pests and diseases or drought and floods. Reduced water infiltration in subsoils limits plant growth, while increasing surface water runoff and the risk of soil erosion. Timber-related activities in forests, for example, can also cause considerable soil compaction leading to a decrease in productivity of forests due to increased surface water runoff and erosion.

Activities under this topic should improve our understanding and knowledge of the links between the subsoil and ecosystem services, and they should promote practices that enhance the health status of subsoils in agriculture, forestry and urban areas, as well as sites of nature conservation and sensitive landscapes.

Proposed activities should:

- Increase knowledge of properties (e.g. soil structure) and chemical, physical and biological process dynamics and their relationships in subsoils, and how these contribute to the delivery of ecosystem services (such as carbon storage and greenhouse gas (GHG) mitigation, water retention, nutrient provision, crop productivity, and habitat for soil biodiversity) and overall soil health.
- Identify pressures on the subsoil that impair a range of soil functions and ecosystem services, as well as drivers for subsoil degradation, and identify indicators to assess subsoil driven changes in soil ecosystem functioning.
- Develop tools and methods for risk assessment as regards subsoil degradation, reflecting diverse soil uses. Demonstrate practical approaches for the use of these tools and methods by land managers and policy-decision makers.

- Identify the potential of subsoils to store and maintain carbon, and to contribute to mitigating other GHG (e.g. N₂O) emissions. Work should take into account potential barriers and the synergies and trade-offs between climate regulation and other ecosystem services, such as the support to biodiversity. Consideration should be given to existing and future land use options.
- Identify existing as well as develop and test, in cooperation with land managers, sustainable management practices to improve subsoil health and therefore its functions (e.g. water retention, nutrient provision, habitat for soil biodiversity, carbon storage).
- Establish robust methods to spatially assess and monitor the chemical, physical and biological characteristics of subsoils and, to improve data collection and use. For this, sampling methods for subsoil should be harmonised in order to provide comparable and reliable data. The long-term storage and access to subsoil data should be done in close collaboration with the European Soil Observatory (EUSO).

In carrying out activities, proposals should consider various soil types and land uses and climatic/biogeographical regions in the EU and Associated Countries. With regard to agriculture, work should draw on sustainable practices, applied across a range of farming systems and for the benefit of both conventional and organic farming. The proposals selected under this topic should dedicate the necessary resources to work closely together to maximise synergies.

Activities should be undertaken in close cooperation with the European Commission's Joint Research Centre (JRC). The cooperation with the JRC is particularly relevant in view of further developing the LUCAS Soil survey and the Soil Health Dashboard under the European Soil Observatory (EUSO). Proposals should demonstrate a route towards open access, longevity, sustainability and interoperability of knowledge and outputs through close collaboration with the EUSO and other projects to be funded under the Mission 'A Soil Deal for Europe'. Potentially, the projects funded under this topic could also cooperate with living labs and lighthouses that will be created in this call or future calls of the Mission 'A Soil Deal for Europe'.

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	HORIZON-MISS-2023-SOIL-01-04: Innovations to prevent and combat desertification				
Budget	EUR 14 million	Opening date	17 January 2023	Deadline 1	20 September 2023
Budget per project	EUR 7 million			Deadline 2	/
Type of action	Innovation Actions (IA)				
FTP subsector	F&F				
Keywords	land degradation				
FTP comments	Agroforestry and forest areas mentioned in the land use types				
FTP SIRA 2030 Challenges addressed	1B – 3C, E			FTP relevance	Low
				Starting TRL	/
				End TRL	5-7

Expected Outcome:

Activities under this topic will help to progress towards the objectives of the Mission ‘A Soil Deal for Europe’, in particular its specific objective 1, “Reduce land degradation relating to desertification”.

