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Annex VI

Horizon Europe

Work Programme 2025

7. Digital, Industry and Space

DISCLAIMER

This draft has not been adopted or endorsed by the European Commission. Any views expressed are the preliminary views of the Commission services and may not in any circumstances be regarded as stating an official position of the Commission. The information transmitted is intended only for the Member State or entity to which it is addressed for discussions and may contain confidential and/or privileged material.

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Table of contents

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DRAFT

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Introduction

Introduction to be added.

Please note that, depending on budgetary availability, some smaller topic(s) supporting SMEs may be added in later versions of the Work Programme. Other actions not subject to calls for proposals may also be added.

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Calls

Call - INDUSTRY-HADEA

HORIZON-CL4-2025-01

Overview of this call[1]

Proposals are invited against the following Destinations and topic(s):

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million)[2]	Indicative number of projects expected to be funded
		2025		
Opening: 22 May 2025 Deadline(s): 23 Sep 2025				
Destination 1: Achieving global leadership in climate-neutral, circular and digitised industrial and digital value chains				
HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-01: Integrated approaches for remanufacturing (Made in Europe Partnership) (IA)	IA	30.00	5.00 to 7.00	6
HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-02: Physical and cognitive augmentation in advanced manufacturing (Made in Europe Partnership) (RIA)	RIA	30.00	4.00 to 6.00	7
HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-05: Advanced manufacturing technologies for leadership	RIA	25.00	5.00 to 6.50	4

[1] The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for 2025.

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

of EU manufacturers in products for the net-zero industry (Made in Europe Partnership) (IA)				
HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-11: Enhanced logistics and operations of construction sites (IA)	IA	13.00	Around 6.50	2
HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-31: From heat-driven processes to the use of mechanical and electric forces (Processes4Planet partnership) (IA)	IA	25.00	8.00 to 10.00	3
HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-32: Green and resilient flexible production processes (Processes4Planet partnership) (IA)	IA	25.00	6.00 to 8.00	4
HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-33: Integrated use of renewable energy carriers in industrial sites (Processes4Planet partnership) (RIA)	RIA	25.00	8.00 to 10.00	3
HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-34: Smart integration of net zero technologies into Energy Intensive industries (Processes4Planet and Made in Europe partnership) (IA)	IA	25.00	5.00 to 9.00	4
HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-35: Embedding upcycling technologies into viable business (Processes4Planet partnership) (IA)	IA	34.00	8.00 to 10.00	4
HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-36: Safe and clean processing technologies and products (Processes4Planet partnership) (RIA)	RIA	22.00	6.00 to 8.00	4
HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-37: Solving issues in carbon-neutral iron and steel making processes with diverse input materials of	RIA	28.00	13.00 to 14.00	2

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varying quality (Clean Steel Partnership) (RIA)				
HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-38: Synergies and mutual learning with national and regional initiatives in Europe on Industrial decarbonisation (Processes4Planet and Clean Steel partnerships) (CSA)	CSA	2.00	Around 2.00	1
HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-39: Towards human-centric, sustainable and resilient energy-intensive industries (Processes4Planet and Clean Steel partnerships) (CSA)	CSA	2.00	Around 2.00	1
Destination 2: Achieving technological leadership for Europe's open strategic autonomy in raw materials, chemicals and innovative materials				
HORIZON-CL4-INDUSTRY-2025-01-MATERIALS-31: Digitally enabled local-for-local textile and apparel production (IA)	RIA	10.00	Around 5.00	2
HORIZON-CL4-INDUSTRY-2025-01-MATERIALS-42: Innovative Advanced Materials (IAMs) for product monitoring, smart maintenance and repair strategies in the construction sector (RIA)	RIA	20.00	Around 6.00	4
HORIZON-CL4-INDUSTRY-2025-01-MATERIALS-43: Innovative Advanced Materials (IAMs) for robust, fast curing sealants and coatings for manufacturing and final assembly (IA)	IA	20.00	Around 6.00	4
HORIZON-CL4-INDUSTRY-2025-01-MATERIALS-44: Innovative Advanced Materials Innovation Procurement (CSA)	CSA	2.00	Around 2.00	1
HORIZON-CL4-INDUSTRY-2025-01-MATERIALS-45: Materials Commons (IA)	IA	20.00	Around 20.00	1
HORIZON-CL4-INDUSTRY-2025-01-MATERIALS-51: Development of safe and sustainable by design alternatives to Perfluoroalkyl and Polyfluoroalkyl	IA	30.00	Around 7.00	3

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Substances (PFAS) (IA)				
HORIZON-CL4-INDUSTRY-2025-01-MATERIALS-52: Accelerate the uptake of life-cycle assessment (LCA) for Safe and Sustainable by Design (SSbD) chemicals and materials and resulting products (RIA)	RIA	15.00	4.00 to 5.00	3
HORIZON-CL4-INDUSTRY-2025-01-MATERIALS-61: Technologies for critical raw materials and strategic raw materials from End of Life products (IA)	IA	24.00	7.00 to 8.00	4
HORIZON-CL4-INDUSTRY-2025-01-MATERIALS-62: Strategic Partnerships for Raw Materials: Innovative Approaches for sustainable production of Critical Raw Materials (IA)	IA	30.00	7.00 to 8.00	4
HORIZON-CL4-INDUSTRY-2025-01-MATERIALS-63: Innovative solutions for the sustainable production for Semiconductor raw materials (IA)	IA	24.00	7.00 to 8.00	3
HORIZON-CL4-INDUSTRY-2025-01-MATERIALS-64: EU Co-funded Partnership on raw materials for the green and digital transition (Programme Co-fund action)	COFUND	45.00	Around 45.00	1
Destination 4: Achieving open strategic autonomy in digital and emerging enabling technologies				
HORIZON-CL4-INDUSTRY-2025-01-DIGITAL-61: AI Foundation models in materials science (RIA)	RIA	12.00	4.00 to 6.00	3
HORIZON-CL4-INDUSTRY-2025-01-DIGITAL-62: Facilitated cooperation for AI in Science (CSA)	CSA	3.00	Around 3.00	1
Destination 6: Digital and industrial technologies driving human-centric innovation				
HORIZON-CL4-INDUSTRY-2025-01-HUMAN-61: Standardisation landscape analyses tool (CSA)	CSA	1.00	Around 1.00	1

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HORIZON-CL4-INDUSTRY-2025-01-HUMAN-62: Artificial Intelligence for knowledge valorisation (CSA)	CSA	2.00	Around 2.00	1
HORIZON-CL4-INDUSTRY-2025-01-HUMAN-63: Value creation pilots for scaling up innovative solutions (CSA)	CSA	2.00	Around 2.00	1
HORIZON-CL4-INDUSTRY-2025-01-HUMAN-64: Pilot initiatives on Technology Infrastructures (CSA)	CSA	2.00	Around 2.00	1
HORIZON-CL4-INDUSTRY-2025-01-HUMAN-65: Network of Industry 5.0 system innovation hubs (IA)	CSA	2.00	Around 2.00	1
Overall indicative budget		550.00		

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

Call - SPACE-HADEA

HORIZON-CL4-2025-02

Overview of this call[3]

Proposals are invited against the following Destinations and topic(s):

Topics	Type of Action	Budgets (EUR million)		Expected EU contribution per project (EUR million)[4]	Indicative number of projects expected to be funded
		2024	2025		
Opening: 03 Jun 2025 Deadline(s): 13 Nov 2025					
Destination 5: Open Strategic Autonomy in Developing, Deploying and Using Global Space-Based Infrastructure, Services, Applications and Data					
HORIZON-CL4-2025-02-SPACE-11: CSA on access to European spaceports	CSA		1.00	Around 1.00	1
HORIZON-CL4-2025-02-SPACE-12: Digital solutions for autonomy for space transportation systems, design and simulation tools - Digital enablers and building blocks	RIA		3.00	1.00 to 3.00	2
HORIZON-CL4-2025-02-SPACE-13: Digital solutions for autonomy for space transportation systems, design and simulation tools – targeting demonstration	IA		7.00	4.00 to 7.00	2
HORIZON-CL4-2025-02-SPACE-21: ISOS Pilot Mission Detailed Design – Servicing component	RIA		18.00	7.00 to 9.00	2
HORIZON-CL4-2025-02-SPACE-22: ISOS Pilot Mission Detailed Design –	RIA		17.50	12.00 to 17.50	1

[3] The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for 2025.