Project results should contribute to all of the following outcomes:

- The socio-economic and climatic drivers, the extent and the impacts of different types of land degradation (incl. water scarcity, vegetation loss, soil erosion) in (semi-)natural and agricultural systems of arid areas and areas becoming increasingly arid are clearly understood, accurately and reliably measured at the most relevant scale and in connection with specific land uses, and the knowledge is widely shared among relevant actors from various sectors.
- The economic viability and environmental effectiveness of solutions for the prevention of desertification and for the restoration of degraded land (such as soil protection measures that help retain water and reduce water needs, improve management of soil organic matter, avoid salinization, protect biodiversity, minimise soil sealing and increase land resilience to droughts) is demonstrated in the different local or regional contexts.
- Enhanced access for land managers in desertification-prone areas to effective, context-specific restoration and prevention solutions and to information about the conditions under which they are effective.
- The number and size of areas under sustainable soil and water management are expanded, and the retention of moisture in the landscape and the management of soil organic matter are improved across different land-use types and local-regional conditions. In consequence, dryland soils become more resilient and less vulnerable to drought and desertification.

Scope:

In 2017, 25% of land in Southern, Central and Eastern Europe was estimated to be at high or very high risk of desertification. The risk is likely to have further increased since then, and to continue increasing, as a consequence of accelerating climate change and continued pressures from land use and land-use change, both in the European Union and beyond. Desertification leads to loss of biodiversity, of organic carbon and of other land based ecosystem services, including reduced agricultural and forest productivity. Desertification further amplifies global warming through the release of CO₂ and other greenhouse gases linked with the decrease in vegetation cover. Thus it has severe environmental, social and economic consequences.

Proposed activities should:

- Synthesise and gather evidence on the drivers and impacts of land degradation at all relevant scales, using diverse data flows and where relevant models, with a view to supporting alternative land management actions (scenarios) to alleviate the pressures from land uses and land-use changes leading to desertification.
- Identify, demonstrate the effectiveness and promote the scale-up of measures for reducing and reversing desertification and increasing soil water-retention capacity, taking into account (actual and projected) change in climatic conditions and different scales of actions as well as various land uses and land use changes. Due attention should be given to the role of plant and microbial diversity in increasing the resilience of land vis-a-vis desertification processes.
- Specifically for agricultural land, with regard to both conventional and organic farming, identify and demonstrate farming or other land-use practices which are more resilient and are suitable for combatting desertification while sustaining ecosystem services and preventing land abandonment.
- Facilitate learning and exchange among all relevant actors, including across sectors, by promoting in the scope of activities various types of innovations (nature-based, technological, socio-economic, cultural and institutional) and/or various types of land use (natural and semi-natural as well as agricultural, agroforestry and forest areas).
- Develop policy recommendations for creating incentives and overcoming obstacles for the widespread uptake of measures demonstrated to be effective for the prevention of desertification and restoration and are suitable for scaling-up.
- Carry-out activities for awareness-raising on desertification and for the demonstration and dissemination of solutions, also as part of the UN Day to combat desertification and drought.

Proposals should demonstrate a route towards open access, longevity, sustainability and interoperability of knowledge and outputs through close collaboration with the Joint Research Centre's EU Soil Observatory (EUSO) and with other projects to be funded under the Soil Mission. 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 ensure synergies with projects funded as part of the Partnership for Research and Innovation in the Mediterranean Area (PRIMA) and with the EU LIFE project NewLIFE4-Drylands. In order to achieve the expected outcomes, international cooperation is encouraged, in particular with third countries in the Mediterranean region.

Potentially, the projects funded under this topic could cooperate with living labs and lighthouses that will be created in this call and future calls under the Mission 'A Soil Deal for Europe'.

Topic ID and title	HORIZON-MISS-2023-SOIL-01-08: Co-creating solutions for soil health in Living Labs				
Budget	EUR 36 million	Opening date	17 January 2023	Deadline 1	20 September 2023
Budget per project	EUR 12 million			Deadline 2	/
Type of action	Research and Innovations Actions (RIA)				
FTP subsector	F&F				
Keywords	land managers, soil health, ecosystem services, science-practice-policy dialogues, living labs				
FTP comments	One Living Lab on forest exploitation is indicated in the text but in a rather obscure way				
FTP SIRA 2030 Challenges addressed	1A	FTP relevance		Low	
		Starting TRL		/	
		End TRL		/	

Expected Outcome:

Activities under this topic respond directly to the goal of the Mission ‘A Soil Deal for Europe’ of setting up 100 living labs by 2027 to lead the transition to healthy soils by 2030. They support the specific objectives of the Mission ‘A Soil Deal for Europe’ dealing with urgent soil health challenges (see in particular specific objectives 1 to 6 and 8). Activities should also contribute to meeting the European Green Deal ambitions and targets, such as those related to food and nutrition security, climate, biodiversity, environment and rural areas.

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

- Living labs across Europe are fully operational and have established themselves as places for co-creation and testing of solutions for soil health in rural and urban areas.
- Increased capacities for participatory, inter- and transdisciplinary R&I approaches, allowing for effective cooperation between research, practice and policy to tackle soil health challenges.
- Practice oriented knowledge and tools are more easily available to land managers and contribute to an enhanced uptake of solutions for soil health and related ecosystem services.
- Strengthen collaborations between territories and sectors and increased consideration of effective solutions for soil health in regions where the selected living labs are operating.
- Policy makers in the EU and Associated Countries are more aware of local needs with regard to soil health and can use this knowledge to design more effective policies.

Scope:

While more research is needed to restore and maintain healthy soils in the EU, an important barrier still encountered to accelerate the transition towards a climate-neutral and green

European Union is the gap between science and practice, between knowledge and implementation. The Mission 'A Soil Deal for Europe' proposes a novel approach to research and innovation in the area of soil health, including the implementation of living labs. Living labs have the potential to empower a green transition towards healthy soils by developing solutions in a co-creative manner and involving actors in real life settings at territorial level to achieve large-scale impact.

Nowadays, there exist various definitions and conceptualizations of living labs. However, three components are recognizable within the now well-established living labs research concept, which include (a) co-creation with a large set of stakeholders, (b) carried out in real-life settings and (c) involving the end-users. For the purpose of the Mission 'A Soil Deal for Europe', Soil health living labs are defined as "user-centred, place-based and transdisciplinary research and innovation ecosystems, which involve land managers, scientists and other relevant partners in systemic research and co-design, testing, monitoring and evaluation of solutions, in real-life settings, to improve their effectiveness for soil health and accelerate adoption".

Living labs are collaborations between multiple partners that operate and undertake experiments on several sites at regional or sub-regional level. Individual sites could be e.g. farms, forest stands, urban green or industrial areas, enterprises and other entities, where the work is carried-out and monitored under real-life conditions, regardless of the land size, tenure (land ownerships) or the type of economic activity.

Lighthouses, in contrast, are defined as "places for demonstration of solutions, training and communication that are exemplary in their performance in terms of soil health improvement". They are individual, local sites (one farm, one forest exploitation, one industrial site, one urban city green area, etc.) that either can be part of a living lab or be situated outside a living lab.

According to the Mission Implementation Plan, living labs involve partners from different backgrounds, disciplines and/or sectors and are composed of 10 to 20 experimental sites. However, depending on the specific context (e.g. the land use(s), the soil health challenge(s) addressed), applicants can propose living labs with fewer experimental sites. By working together on themes of common interest, the various partners involved in a living lab will be able to replicate actions and solutions, compare results, exchange good practices, validate methodologies and benefit from cross-fertilisation within a local/regional setting.

More specifically, each of the funded projects should:

- Set up four to five living labs (or more, as applicable to the land use(s) and purpose of the project) to work together on thematically related soil health challenges, addressing the same or several land use types. The living labs should be located in at least three different Member States and/or Associated Countries. Proposals should describe the rationale for cooperation across the various living labs and explain how the work undertaken will contribute to one or more of the Mission's specific objectives. Living labs on carbon farming are excluded from this topic as a dedicated topic for carbon farming living labs is opened in this work programme.
- Establish, based on the projects' goals and objectives, a detailed work plan with the activities to be undertaken in an interdisciplinary way, ensuring the co-design, co-development, and co-implementation of locally adapted solutions.
- Carry out participatory and transdisciplinary research and innovation in living labs to seek practical solutions to problems/challenges identified, taking into account the relevant drivers and pressures. Moreover, activities should address challenges to the scaling up and the transferability of solutions. Proposed strategies and solutions should be adapted to the different environmental, socio-economic and cultural contexts in which the living labs are operating. Living labs working in the area of agriculture are expected to promote sustainable practices, applied across a range of farming systems and benefit both conventional and organic farming.
- Identify sites that demonstrate high performance in terms of their actions and results on soil health improvement and that may be converted into lighthouses.
- Establish for each living lab a baseline for the selected soil health challenge(s), in order to allow for an accurate assessment of the conditions and changes of soils in the different sites over time and for monitoring of progress towards the objectives of the respective living labs and the project overall. As appropriate, make use of the set of soil health indicators presented in the Soil Mission Implementation Plan. To this end, funded projects should work closely with the European Commission's Joint Research Centre (JRC) to contribute to their efforts on soil monitoring and the development of the European Union Soil Observatory (EUSO).
- Monitor and carry out an assessment of the effects of the developed innovative practices or introduced solutions on soil health and related ecosystem services. This should include a demonstration of the viability (e.g. technical, economic) of the proposed solutions.
- Propose strategies (e.g. financial, organisational) to ensure long-term sustainability and continuity of the living labs beyond the Horizon Europe funding, including the identification of possible business models and actions involving local authorities, business communities, SMEs, investors, entrepreneurs.
- Document in an easy and accessible way the developed solutions in order to facilitate their uptake by land managers and transmit the acquired knowledge to relevant

actors.

In line with the nature of living labs, proposals must implement the multi-actor approach. The list of stakeholders will vary depending on features specific to each living lab and can involve different types of actors such as researchers, land owners or land managers, industry (e.g. SMEs), public administrations, representatives of civil society (e.g. consumers, environmental NGOs). Care should be taken to describe the capabilities and roles of the different partners involved in the project, depending on their area of expertise. For example, while some partners may lead the conceptual work and coordinate the work within and across living labs, others may focus on carrying-out experiments, providing advice, testing and validating innovative solutions, or be involved in outreach activities.

To encourage and facilitate the involvement of different types of actors in the living labs, applicants are reminded of the different types of participation possible under Horizon Europe: This includes not only beneficiaries (or their affiliated entities) but also associated partners, third parties giving in-kind contributions, subcontractors and recipients of financial support to third parties.

Proposals may provide for financial support to third parties (FSTP) to implement one or more of the living lab activities described in this topic further to calls or, if duly justified, without a call for proposals. Applicants are reminded to consult the standard conditions for “financial support to third parties” set out in Annex B of the General Annexes including those that apply to FSTP calls.

Proposals should include a dedicated task and appropriate resources to collaborate with other Living Lab projects funded under this topic as well as with projects funded under other Work Programme topics of the Mission ‘A Soil Deal for Europe’ which are relevant to the chosen soil health challenge(s). In addition, proposals should seek for synergies with projects PREPSOIL, NATI00NS and NBSSOIL. Additionally, projects should cooperate and benefit from the services of a dedicated ‘Living Lab Support Structure’ to be established by the Specific Grant Agreement under this Work Programme.

Cooperation with relevant networks active at local level, such as EIP-AGRI operational groups, is encouraged in order to promote the involvement of key local stakeholders in living labs activities or in the dissemination of solutions. The projects should also build on other existing activities and ensure cooperation with relevant projects and partnerships, such as EIT Knowledge and Innovation Communities (EIT KICs) or the ‘European partnership on accelerating farming systems transition: Agroecology living labs and research infrastructures’, which will also support living labs.

Proposals should demonstrate a route towards open access, longevity, sustainability and interoperability of knowledge and outputs through close collaboration with the European Union Soil Observatory (EUSO).

Topic ID and title	HORIZON-MISS-2023-SOIL-01-09: Carbon farming in living labs				
Budget	EUR 12 million	Opening date	17 January 2023	Deadline 1	20 September 2023
Budget per project	EUR 12 million			Deadline 2	/
Type of action	Research and Innovations Actions (RIA)				
FTP subsector	F&F				
Keywords	carbon farming, land managers, land owners, biomass, soils, organic matter,				
FTP comments	Forests stands are mentioned as a potential living lab				
FTP SIRA 2030 Challenges addressed	1A – 3E			FTP relevance	Low
				Starting TRL	/
				End TRL	/

Expected Outcome:

Activities under this topic responds directly to the goal of the Mission ‘A Soil Deal for Europe’²⁰¹ of setting up 100 living labs by 2027 to lead the transition to healthy soils by 2030. In particular, it supports the Mission’s specific objective 2, “Conserve and increase soil organic carbon stocks”.