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

HOST component					
HORIZON-CL4-2025-02-SPACE-23: ISOS Pilot Mission Detailed Design – Logistics component	RIA		12.00	10.00 to 12.00	1
HORIZON-CL4-2025-02-SPACE-24: ISOS Pilot Mission Detailed Design – satAPPS component	RIA		5.00	2.00 to 3.00	2
HORIZON-CL4-2025-02-SPACE-31: Digital enablers and building blocks for Earth Observation and Satellite telecommunication for Space solutions	RIA		6.00	1.00 to 5.00	3
HORIZON-CL4-2025-02-SPACE-32: Preparing demonstration missions for collaborative Earth Observation and Satellite telecommunication for Space solutions	IA		11.00	2.00 to 6.00	3
HORIZON-CL4-2025-02-SPACE-41: Copernicus Climate Change Service (C3S) evolution: new and innovative processing and methods for future Sentinels and other satellites for reanalyses	RIA		10.00	Around 10.00	1
HORIZON-CL4-2025-02-SPACE-42: Copernicus Atmosphere Monitoring Service (CAMS) evolution: improved soil-vegetation-atmosphere modelling and data assimilation of atmospheric constituents	RIA		3.00	Around 3.00	1
HORIZON-CL4-2025-02-SPACE-43: Copernicus Anthropogenic CO_2 Emissions Monitoring & Verification Support (CO2MVS) capacity: new and innovative methods to estimate the impact of fires on vegetation and related carbon fluxes	RIA		3.00	Around 3.00	1
HORIZON-CL4-2025-02-SPACE-44: Copernicus Marine Environment Monitoring Service (CMEMS)	RIA		5.00	Around 5.00	1

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evolution: new and innovative ocean data assimilation techniques					
HORIZON-CL4-2025-02-SPACE-45: Supporting the AI/ML digital transition of Copernicus Services	RIA		12.00	Around 12.00	1
HORIZON-CL4-2025-02-SPACE-46: Innovative Earth observation services in support of maritime litter detection and ship source pollution policies	IA		5.00 [5]	Around 5.00	1
HORIZON-CL4-2025-02-SPACE-71: HORIZON-CL4-YEAR-SPACE-XX-XX: Space Critical EEE Components and Related Technologies for EU non-dependence	RIA		10.00	N/A	Not relevant
HORIZON-CL4-2025-02-SPACE-72: HORIZON-CL4-YEAR-SPACE-XX-XX: Space Critical Equipment and Related Technologies for EU non-dependence	RIA		10.00	N/A	Not relevant
HORIZON-CL4-2025-02-SPACE-81: EU-Japan cooperation on the exploitation of Quantum Space Gravimetry data	RIA		0.50	0.45 to 0.50	1
Heading 2 of Space - Acting in Space					
HORIZON-CL4-2025-02-SPACE-25: HORIZON-CL4-SPACE-2025-01-25: ISOS Pilot Mission – Coordination and Support	CSA	2.50		2.00 to 2.50	1
Overall indicative budget		2.50	139.00		

General conditions relating to this call	
Admissibility conditions	The conditions are described in General Annex A.
Eligibility conditions	The conditions are described in General

[5] Of which EUR 5.00 million from the 'Climate, Energy and Mobility' budget.

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

Call - DIGITAL - CNECT

HORIZON-CL4-2025-03

Overview of this call[6]

Proposals are invited against the following Destinations and topic(s):

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million)[7]	Indicative number of projects expected to be funded
		2025		
Opening: 10 Jun 2025 Deadline(s): 13 Nov 2025				
Destination 2: Achieving technological leadership for Europe's open strategic autonomy in raw materials, chemicals and innovative materials				

6 The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for 2025.

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

HORIZON-CL4-2025-03-MATERIALS-46: Innovative Advanced Materials (IAMs) for photonics, enabling low-power and ultra-broadband performance for telecommunication (IA/RIA) (New European Partnership on innovative advanced materials)	RIA	10.00	Around 5.00	2
HORIZON-CL4-2025-03-MATERIALS-47: Innovative Advanced Materials (IAMs) for conformable, flexible or stretchable electronics (RIA) (New European Partnership on innovative advanced materials)	RIA	10.00	Around 5.00	2
Destination 3: Developing an agile and secure single market and infrastructure for data-services and trustworthy artificial intelligence services				
HORIZON-CL4-2025-03-DATA-08: Large-scale pilots for supply end-to-end infrastructures integrating device, network computing and communication capabilities for Telco Edge Cloud deployments, as a basis for Connected Collaborative Computing Networks (3C networks) (RIA)	RIA	80.00	Around 80.00	1
HORIZON-CL4-2025-03-DATA-09: Alignment of stakeholders towards the supply-side large-scale pilot of end-to-end infrastructures integrating device, network computing and communication capabilities (CSA)	CSA	2.50	1.80 to 2.50	1
HORIZON-CL4-2025-03-DATA-10: Roadmap for next generation computing technologies from IoT device level to edge to cloud to HPC (CSA)	CSA	2.50	1.80 to 2.50	1
HORIZON-CL4-2025-03-DATA-11: Open Internet Stack: development of technological commons/open-source 3C building blocks (RIA)	RIA	10.00	Around 10.00	1
HORIZON-CL4-2025-03-DATA-12: Preparing the Advancement of the state of the art of submarine cable infrastructures (CSA)	CSA	2.10	1.90 to 2.10	1
HORIZON-CL4-2025-03-DATA-13: Fostering	IA	45.00	7.00 to 9.00	6

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Innovative and Compliant Data Ecosystems (IA) (AI, Data and Robotics Partnership)				
Destination 4: Achieving open strategic autonomy in digital and emerging enabling technologies				
HORIZON-CL4-2025-03-DIGITAL-EMERGING-01: Continuation of the Quantum Technologies Flagship (CSA)	CSA	4.00	Around 4.00	1
HORIZON-CL4-2025-03-DIGITAL-EMERGING-02: Quantum Computing – complementing the quantum computing FPAs with the development of a technology agnostic software stack (RIA)	RIA	10.00	4.00 to 6.00	1
HORIZON-CL4-2025-03-DIGITAL-EMERGING-03: International cooperation: joint research and development with Korea (RIA)	RIA	8.00	2.50 to 2.70	3
HORIZON-CL4-2025-03-DIGITAL-EMERGING-04: Post-exascale HPC (CSA)	CSA	2.50	Around 2.50	1
HORIZON-CL4-2025-03-DIGITAL-EMERGING-07: Enhanced Learning Strategies for General Purpose AI: Advancing GenAI4EU (RIA) (AI/Data/Robotics Partnership)	RIA	30.00	Around 15.00	2
Destination 6: Digital and industrial technologies driving human-centric innovation				
HORIZON-CL4-2025-03-HUMAN-14: Core technologies for virtual worlds (RIA) (Virtual Worlds and Photonics Partnerships)	RIA	43.00	5.00 to 6.00	7
HORIZON-CL4-2025-03-HUMAN-15: GenAI4EU: Generative AI for Virtual Worlds: Advanced technologies for better performance and hyper personalised and immersive experience (IA) (AI/Data/Robotics & Virtual Worlds Partnerships)	IA	20.00	4.00 to 5.00	5
HORIZON-CL4-2025-03-HUMAN-16: Drive the evolution of the internet towards open and interoperable Web 4.0 and Virtual Worlds : building blocks in priority areas (RIA) (Virtual	RIA	14.50	Around 3.00	4

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Worlds Partnership)				
HORIZON-CL4-2025-03-HUMAN-17: Specific support for the Virtual Worlds Partnership and the Web 4.0 initiative (CSA) (Virtual Worlds Partnership)	CSA	2.50	Around 2.50	1
HORIZON-CL4-2025-03-HUMAN-18: GenAI4EU central Hub (CSA) (AI/Data/Robotics Partnership)	CSA	3.00	Around 3.00	1
HORIZON-CL4-2025-03-HUMAN-19: International cooperation in semiconductors (CSA)	CSA	3.00	Around 3.00	1
Overall indicative budget		302.60		

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

Call - DIGITAL - HADEA

HORIZON-CL4-2025-04

Overview of this call[8]

Proposals are invited against the following Destinations and topic(s):

Topics	Type of Action	Budgets (EUR million)	Expected EU contribution per project (EUR million)[9]	Indicative number of projects expected to be funded
		2025		
Opening: 10 Jun 2025 Deadline(s): 13 Nov 2025				
Destination 3: Developing an agile and secure single market and infrastructure for data-services and trustworthy artificial intelligence services				
HORIZON-CL4-2025-04-DATA-02: Empowering AI/generative AI along the Cognitive Computing continuum (RIA) (AI/Data/Robotics Partnership)	RIA	30.00	6.00 to 8.00	4
HORIZON-CL4-2025-04-DATA-03: Software Engineering for AI and generative AI (RIA) (AI/Data/Robotics Partnership)	RIA	15.00	4.00 to 6.00	3
Destination 4: Achieving open strategic autonomy in digital and emerging enabling technologies				
HORIZON-CL4-2025-04-DIGITAL-EMERGING-01: Advanced sensor technologies and multimodal sensor integration for multiple application domains (IA) (Photonics Partnership)	IA	25.00	4.00 to 6.00	5
HORIZON-CL4-2025-04-DIGITAL-EMERGING-04: Assessment methodologies for General Purpose AI capabilities and risks	RIA	7.00	3.00 to 4.00	2

[8] The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for 2025.

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

(RIA) (AI/Data/Robotics Partnership)				
HORIZON-CL4-2025-04-DIGITAL-EMERGING-05: Soft Robotics for Advanced physical capabilities (IA) (AI/Data/Robotics Partnership)	RIA	20.00	Around 10.00	2
HORIZON-CL4-2025-04-DIGITAL-EMERGING-06: Challenge-Driven GenAI4EU Booster (RIA) (AI/Data/Robotics Partnership)	RIA	30.00	Around 15.00	2
HORIZON-CL4-2025-04-DIGITAL-EMERGING-07: GenAI4EU in Robotics and industrial automation (RIA) (AI/Data/Robotics & Made in Europe Partnerships)	RIA	85.00	40.00 to 45.00	3
Destination 6: Digital and industrial technologies driving human-centric innovation				
HORIZON-CL4-2025-04-HUMAN-08: GenAI for Africa	RIA	5.00	1.00 to 2.00	2
Overall indicative budget		217.00		

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

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Destinations

Destination 1: Achieving global leadership in climate-neutral, circular and digitised industrial and digital value chains

Supporting net-zero manufacturing is a key objective of the Net-Zero industry Act and has a crucial role to play in the transition towards a green and sustainable society, going from 'smart factory' to a 'smart sustainable value chain'. This includes flexible and 'first-time right' manufacturing systems and processes for innovative and sustainable materials, components and products, based on advances in manufacturing technologies, data spaces and digital twins. Smart manufacturing will help develop the materials and products needed to support net-zero and less polluting industries. Breakthrough technologies to be exploited beyond 2030 will also play an important role. There is much scope for improvement in circularity technologies applicable to different value chains, with special attention needed for product design, re-use, disassembly, remanufacturing/upgrading, recycling, and 'Zero-X' – zero defects, zero breakdowns and zero waste. 'Servitisation' – the transformation from selling physical products to providing services for and through them – needs the combination of green and recycling technologies enabled by leveraging the data available in the industrial environment. Digital technologies, like big data, advanced computing, and networking (including quantum), AI, robotics, photonics and the industrial virtual worlds will transform the practices of research, design and engineering, with better performing net-zero solutions and increased productivity in all sectors. Quick-response services can support hyperflexible production using, e.g. trustworthy AI and digital twins, with digitally enabled certification and qualification of processes and products. The development of new and cross-cutting technologies will boost the transformation of existing value chains and the creation of new ones. Energy-intensive industries need to embrace the circular economy as a key pillar in the design of their value chains. This will be fundamental to their resource efficiency (material, energy and water). Particularly important in this context is the innovative upcycling of secondary raw material and waste and the development of sustainable and resource-efficient industrial processes. Further development and deployment of technologies identified in the ERA industrial technology roadmaps for circular technologies and for low-carbon technologies will be essential to achieve this goal. Manufacturing processes, supply chains, cyber-physical systems or cities will become more climate neutral and less polluting, and circular solutions will include AI and digital twins, and the deployment of common European data spaces like those under the Digital Europe Programme. These and other breakthrough technologies will be key for developing and implementing the pathways and new value chains that the Hubs4Circularity project will require. The EU has set an ambitious goal for Europe to become the first climate-neutral continent by 2050. In some areas the key solutions for achieving significant reductions in emissions are already in the market. In crucial parts of the economy, as is the case for energy-intensive industries, many of the tools needed for such a significant reduction are still at an earlier stage of industrial or commercial development. To successfully move from innovation to deployment, a more effective transfer from small[1]scale industrial demonstrators to first-of-a-kind climate-neutral demonstrators is

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needed. In line with the EC 'demonstrators report', the aim will be to consolidate the relevant work strands to accompany the deployment mechanism for these industrial technologies in FP10. It is also important to pursue breakthrough innovations and completely new approaches, with a high capacity to drastically reduce air pollutants, CO2 and GHG emissions at the source. Research and pilot projects would be needed on how low-tech alternatives combined with high-tech and data-driven innovation can reduce the climate and environmental footprint of products and sectors. Across industries, the human dimension (including gender differences) will be stressed via the Industry 5.0 paradigm.

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.

Manufacturing

Proposals are invited against the following topic(s):

HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-01: Integrated approaches for remanufacturing (Made in Europe Partnership) (IA)

Call: INDUSTRY 2025
Specific conditions

Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 5.00 and 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 30.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to start at TRL 5 and achieve TRL 6-7 by the end of the project – see General Annex B.

Expected Outcome: The manufacturing industry should benefit from the following outcomes:

- Enable an industrial ecosystem[10] to double the volume of remanufactured components compared to 2021, for the sectors and products considered;
- Stimulate new synergies for circularity in manufacturing industries;
- Increase significantly the capability in Europe to implement remanufacturing technologies for retaining, reusing, upgrading or adapting the function of products and components;
- Double the capacity to remanufacture in Europe, leading to enhanced industrial resilience, competitiveness and strategic autonomy; and
- Support skills and education capabilities for remanufacturing.

Scope: Remanufacturing (including de-manufacturing) is the rebuilding of products using combinations of reused, repaired and new components. Remanufacturing aims to retain the usefulness of both products and components and is an essential step in achieving full industrial circularity. Ultimately, remanufacturing is expected to reduce the level of resource consumption, as well as the carbon footprint of products and logistic chains. Such approaches will strengthen industrial resilience by building up a remanufacturing capacity in Europe.

Proposals should demonstrate cutting-edge remanufacturing approaches, covering product design, de-manufacturing and appropriate manufacturing technologies, and business models. Repurposing of products and components may also be considered. This approach calls for remanufacturing technologies at the factory level, as well as for their integration into circular value loops – within specific industrial sectors or across industrial sectors. In general, the approaches should integrate traditional manufacturing processes, such as additive manufacturing, machining and welding, with digitisation.

Recycling technologies for the generation of secondary raw materials are excluded.