Activities should also contribute to meeting the European Green Deal ambitions and targets and more specifically those of the Farm to Fork Strategy, of the Commission’s Communication on Sustainable Carbon Cycles and of the upcoming regulatory proposal on the certification of carbon removals, as well as to Sustainable Development Goal (SDG) 13 on climate action. Activities performed within living labs will also support the Long Term Vision for EU’s Rural Areas (LTVRA).

In its 2021 Communication on Sustainable Carbon Cycles, the Commission sets out how to increase removals of carbon from the atmosphere, including by upscaling carbon farming to store more carbon in nature. Research and innovation will also contribute to this goal, providing further solutions to farmers and foresters. Measures to achieve this goal include: standardising the monitoring, reporting and verification methodologies needed to provide a clear and reliable certification framework for carbon farming, allowing for developing voluntary carbon markets; and provide improved knowledge, data management and tailored advisory services to land managers.

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

- Increased carbon sequestration and protection of carbon in soils, living biomass and dead organic matter, with environmental co-benefits safeguarded or enhanced, in different regions within the EU and Associated Countries where the selected living labs are operating.

- Increased capacities for participatory, interdisciplinary and transdisciplinary R&I approaches, allowing for effective cooperation between research, practice and policy, to tackle carbon farming challenges.
- Practice-oriented knowledge and tools are more easily available to land managers and contribute to an enhanced uptake of carbon farming.
- Strengthened collaborations between actors across territories and sectors as well as increased consideration of effective solutions for carbon farming in regions where the selected living labs are operating.
- Policy-makers in the EU and Associated Countries are more aware of local needs with regard to carbon farming and can use knowledge to design and implement more effective policies.

Scope:

Carbon farming can be defined as a green business model that rewards land managers for taking up improved land management practices, resulting in the increase of carbon sequestration in living biomass, dead organic matter and soils by enhancing carbon capture and/or reducing the release of carbon to the atmosphere, in respect of ecological principles favourable to biodiversity and the natural capital overall.

More research is still needed to increase removals of carbon from the atmosphere and achieve the EU's legally binding commitment to become climate neutral by 2050, as well as to close the gap between science and practice, between knowledge and implementation. The Mission 'A Soil Deal for Europe' proposes a novel approach to research and innovation in the area of soil health, including the implementation of living labs. Living labs have the potential to empower a green transition towards healthy soils by developing solutions in a co-creative manner, involving actors in real-life settings at territorial level to achieve large-scale impacts.

Nowadays, there exist various definitions and conceptualizations of living labs. However, three components are recognizable within the now well-established living labs research concept, which include (a) co-creation with a large set of stakeholders, (b) in real-life sites and (c) involving the end-user. For the purpose of the Mission 'A Soil Deal for Europe', "Soil health living labs" are defined as "user-centred, place-based and transdisciplinary research and innovation ecosystems, which involve land managers, scientists and other relevant partners in systemic research and co-design, testing, monitoring and evaluation of solutions, in real-life settings, to improve their effectiveness for soil health and accelerate adoption".

Living labs are collaborations between multiple partners that operate and undertake experiments on several sites at regional or sub-regional level²²⁵. Individual sites could be e.g. farms, forest stands, urban green or industrial areas, enterprises and other entities,

where the work is carried-out and monitored under real-life conditions regardless of the land size, tenure (land ownerships) or the type of economic activity.

Lighthouses in contrast are defined as “places for demonstration of solutions, training and communication that are exemplary in their performance in terms of soil health improvement”. They are individual, local sites (one farm, one forest exploitation, one industrial site, one urban city green area, etc.) that can either be part of a living lab or be situated outside a living lab.

According to the Mission Implementation Plan, living labs involve partners from different backgrounds, disciplines and/or sectors and are composed of 10 to 20 experimental sites. However, depending on the specific context (e.g. the land use(s)), applicants can propose living labs with fewer experimental sites. By working together in a carbon farming living lab, the various partners involved will be able to replicate actions and solutions, compare results, exchange good practices, validate methodologies and benefit from cross-fertilisation within a local/regional setting.