[10] ecosystems acknowledged under the European Industrial Strategies

Proposals should address all of the following:

- Remanufacturing technologies and processes, building on advances in data sharing and AI;
- Mass de-manufacturing, such as disassembly, separation and sorting;
- Capability to produce high-quality products from a wide range of resources (new and remanufactured components and materials);
- Methodologies to facilitate decisions made at the end-of-use or end-of-life phase at the level of components or systems;
- Repurposing of products; such repurposing can take place at the level of components or systems;
- Measurement, verification and inspection approaches assuring high quality, traceability and compliance with quality standards;
- Stringent data sourcing, interoperability and processing, coupled to robust AI technologies; (leveraging on existing ontologies and through the implementation of the FAIR data principles[11]);
- International standards, building on existing standards or contributing to future standardisation, with a focus on remanufacturing standards; and
- new sets of skills required for remanufacturing implementation at the European level

Proposals should consider

- The EU regulatory framework, notably the Ecodesign for Sustainable Product Regulation[12] and the EU waste/sectoral legislation[13];
- The Ecodesign approach, especially the circular-by-design approach including modularity, repairability, adaptability and exchangeability of components as well as refurbishment and repurposing of products or components; and
- The Digital Product Passport: information about products along their overall lifecycle needs to be collected along the remanufacturing operations.

Proposals should include a business case and exploitation strategy, as outlined in the introduction to this Destination. It is essential that the business model address the entire lifecycle of remanufacturing, including logistics. They should assess the circularity and decarbonisation that can be achieved, as well as the economic case and competitiveness, and

11 Turning FAIR into reality: https://ec.europa.eu/info/sites/default/files/turning_fair_into_reality_1.pdf
12 https://ec.europa.eu/environment/publications/proposal-ecodesign-sustainable-products-regulation_en
13 https://environment.ec.europa.eu/topics/waste-and-recycling/waste-law_en

make a corresponding contribution to the standardisation of lifecycle performance metrics. Regarding decarbonisation, proposals should address the expected reductions in energy consumption and GHG emissions.

Proposals may optionally cover the design of products for circularity. Points to consider in this case are circularity by design; prioritising the use of renewable or reusable materials and recyclable or reusable components; increased adaptability, exchangeability and lifetime of components.

Where relevant, proposals are encouraged to build on, or seek collaboration with, existing projects and develop synergies with other relevant European, national or regional initiatives and funding programmes. In particular, links are encouraged with

- the projects funded under earlier relevant topics, for example the topic on re-manufacturing, HORIZON-CL4-2023-TWIN-TRANSITION-01-04: Factory-level and value chain approaches for remanufacturing; or
- the Digital Europe programme, e.g. in the area of Manufacturing Data Spaces.

To address the requirements above related to business models and to relevant skills (and where applicable to design), appropriate contributions from Social Sciences and Humanities (SSH) are indispensable. Where appropriate social partners or social innovation may be considered.

International cooperation is encouraged, especially with Japan, [South Korea] or Taiwan.

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

HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-02: Physical and cognitive augmentation in advanced manufacturing (Made in Europe Partnership) (RIA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 4.00 and 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 30.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to start at TRL 3 and achieve TRL 5-6 by the end of the project – see General Annex B.
Legal and financial set-up of the Grant	The rules are described in General Annex G. The following exceptions

Agreements	apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [14].

Expected Outcome: Manufacturing industry should benefit from the following outcomes:

- Empower workers at all levels in factories, both individuals and teams, through breakthrough augmentation technologies embodying the next stage in human-machine interactions;
- Enhance, with the help of these technologies and related contributions from Social Sciences and Humanities (SSH), the flexibility, inclusiveness, safety and well-being of workers in the industrial environment, leading to more attractive jobs in the EU and attracting talents from new generations (e.g. Generation Z);
- Foster the human-centric aspect of the Industry 5.0 model, through insights into how technology affects the working environment and the organisation, and into how technology can support the worker in their career. (including the associated meaningful job profiles).

Scope: The rising complexity of manufacturing operations requires workers to adapt to the introduction of new breakthrough technologies, machines, processes, and production environments. In addition, labour shortages are growing. The development of a human-centric culture that places the humans at the centre of the manufacturing operation is crucial. Augmentation technologies supports and empowers the workforce, leading to more high-quality jobs and prosperity beyond efficiency. They can relieve people of non-creative tasks or reduce human strain and stress and potential risks in the workplace. Augmentation technologies can therefore produce benefits for both workers and managers and can become the most effective ways of supporting, or amplifying, human abilities.

Proposals should develop breakthrough technologies to augment human capabilities and skills. Proposals should cover all of the following aspects:

- Develop breakthrough solutions (based on e.g. mechatronics andphotonics) for human-centric approaches including innovative perception technologies to sense the shopfloor environment and to perform prediction of intention of humans, also leading to enhanced worker safety;

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

- Develop innovative methodologies, potentially using AI, to provide reasoning capabilities and to control the behaviour of the developed systems, to support humans and to interact and communicate with them, improving efficiency, sharing of knowledge, inclusiveness, accessibility and flexibility;

- Assess needs of managers and workers at the beginning of the design phase and involve them at all stages up to the development of a prototype, ensuring that both workers and managers have the right skills to implement new solutions;

- Develop new methodologies to perform an assessment of augmentation technologies and to explore the value-added, potentially leading to new standards for validation of the developed systems.

Digital-twins models can be potentially used in the development of new assessment methodologies to perform validation in a virtual scenario.

Proposals should take into account Social Sciences and Humanities (SSH) contributions regarding human-related barriers for the uptake of augmentation technologies in industrial environments, such as ergonomics, user experience, comfort, trust, feeling of safety and liability in modern production facilities; and taking into account age and gender aspects. Social partners may also be considered. Optionally, proposals may include test environments such as living labs for validation.

Proposals should include a business case and exploitation strategy, as outlined in the introduction to this Destination (adapted to the expected TRL of this topic).

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

HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-05: Advanced manufacturing technologies for leadership of EU manufacturers in products for the net-zero industry (Made in Europe Partnership) (IA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 5.00 and 6.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 25.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 6-7 by the end of the project – see General Annex B.

Expected Outcome: The European Union's manufacturing industry should benefit from the following outcomes:

- Enhanced capabilities in the areas of strategic and high-value-added products for the net-zero industry; and
- Increased production capacity for clean technologies, diversifying supply sources, and ensuring high environmental standards.
- Contributions to reaching the targets set by the Net Zero Industry Act, in ensuring the reduction of strategic dependencies.

Scope: The net-zero industry relies on manufactured products, components and equipment.

The focus is on advanced manufacturing processes for such products components and equipment, which enable new product features (in terms of geometry, weight, robustness, functional integration, re-use-potential); innovative production processes; or the use of innovative materials. The processes should improve productivity and upscaling, decrease waste, and shorten time-to-market and process integration times.

Proposals should address manufacturing technologies for products for at least two of the strategic net-zero technologies listed in Annex I of the Net-Zero Industry Act [ref]:

[The technology areas may be narrowed, to reflect coverage in other topics in Cluster 5 and under P4P partnership.]

Battery/storage technologies, one of the net-zero technologies, is covered under Cluster 5 of this Work Programme [topics] and is excluded from this topic.

The projects should address the key manufacturing technologies that generate cross-sectoral impact among the chosen net-zero technology sectors

While operating in synergy with initiatives that focus on the design and engineering of strategic products and solutions, research and innovation should focus on the innovative development and application of a selection of the following manufacturing technologies:

- Additive manufacturing or cladding for manufacturing and/or repair;
- Advanced joining technologies;
- Advanced Forming and material shaping technologies;
- Surface (pre-)processing technologies, nano- or micromanufacturing; and
- High precision machining and assembly.

Proposals should consider integrating

- Innovative metrology and inspection methods, aiming at first-time right manufacturing;

- Advanced and flexible automation approaches, for instance for complex assembling and handling of hazardous materials);
- Digital twins and data mining for fast ramp-up, scale-up and real-time optimization of production;
- Circular manufacturing approaches in view of increasing the options for re-manufacturing, disassembly, recycling, etc.; and
- Manufacturing breakthroughs, perfecting the technologies for market needs, including enhancing its efficiency, reliability, and developing standards.

In addition the overall environmental impact of the manufacturing processes should be minimal in terms of energy consumption and CO_2 emissions.

Proposals should include a business case and exploitation strategy, as outlined in the introduction to this Destination. The aspect of manufacturing in the Union is particularly important in this topic.