More specifically, the funded project(s) should:

- Set up four to five living labs (or more, as applicable to the land use(s) and purpose of the project) to work together on carbon farming, covering one or several land use types. The living labs shall be located in at least three different Member States and/or Associated Countries. Proposals should describe the rationale for cooperation across the various living labs and explain how the work undertaken will contribute to the Mission’s specific objective 2.
- Establish, based on the goals and objectives of the project(s), a detailed work plan with the activities to be undertaken in an interdisciplinary way, ensuring the co-design, co-development, and co-implementation of locally adapted solutions.
- Carry out participatory and transdisciplinary research and innovation in living labs in view of seeking practical solutions to carbon farming challenges, taking into account the relevant drivers and pressures. Moreover, challenges to the scaling up and the transferability of solutions should be addressed. Proposed strategies and solutions should be adapted to the different environmental, socio-economic and cultural contexts in which the living labs are operating. Living labs working in the area of agriculture are expected to address sustainable practices, applied across a range of farming systems, and benefit both conventional and organic farming.
- Identify sites that demonstrate high performance in terms of their actions and results on carbon farming and that may be converted into lighthouses.

- Establish for each living lab a baseline for carbon farming, in order to allow for an accurate assessment of the conditions and changes of soils in the different sites over time, and a clear monitoring of progress towards the objectives of the respective living lab and of the project overall. The funded project(s) should make use of relevant accounting methodologies for quantification of carbon removals, addressing the durability, additionality and environmental safeguards/co-benefits of carbon farming. They should work closely with the European Commission's Joint Research Centre (JRC) to contribute to the JRC's efforts on soil monitoring and the development of the European Union Soil Observatory (EUSO).
- Monitor and carry out an assessment of the innovative practices for carbon farming, taking into account the effects of ongoing climate change on carbon sequestration potential and dynamics. This should include a demonstration of the viability of the proposed solutions. Propose strategies (e.g. financial, organisational) to ensure long-term sustainability and continuity of the living labs beyond the Horizon Europe funding, including through identification of possible business models and actions involving local authorities, business communities, SMEs, investors, entrepreneurs, etc.
- Document in an easy and accessible way the newly developed solutions in order to facilitate their uptake by land managers and transmit the acquired knowledge to all relevant actors.

In line with the nature of living labs, proposals must implement the multi-actor approach. The list of stakeholders will vary depending on features specific to each living lab and can involve different types of actors such as researchers, land owners or land managers, industry (incl. SMEs), public administrations, representatives of civil society (e.g. consumers, environmental NGOs). Care should be taken to describe the capabilities and roles of the different partners involved in the project and their areas of expertise. For example, while some partners may lead the conceptual work and coordinate the work within and across living labs, others may focus on carrying out experiments, providing advice, testing and validating innovative solutions, or be involved in outreach activities.

To encourage and facilitate the involvement of different types of actors in the living labs, applicants are reminded of the different types of participation possible under Horizon Europe. This includes not only beneficiaries (or their affiliated entities) but also associated partners, third parties giving in-kind contributions, subcontractors and recipients of financial support to third parties.

Proposals may provide for financial support to third parties (FSTP) to implement one or more of the living lab activities described in this topic further to calls or, if duly justified, without a call for proposals. Applicants are reminded to consult the standard conditions for "financial

support to third parties” set out in Annex B of the General Annexes including those that apply to FSTP calls.

Proposals should include a dedicated task, and appropriate resources, on how they will collaborate with projects funded under other Work Programme topics of the Mission ‘A Soil Deal for Europe’ which are relevant to carbon farming and related challenges (such as, but not limited to, HORIZON-MISS-2022-SOIL-01-06: Network on carbon farming for agricultural and forest soils). In addition, proposals should seek synergies with projects PREPSOIL, NATI00NS and NBSSOIL. Additionally, projects should cooperate with and benefit from the services of a dedicated ‘Living Lab Support Structure’ to be established by the Specific Grant Agreement under this Work Programme.

Cooperation with relevant networks active at local level, such as EIP-AGRI operational groups, is encouraged, in order to promote the involvement of key local stakeholders in living labs’ activities or in the dissemination of solutions. The project should also build on other existing activities and ensure cooperation with relevant projects and partnerships, such as EIT Knowledge and Innovation Communities (EIT KICs), in particular EIT Food and its regenerative agriculture activities, or the ‘European partnership on accelerating farming systems transition: Agroecology living labs and research infrastructures’ which will also support living labs.

Proposals should demonstrate a route towards open access, longevity, sustainability and interoperability of knowledge and outputs through close collaboration with the European Union Soil Observatory (EUSO).

Missions' Joint Calls

Joint Call between Mission Restore our Ocean and Waters by 2030, Mission Adaptation to Climate Change and Mission A Soil Deal for Europe

Topic ID and title	HORIZON-MISS-2023-CLIMA-OCEAN-SOIL-01-01: Mission Climate adaptation, Mission Ocean & waters and Mission Soil Deal for Europe - Joint demonstration of an integrated approach to increasing landscape water retention capacity at regional scale				
Budget	EUR 15 million	Opening date	17 January 2023	Deadline 1	20 September 2023
Budget per project	EUR 15 million			Deadline 2	/
Type of action	Innovation Actions (IA)				
FTP subsector	F&F				
Keywords	landscape management, water retention, EU Biodiversity Strategy, EU Soil Strategy, local communities				
FTP comments	The topic mentions foresters and landowners and it would be beneficial if some forest manager representatives are involved in future project activities.				
FTP SIRA 2030 Challenges addressed	1C			FTP relevance	Medium
				Starting TRL	/
				End TRL	6-7

Expected Outcome:

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

- Demonstrated effective and inclusive integrated approaches to the management of landscape, soil, water and vegetation at a regional level, to increase the resilience to climate change impacts on soils, waters, habitats and biodiversity;
- Demonstrated effective nature-based solutions and ecological approaches to increase landscape water retention capacity, including soil water retention capacity;
- Demonstrated economic feasibility of these solutions, ensuring their long term sustainability;
- Enhanced implementation of the European Green Deal, the EU Adaptation Strategy, the EU Biodiversity Strategy, EU legislation for the protection of freshwaters (such as the EU Water Framework Directive and EU Groundwater Directive) and the EU Soil Strategy for 2030;
- Better information and greater mobilisation of all relevant actors, including citizens, local and regional authorities and planning bodies, farmers, foresters, land owners, business owners and economic operators, soil protection and management organisations, water management and planning bodies, for an effective and

sustainable governance of soil, water and all other landscape components to achieve climate change resilience and increase water retention in the landscape.

Scope:

This joint topic relates to the Adaptation to Climate Change Mission's third objective, aiming to support at least 75 full-scale deep demonstrations of climate resilience, to the Mission Ocean & Waters' objective 1, protect and restore marine and freshwater ecosystems and biodiversity, and objective 2, prevent and eliminate pollution of marine and freshwaters. The topic also relates to several specific objectives of the Mission "A Soil Deal for Europe", including to the objectives to reduce soil degradation and soil sealing and to prevent erosion. It also contributes to the objectives of the Water Framework Directive (WFD)²⁴⁰, including achieving Good Ecological and Chemical Status and restoration of aquatic ecosystems, and to the objectives of the Groundwater Directive as regards improvement of chemical status of ground waters.

Landscape water retention capacity is understood as the ability of water bodies, soils and other ecosystems to retain water after it has fallen as precipitation; it is fundamental for the protection of biological diversity as life depends on water. High landscape water retention capacity prevents accelerated surface run-off, increases water content in soils and surface and ground water availability for vegetation, improves the quantity and quality of groundwater and aquifer recharge, reduces soil erosion and nutrient run off into surface water bodies, and improves local micro-climate by reducing local air and biomass temperature. As such, it has the potential to prevent and mitigate impacts of extreme hydrological events such as floods and to act as a buffer against heat extremes. Permanent vegetation in a landscape, such as forest areas, wetlands and permanent grasslands, significantly improves water retention capacity.

Projects should demonstrate socio-ecological approaches and nature-based solutions to increase landscape and soil water retention capacity, leading to improvement of quality and quantity of ground and surface waters in the area where they are deployed, and boosting resilience to climate change impacts. A combination of nature-based measures with hybrid solutions and relevant Blue-Green engineering may be considered, provided these combined solutions are sustainable and provide adequate social and environmental safeguards.