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

Construction

Proposals are invited against the following topic(s):

HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-11: Enhanced logistics and operations of construction sites (IA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 6.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 13.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to start at TRL 5 and achieve TRL 6-7 by the end of the project – see General Annex B.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions

	under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [15].

Expected Outcome:

- Reduce the time taken to carry out site operations of construction or demolition works;
- Increase the application of on-site circular approaches such as re-use, preparing for re-use and recycling, resulting in reduced waste generation and improved waste management;
- Improve health and safety of construction workers.

Scope: Construction works on the building site, whether for civil infrastructure or for buildings, often involve a variety of complex operations apart from the actual assembly of elements. These can include transport and movement of construction products to and around the site; storage of products, materials and other items on site, and their eventual removal; dealing with packaging of products and other consumables related to the construction works; temporary accommodation for workers; temporary utility connections and associated works; planning of works; coordination of trades and operations, including machines as well as human workers. Mistakes and delays in construction works can lead to negative consequences such as risk of accidents, waste, pollution, inefficiency and financial consequences.

Construction works need to be carried out more quickly and efficiently, with less room for error and waste. This could be improved through technology-driven innovations linked to on-site operations and logistical aspects.

Proposals should:

- Develop technologies that improve the efficiency of operations on the construction site, leading to more productive, faster and more efficient working practices. The technologies should be interoperable with, or build upon existing industry-wide practices, such as Digital Twins and Building Information Modelling tools. Speed and efficiency improvements must not be at the expense of safety.
- Address the traceability of construction products and other items delivered to the site, installed on site, and removed. If relevant, this can also include coordination with other operations outside the construction site boundary.

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

- Integrate circular economy approaches, such as waste prevention and the management and recovery of construction and demolition waste;
- Address new ways for site operations to reduce the chances of errors and accidents/taking better account of unexpected disruptions;
- Address human-centric and Social Science and Humanities (SSH) aspects of technologies or tools that are developed.

Proposals may choose to contribute to relevant European standardisation efforts. Proposals should seek to build synergies with relevant other work, for example, EU-funded projects under the New European Bauhaus Facility, or Horizon Europe partnerships including Built4People.

Energy-Intensive Industries - Decarbonisation and Energy Efficiency

Proposals are invited against the following topic(s):

HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-31: From heat-driven processes to the use of mechanical and electric forces (Processes4Planet partnership) (IA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 8.00 and 10.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 25.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 7 by the end of the project – see General Annex B.

Expected Outcome: Energy Intensive industries will benefit from the following outcomes:

- Enable the integration of renewable electricity in the process industries by transitioning from heat driven to direct electricity driven process units in a plant;
- Contribute to achieving the EU climate neutrality objective as well as proposed 2040 90% GHG reduction target[16];

[16] 2040 climate target - European Commission (europa.eu)

- Achieve 25% energy savings compared to processes based on relevant Best Available Technologies;
- Improve the economic viability of the entire unit compared to the state-of-the-art heat-driven process and increase the competitiveness and resilience of the European process industry.

Scope: The generation of heat, which is often sourced from fossil fuel combustion, is the biggest consumer of energy in the process industries and responsible for 60% of process industries GHG emissions. Heat input is in particular commonly used in separation and drying processes. The topic focuses on the development of new electrically driven industrial processes where heat input is replaced by electro-mechanical power or other forms of direct electrical input. These electrified processes could represent a major reduction of GHG emissions as well as an important source of energy savings. The scope does not include conventional electric heating or the use of heat pumps.

Proposals under this topic should:

- Demonstrate and/or integrate highly efficient electrically driven technologies e.g., membrane technology, power ultrasound, mechanical activation, mechanically or electricity induced forces, electrochemical processes, that can replace traditional heating processes;
- Establishing and validating scale-up methods for electrically driven technologies from lab-scale to production size connecting existing and advanced experimental setups and simulation methods;
- Demonstrate and evaluate energy efficiency gains;
- Prove the effectiveness of the technologies towards GHG emission avoidance;
- Take a holistic approach which may include aspects such as redesign of equipment, requirements for advanced materials and integrated electrified processes;
- Ensure process safety, sufficient flexibility and ease of process control;
- Showcase improved CO2 reduction potential, performance, scalability and cost efficiency of the proposed solution through, at least, one realistic use case that can be replicable with demonstrable economic return.

The inclusion of a GHG avoidance methodology[17] is recommended and should provide detailed descriptions of baselines and projected emissions reduction.

[17] That could follow Innovation Fund methodology: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/innovfund/wp-call/2021/call-annex_c_innovfund-lsc-2021_en.pdf

Proposals submitted under this topic should include a business case and exploitation strategy, as outlined in the introduction to this Destination. As project output an 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 (e.g., Innovation Fund, InvestEU, ESIF). Societal- and environmental impact as well as implications for the workplace (including skills and organisational change) should be outlined.

This topic implements the co-programmed European partnership Processes4Planet.

HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-32: Green and resilient flexible production processes (Processes4Planet partnership) (IA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 6.00 and 8.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 25.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 6-7 by the end of the project – see General Annex B.

Expected Outcome: Energy Intensive industries will benefit from the following outcomes

- Increase significantly the process flexibility offering a step change in the capacity of individual production plants to promptly and frequently adapt to energy input variations over a significant range and with increased speed;
- Enable new flexible and efficient production processes, leading to economic and sustainability gains despite of volatile energy supply variations;
- Increase significantly raw material and energy efficiency while facing variations of the renewable energy input when compared to state-of-the-art industrial processes;
- Contribute to achieving EU climate neutrality objective as well as Commission recommendation of reducing EU GHG emissions by 90% by 2040 [18].

Scope: Flexibility of energy intensive production processes is a necessity for the use of alternative energy carriers as the supply of energy by renewable sources is subject to

[18] 2040 climate target - European Commission (europa.eu)

significant variations and the competitive potential of energy storage is limited. The optimal use of the renewable energy supply will require processes that can perform fast transitions to allow continuous and efficient operation when the renewable energy input varies. The limiting factor addressed by the topic is the ability of the production plants to promptly change loads and throughputs in large ranges without negative consequences for the equipment, while staying energy and resource efficient. Storage options and use of several sources of renewable energy can be included, the combination (hybridation) of various decarbonisation technologies can also be considered.

Proposals under this topic should:

- Address the redesign and modification of existing processes, including, as relevant, modifications of process steps or equipment and smart combinations of renewable energy sources, thereby improving the overall operation flexibility of the process and resulting in continuous efficient operation;
- Propose redesign and modification of plants and processes to increase their flexibility response rate (e.g., faster ramp up or ramp down) while maintaining a high energy- and resource efficiency;
- Demonstrate and evaluate material and energy efficiency gains from a holistic view of the processing plants and energy systems as well as economic benefits by exploiting the price variations on the energy markets;
- Showcase improved performance, scalability and cost efficiency of the proposed solution through at least one realistic use case at pilot scale;
- Define necessary skills and consider the human dimension of the proposed solution, to enable their industrial implementation.

Digital tools and advanced control to support the operation and the flexibility of the processes can be elements of a solution.

This topic implements the co-programmed European partnership Processes4Planet.

HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-33: Integrated use of renewable energy carriers in industrial sites (Processes4Planet partnership) (RIA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 8.00 and 10.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Indicative budget	The total indicative budget for the topic is EUR 25.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 5-6 by the end of the project – see General Annex B.

Expected Outcome: Energy Intensive industries will benefit from the following outcomes

- Enable the integrated use of different types of renewable energy carriers in industrial sites[19] with the aim to provide a constant robust low-carbon and economic energy input to process industries;
- Pave the way for strategic industrial cooperation to cope with fluctuations of the energy inputs and to achieve overall energy and cost efficiency;
- Support stability and operational flexibility of the power grid, including implementation of storage solutions to buffer energy demand peaks;
- Enable the use of renewable energy labelling and documentation, scheduling of energy use and price compensation models to achieve optimal grid load;
- Improve the technical and economic feasibility of the integrated use of renewable energy carriers in industrial sites compared to other solutions with a similar CO2 reduction potential;

Scope: There is a broad range of renewable energy carriers (e.g., electricity, hydrogen, solar heat, ammonia, etc) which can be utilised in the process industries. Many of them are provided with significant temporal variations, e.g., renewable electricity and solar heat. Integrated design and operation of these highly complex systems within process industry sites are needed to cope with the fluctuations of the energy inputs and to achieve overall energy and cost efficiency. Industrial symbiosis and integration of production systems with energy systems in industrial sites can ensure overall emission reduction. These approaches can increase the efficiency of generation and enable solutions that avoid losses, supporting stability and efficiency of power systems.