The consortium must carry out demonstration activities in 3 different Member States or Associated Countries, involving and including in the consortium partners from these respective countries. Proposals under this topic should comprise full-scale demonstration of innovative solutions in real conditions of landscapes in the countries selected for demonstration activities, with specific impacts leading to a measurable increase of the

resilience and adaptation capacity of the areas involved, whilst contributing to climate change mitigation, surface and ground water quality, soil health improvement and biodiversity protection and conservation. Applying a multi-actor approach, demonstrations should be carried out at the level of socio-ecological territorial units that are large enough to allow covering the different living and non-living systems (soil, water, vegetation and other biota, human communities, etc.) in a landscape and the complex web of relations among them (e.g. a region or a sea/river basin).

Planning, implementation and management of effective measures to increase landscape water retention capacity requires involvement of various stakeholders and their expertise, such as land, owners, spatial planning and other local and regional authorities, soil protection and management experts, water management and planning bodies, landscape planning experts, farmers and forest managers. Local authorities and local communities should be involved in the design and implementation of the solutions, to ensure that these are well suited for local needs and conditions and are “owned” by the local communities. Activities should, therefore, promote the involvement of local communities as well as the relevant authorities, to consider with them the impact of intended actions, and to co-create measures while taking local communities’ needs and values on board. The proposals should involve citizens, including where appropriate European volunteer/solidarity corps, and relevant citizen science activities.

The project(s) should also identify, create and disseminate best-practice examples for end-users (e.g. farmers and other land managers, decision-makers, water management authorities, landscape planners) to ensure landscape water retention capacity in the long term, including soil water retention capacity, with a view to boosting resilience to climate change, preventing biodiversity loss and promoting at the same time socio-economic transition processes in an ecosystem-based and circular economy perspective, and promote those best practices among the end users.

The demonstration sites established within the project(s) funded under this topic could qualify as “lighthouses”²⁴² in the sense of the Mission A Soil Deal for Europe if and when they comply with the criteria laid down in the Implementation Plan of that Mission.

Proposals should both:

- Involve at least five “associated regions”²⁴³ as third parties, to showcase the feasibility, replicability and possibility to scale up the solutions developed. The consortium will proactively reach out to these associated regions to enable them to follow closely the project and its demonstration activities, transferring knowledge to them and technical assistance to build capacity and to implement integrated approaches for landscape, water and soil management to increase landscape water retention capacity in their territories; and

- Draw up an action plan and roadmap to replicate and scale up the solutions within the 'associated regions' and beyond them, to increase landscape water retention capacity, including soil water retention capacity.

As a mechanism to provide knowledge transfer and technical assistance to the associated regions, the selected project should provide support to third parties in the form of grants. The maximum amount of the envisaged Financial Support to Third Parties is EUR 100 000 per third party for the entire duration of the action. Proposals should outline the process for selection of the third parties to which financial support would be granted, based on the principles of transparency, objectivity and fairness.

The project(s) funded under this topic should address all the below points:

- Contribute to the networking and coordination activities and joint activities of the three Missions, including by establishing links with projects funded under Horizon 2020²⁴⁴, including the European Green Deal call, and under Horizon Europe, where they are relevant for climate adaptation and soil health knowledge and solutions;
- Include a mechanism and resources to establish links with the Implementation Support Platform of the Mission Ocean and Waters and build links with other activities of this Mission to maximize synergies;
- Include a mechanism and the resources to establish operational links with the Climate- ADAPT platform (run by the European Environment Agency (EEA) together with DG CLIMA) that will act as a central element for the monitoring, support and visualisation of the Adaptation to Climate Change Mission progress in European Regions. To this purpose, projects will feed their results to the Climate-ADAPT and EEA assessments and should include a mechanism to establish links with the Mission Adaptation to Climate Change Implementation Platform;
- Include a mechanism and resources to establish links with the Implementation Platform being established for the Mission A Soil Deal for Europe; and
- Support the Ocean and Water Knowledge System²⁴⁵ and the EU Soil Observatory²⁴⁶, in particular by contributing to knowledge creation and data collection.