Proposals under this topic should:

- Develop highly efficient technologies for, and prototype designs of, integrated structures of industrial sites, including storage elements and solutions for their integrated operation under varying conditions;
- Take due account of logistic aspects, risk assessment and management at plant level;

[19] Industrial sites refers to industrial clusters, hubs, parks formed by several plants of the energy intensive industries.- Large individual plants may be considered in those sectors where plants are not typically integrated in industrial sites.

- Develop systemic solutions embracing industrial symbiosis, and if relevant, contribute to further evolution of existing Hubs4Circularity[20];
- Consider the interaction with the supply side, in particular electric power grids, hydrogen pipelines or district heating;
- Demonstrate full integration and use of advanced digital technologies from fields of distributed process control strategies, and data driven AI based optimisation and the application of model-based technologies for the improved, safe and efficient operation of industrial plants and sites, including the interaction with different grids;
- Demonstrate and evaluate energy efficiency and CO2 footprint reduction by optimal integration of energy from renewable sources as well as providing demand side flexibility;
- Propose new ways to adapt the workplaces and organisation of site management to ensure that the solutions can be widely implemented.

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

Proposals should consider representative real industrial sites demonstrating the solutions at least in open-loop computations. This should be done in parallel to the actual operation of the plants with validation of the benefits by simulations with accurate models. Experiments involving real industrial sites are encouraged.

Proposals should actively pursue involvement of all actors in the value chain, from industrial sites management to plant operators, and renewable energy providers. Interoperability as well as secure and trusted data sharing between stakeholders in the value chain should be considered. Proposals submitted under this topic should include a business case and exploitation strategy (as outlined in the introduction to this Destination).

A strategy for skills development to master the challenges of such integrated systems should be included associating social partners. Attention should be given to using results from existing initiatives that have developed education and skills development concepts this area.

This topic implements the co-programmed European partnership Processes4Planet.

HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-34: Smart integration of net zero technologies into Energy Intensive industries (Processes4Planet and Made in Europe partnership) (IA)

Call: INDUSTRY 2025

[20] Hubs4Circularity (h4c-community.eu);Horizon_Europe_strategic_plan_2025-2027-KI0223326ENN.pdf (page 94)

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 5.00 and 9.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 25.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 7 by the end of the project – see General Annex B.

Expected Outcome: Manufactures of net zero technology solutions, as well as energy intensive industries will benefit from the following outcomes:

- Enable the sustainable and efficient use of energy in the energy intensive industries by bridging the gap between users and manufacturers of net-zero solutions for the energy-intensive industries.
- Foster win-win situations in which equipment manufactures co-create solutions with the energy-intensive industrial sectors opening new markets for the net-zero technologies;
- Develop new net-zero technologies industrially integrated processes that support the decarbonization of industry and offer new market opportunities;
- Accelerate the adoption of net-zero technologies in the energy intensive industries.

Scope: As the industry decarbonises net-zero technologies[21] can be applied to a wide range of energy intensive sectors and processes. Furthermore, the Net-Zero Industry Act which is part of the Green Deal Industrial Plan, is aiming at increasing the manufacturing capacity of strategic net-zero technologies to meet at least 40% of the EU's annual deployment needs. In this framework the aim of this topic is to accelerate the deployment of net-zero technologies in at least one industrial sectors through a closer collaboration between, net-zero technology manufacturers and energy intensive industries.

Proposals under this topic should:

- Facilitate collaboration between at least one energy intensive industrial sector, with manufacturers of net-zero technology solutions, as well as where relevant engineering, and construction firms for the smart integration of one or several net-zero technologies in specific processes. Several energy intensive industrial sectors can be considered if they share similar processes and energy related needs;

[21] Net-zero technologies as defined in the Net Zero Industry Act, Annex I: Strategic Net-zero Technologies

- Assess the proposed industrial sector(s) to define 'standard' process(es) and assess operational energy needs through a closer exchange with net-zero technology manufacturers and suppliers in order to effectively design sustainable and cost-efficient energy solutions;

- Optimise and adapt technologies, products and solutions proposed by manufacturers of net zero technologies to meet the industrial sector needs;

- Propose and demonstrate the necessary modifications of processes for the efficient and flexible incorporation and the integration of net zero technologies in existing industrial plants;

- Demonstrate the effectiveness and replicability of the proposed approaches allowing to move from custom-built project by project approach for each specific industrial plant and process, to more streamlined, standardised yet flexible solution for industrial sector(s) and/or processes;

- Develop solutions offering an optimal balance between standardisation and flexibility as well as providing high-quality tailored solutions at competitive prices;

- Be based on a sound techno-economic analysis that confirms the economic viability in view of evolving regulatory frameworks; and

- Support the development of skills for the integration of net-zero technologies into energy intensive industries.

Proposals must involve all actors in the value chain from the manufacturers of net zero technology solutions to energy intensive industries and engineering and construction firms. Interoperability and secure and trusted data sharing between the stakeholders of the value chain should be ensured.

Proposals should ensure dissemination and replication of the proposed approaches for wide deployment, including advising and building capacity among the relevant actors. Proposals submitted under this topic must include a detailed business case and post-project exploitation strategy, as outlined in the introduction to this Destination.

This topic implements the co-programmed European partnerships Processes4Planet and Made in Europe.

HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-37: Solving issues in carbon-neutral iron and steel making processes with diverse input materials of varying quality (Clean Steel Partnership) (RIA)

Call: INDUSTRY 2025
Specific conditions

Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 13.00 and 14.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 28.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 6 by the end of the project – see General Annex B.

Expected Outcome: The topic enables a fast and reliable transition to the innovative technology pathways for carbon-neutral iron and steel making (including direct reduction, (plasma) smelting reduction, electric arc furnace, electric smelting furnace, and electrolysis) by tackling fundamental problems and boundary conditions with a system-level approach. This approach will target input materials, processes, and iron /steel output quality, considering the needs to reduce production costs, find alternative materials and solutions, improve process/energy efficiency and achieve at least the traditional product quality.

Iron and steel making plants constitute complex systems where the product quality is bound to a large set of variables, including that of input materials (e.g. feedstock and reductants) and the stability of the processes. Variations in feedstock composition, along with reductant choice and mix, introduce noticeable variations in process metallurgy, its kinetics and thermodynamics, with influence on the morphology of the intermediates and consequent impact on the next phases of production and the lifetime, quality, safety and reliability of the finished product.

The strong dependence of the final steel quality on the variable quality of the raw materials and the balance of the production process, has to be taken into account under the consideration of costs, sustainability, overall and specific energy efficiency, CO2 emissions and strategic resources (in particular strategic raw materials[22]).

Availability of raw materials, such as high-grade ore and scrap, and specific types of reductants, will become critical in the transformation process to achieve climate neutrality, as the demand for steel is projected to increase, creating a shift towards the use of lower quality raw materials, including waste products of biological origin as alternative sources of carbon and NetZeroWaste steel value chain recycling.

Projects are expected to contribute to at least three (3) of the following outcomes:

- Validate innovative carbon-neutral iron and steel making solutions within a system-level approach and in consideration of diverse materials with varying quality (raw input materials and reductants mix). Address high-risk factors at macroscopic and microscopic

[22] https://www.consilium.europa.eu/en/infographics/critical-raw-materials/

level through detailed characterisation of the physical and chemical interactions that could compromise the optimal functioning of the processes and compromise the achievement of the optimal functioning of the processes;

- Solve system-level issues within at least two low-CO2 production routes to accelerate the green transition in the steel sector;
- Define solutions and provide concepts to address possible modifications or material substitutions in innovative installations for low CO2 iron and steel production;
- Improve low-CO2 steel production reliability to target high-quality products: i) clarify the effect of material and process variables, and overall system aspects; ii) clarify the influence of changing crude steel quality on the properties of the produced steel, with the purpose to achieve quality and extended lifespan of products; iii) clarify the impact of diverse input materials with varying quality on the residue characteristics and on its potential valorisation and use;
- Provide impact analysis including overall materials and energy balance of identified solutions. Address sustainability, process flexibility and interoperability (in terms of material and energy use), viability and by products. The "do no significant harm" concept needs to be strongly followed.

Scope: The topic calls for collaborative approach between academia, industry (including SMEs) and research organizations with the purpose to support: i) understanding, validating, and solving essential problems to allow maturity of innovative technologies in the industrial investment panorama for future carbon-neutral iron and steel making, ii) accelerating a reliable transition to climate neutrality in view of the end of the free ETS allowances by providing solutions optimized for different scenarios, and iii) fulfilling the Commission Recommendation 2024/774[23] on a Code of Practice on industry-academia co-creation for knowledge valorisation.

Proposals should address at least six (6) of the following points:

- De-risk and extend operational windows of low CO2 iron- and steel making technologies considering system-level scenarios with different combinations of feedstock materials, reductants and their aggregate states;
- Target the heterogeneity of available reductants and feedstock materials, their different physical states and the mixed use of them. In this context, the sustainability of the process to produce them should be considered, along with the requirements for various grades of purity;
- Achieve high-quality steel products characterized by increased tolerances of contents of contaminants, originating from low quality raw materials. Adapt the micro-structure and

[23] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_202400774

control application-specific properties by acting on material preparation, processes and process technologies. Include the development of detection / measurement systems and multi-scale models as needed;

- Analyse, micro- and/or nano-characterise, and compare low-carbon production of liquid iron and/or crude steel combining the use of direct reduced iron (DRI) with varying qualities and raw materials from primary and secondary sources to push for closing material cycles;

- Couple the analysis with needs for plant design optimisation and measures to mitigate risks during operation, ensuring inline/online management of the processes, and limit hazards on the medium/long term;

- Define pre-processing needs of primary and secondary iron containing materials for iron and steelmaking targeting low environmental impact. Analyse the effects on the production process and product metallurgy;

- Consider analytical research infrastructures. Data should be supporting simulations- and modelling needs in line with FAIR (Findability, Accessibility, Interoperability and Reusability) principles. Interoperability of data sharing should be addressed;

- Consider effects of solutions indicated in the outcomes of the proposed project on specific regional or country level conditions, including cross-sectorial scenarios, such as water use and recovery of water and other resources from the steelmaking process to use in other industrial sectors and vice versa, where applicable;

- Use tools such as, but not limited to, life cycle assessment (LCA) or life cycle costing (LCC) to create benchmarks for progress measurement towards carbon neutrality;

- Aim at taking advantage of pilot plants in Europe to create correlations between real-world processes and laboratory-based research.

Multidisciplinary research activities must address at least one (1) the following:

- Introduce sensors or develop new ones, especially able to work in very high temperature environments. They may include a soft and integrated set of sensors. Use fast digital techniques for data collection, processing and analysis. Develop enhanced models with different levels of resolution and integrate ML/AI for comprehensive understanding of process mechanisms, including process and/or product digital twin technology and circular materials models;

- Use input from finalised/ongoing research in heat recovery via heat exchange technologies that could produce a positive impact on the system energy balance by contributing to reduction of external energy use;

- Develop concepts for on-site hydrogen production techniques at very low cost, e.g. using part of the heat and waste gases from the process.

Proposals submitted under this topic should include a business case and exploitation strategy, for at least one process route, as outlined in the introduction to this Destination. If more than one process route is part of the project, the selection of the preferred one should be duly justified.

Additionally, a strategy for skills development to target innovative solutions should be presented, associating social partners when relevant.

The actions shall envisage clustering activities with other projects funded under this topic and at least one (1) project funded under topic HORIZON-CL4-INDUSTRY-2025-01-DIGITAL-61: "AI Foundation models in materials science" to develop synergies. Cross-projects co-operation should include consultations and joint activities on cross-cutting issues and share of results not bound to intellectual property, as well as participating in joint meetings and communication events. To this end proposals should foresee a dedicated work package.

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

This topic implements the European co-programmed Clean Steel Partnership.

Energy-intensive Industries - Circularity and Zero Pollution

Proposals are invited against the following topic(s):

HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-35: Embedding upcycling technologies into viable business (Processes4Planet partnership) (IA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 8.00 and 10.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 34.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 5-7 by the end of the project – see General Annex B.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for

	Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [24].

Expected Outcome: Energy Intensive industries will benefit from the following outcomes:

- Prove the technical, economic, and environmental feasibility of the upcycling of end-of-life materials by process industries in integrated circular schemes;
- Enable doubling the rate of secondary raw materials upcycled leading to a significant increase in resource, including energy, efficiency across the value chain;
- Increase the competitiveness of the European process industry, including by providing new business opportunities and revenue flows for recycling companies benefiting particularly SMEs which dominate this sector of the market;
- Foster the use of digital tools as well as the data sharing, and FAIR (Findability, Accessibility, Interoperability and Reusability) digital assets principles.

Scope: The recycling of end-of-life materials [25] into valuable materials that can replace primary raw materials requires integrated systems from the collection to dismantling and separation to their final processing. The technologies and implementation (including logistics and economics) of such circular schemes must be addressed in an integrated way. The innovation needed will depend on the addressed waste category. However, even if the upcycling technologies and implementation may be sector/material specific, the cross-sectorial elements are important and should deserve due attention.

Proposals are expected to address the following:

- Focus on the integration of technologies, logistics systems into business models of circular schemes;
- Develop processes for the upcycling of end-of-life materials in an integrated way, including the development of better novel separation, sorting and processing technologies as well as digitalisation and automatisation of the processes as necessary;
- Identify the processes and secondary raw materials which offer the highest upcycling potential and accordingly develop novel upcycling technologies and processes including purification technologies;

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

[25] Secondary raw materials include end of use materials, production waste and by-products

- Identify the likely impacts of the upcycling solutions with respect to economic and job creation potential, as well as environmental footprint referring to the full set of planetary boundaries including freshwater intake aspects;

- Minimise the presence of substances of concern to mitigate the impacts of multiple recycling loops as well as the accumulation of additives and trace materials in secondary resource streams;

- Consider advanced monitoring and sensing along the value chains and improved data completeness, accuracy and interoperability between the process and recycling companies. In this context, digital tools, such as a Digital Product Passport for tracking and tracing of materials throughout the lifecycle of a product should be applied and data sharing should be addressed.

Proposals should include techno-economic and life-cycle assessment of the overall process and demonstrate the economic viability of the approach. This can be combined with an analysis of the effect of regulatory changes and demand side stimulation measures.

Projects are encouraged to integrate existing Hubs4Circularity[26] as nodes in the value chains. Proposals should actively pursue the involvement of all actors in the value chain from the process industry to designers, operators, formulators, recyclers, public authorities, and standardisation actors.

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 having developed education- and skills activities and outcomes in this area.

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

This topic implements the co-programmed European partnership Processes4Planet.

HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-36: Safe and clean processing technologies and products (Processes4Planet partnership) (RIA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 6.00 and 8.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

[26] Hubs4Circularity (h4c-community.eu), Horizon Europe strategic plan 2025-2027-KI0223326ENN.pdf (page 94)

Indicative budget	The total indicative budget for the topic is EUR 22.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 4-6 by the end of the project – see General Annex B.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [27].

Expected Outcome: Energy Intensive industries will benefit from the following outcomes:

- Enable novel processing technologies and materials with reduced health, safety, and environmental impacts;
- Reduce the use of hazardous substances in production processes and materials that pose a risk for human- and environmental health and safety, and ensure the avoidance of their proliferation into products;
- Increased knowledge on the industrial emission releases when it comes to emerging and less known groups of hazardous pollutants not regulated at EU level;
- Reduce the occupational exposure risk and negative health impacts at work by empowering employees;

Scope: Whereas the release of pollutants by European industry has generally decreased during the last decade, and it is expected to continue to do so, industry still contributes significantly to the emission of many pollutants into the European environment. Moreover, only emissions of historically important pollutants are reported by industry. Information on emerging and less known pollutants, especially those not regulated by the Industrial Emissions Directive, and related methods of monitoring is lacking. GHG emissions from industry are not included in the scope of this topic. Pollutant emissions to air, water and soil are considered.

Proposals under this topic should:

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

- Develop novel processing technologies leading to reduced health, safety and environmental impacts beyond CO2 emissions;
- Demonstrate the reduction of the use of hazardous substances that pose a risk for human- and environmental health and safety and thereby also their proliferation into the products;
- Minimise adverse effects from the novel processes' technologies on the function and durability of the materials, recyclability, the production cost as well as the associated risk;
- Consider involving all the relevant actors in a participatory approach for the reduction of risk and health issues at work;
- Where relevant, develop sampling and monitoring methods for emerging pollutants and less known groups of pollutants in stack emissions before entering the environment.

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

Research should build on existing standards, or if relevant, contribute to standardisation, especially when addressing pollutants that lack robust monitoring methods. 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.

All proposals are encouraged to build on, or seek collaboration, with existing projects and develop synergies with other relevant European, national, or regional initiatives, funding programmes.

International cooperation is encouraged.

This topic implements the co-programmed European partnership Processes4Planet.

HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-38: Synergies and mutual learning with national and regional initiatives in Europe on Industrial decarbonisation (Processes4Planet and Clean Steel partnerships) (CSA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Indicative budget	The total indicative budget for the topic is EUR 2.00 million.
Type of Action	Coordination and Support Actions
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [28].

Expected Outcome: Projects should contribute to the following outcomes:

- Coordinate European, national and regional initiatives in the field of decarbonisation of energy -intensive industries;
- Coordinate national and regional funding programmes offering synergies with projects funded at European level;
- Contribute to further development of a strong comprehensive European research and innovation and industrial ecosystem for the decarbonisation of energy-intensive industries;
- Enable Europe to effectively address the European industry challenges of reducing CO2 emissions to reach the 2050 EU climate neutrality target and maintaining its competitiveness in line with the Green Deal and the New Industrial Strategy.
- Facilitate the update of existing, or development of new, national and regional industrial decarbonisation roadmaps, strategies, and action plans across Europe.

Scope: Proposals should support the coordination of national and regional public authorities' funding research, innovation, acceleration of public/private R&I and deployment of Energy Intensive Industries' decarbonisation. This coordination should allow public authorities to work synergistically with the goal to strengthen and complement the EU innovation funded activities in industrial decarbonisation[29] and to leverage future actions beyond 2027. This coordination action should learn from and further seek the active follow-up, with an enlarged participation, of the Mutual Learning Exercise on Industrial Decarbonisation[30] and should

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

[29] Including Horizon Europe and Innovation Fund

[30] Mutual Learning Exercise on Industrial decarbonisation | Research and Innovation (europa.eu)

build on the best practices and models for mobilising investment and deployment already identified.

Coordination and support activities should address all of the following:

- Promote active networking through application of a whole-of-government approach, involving national and regional authorities;
- Trigger mutual learning and build an overview of national and regional technology roadmaps, strategies, and action plans on industrial decarbonisation;
- Promote coordination of national and regional funding bodies, programmes and initiatives favouring the development of a strong research and innovation ecosystem for industrial decarbonisation in Europe;
- Promote mutual learning of national and regional policies for the design and financing of R&I, deployment and uptake actions for the decarbonisation of energy intensive industries;
- Further analyse and propose first actions on relevant identified framework conditions barriers and opportunities to facilitate the deployment and uptake of low-carbon technologies in energy-intensive industries;[31]
- Build and exchange knowledge and expertise in national and regional industrial decarbonisation road mapping for low-carbon technologies in energy-intensive industries; develop monitoring tools and identify indicators to monitor progress. Dedicated actions in relation to the involvement of entities from widening countries could also be considered.

Proposals should build on existing mapping and monitoring exercises of EU demonstrators and develop synergies with relevant international[32], European[33], national or regional initiatives, funding programmes and platforms and in particular with the Horizon Europe Partnerships 'Processes4Planet' and 'Clean Steel' (including the steel side of the Research Fund for Coal and Steel programme), including any relevant major European initiative on industrial decarbonisation.

Topic supporting the goals for Processes4Planet and Clean Steel partnerships.

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31 Framework conditions for deployment and uptake of low-carbon technologies - Publications Office of the EU (europa.eu)

32 IEA Working Party on Industrial Decarbonisation (WPID) - Home (sharepoint.com), NET-ZERO INDUSTRIES MISSION - Mission Innovation (mission-innovation.net), Climate Club, Just Transition Fund

33 SET Plan Energy efficiency for the industry action area, Clean technology Observatory Partnership, European Innovation Centre for Industrial Transformation and Emissions (INCITE) , Net Zero Europe Platform etc.

HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-39: Towards human-centric, sustainable and resilient energy-intensive industries (Processes4Planet and Clean Steel partnerships) (CSA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 2.00 million.
Type of Action	Coordination and Support Actions
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [34].

Expected Outcome: Projects should contribute to the following outcomes:

- Facilitate radical workplace innovation, optimising human-machine interactions and capitalising on the added value of human workers via digital technologies;
- Contribute to the development of innovative technologies in a human-centric way while reducing the risk and negative health impacts at work.
- Incorporate new breakthrough technologies and assess new production processes with respect to human-centric design, environmental- and societal impacts and resilience;
- Improve the capacities of actors to integrate Industry 5.0 (human-centricity, sustainability, and resilience) in the technological development processes by at the same time increasing the competitiveness of the industry.

Scope: Industry 5.0 recognises the power of industry to achieve societal goals beyond jobs and growth to become a resilient provider of prosperity. It focuses on making production

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

respect the boundaries of our planet improving competitiveness of European process industries and placing the wellbeing of the industrial worker at the centre of the production process, while increasingly embracing digital and green technologies to remain the solution provider for all Europeans.

Coordination and support activities should address all of the following:

- Prepare an overview of the state of the preconditions for adding the Industry 5.0 perspective (human-centric, resilient, sustainable) to energy intensive industries;
- Map technologies (e.g., industrial wearable, human digital twin, extended reality) integrating individual competences and increasing usability, specifically applicable to energy intensive industries sectors and processes. For example technologies i) supporting the co-design of processes and workplaces, enhancing the remote monitoring experience and creating new capabilities for operating; ii)supporting new forms of human-machine interaction by providing real-time feedback on personal performance and holistic intuitive workplace interfaces; or iii) co-designed in accordance with user expectations and the integration of workplace experience.
- Explore through a practical assessment how the process automation technologies currently in use in Process Industries are making use of innovative the industry 5.0 technologies (the practical assessment is expected to cover several companies and at least five industry sectors);
- Develop an Industry 5.0 framework and engage with a wide range of stakeholders including labour authorities and ongoing relevant sectoral social dialogues at European level. This should include empower employees in a participatory approach for adding the industry 5.0 dimension to the industrial processes including the reduction of risk and health issues;
- Dissemination and communication of information and knowledge to stakeholders including industry, policy makers, research and education actors, civil society and general public.

Topic supporting the goals for Processes4Planet and Clean Steel partnerships.

Destination 2: Achieving technological leadership for Europe's open strategic autonomy in raw materials, chemicals and innovative materials

A paradigm shift, as regards the availability, development, use and disposal of chemicals and materials is required to guarantee Europe’s open strategic autonomy, technological sovereignty and capacity to deliver on the twin green and digital transitions. To enable such a shift, an innovative, strong European R&I ecosystem for circular chemicals and materials is needed working across different technology readiness levels. Bringing knowledge and skills together across the materials’ value chains is key to ensuring that this shift can materialise. The requirements of the European Green Deal for safety, sustainability and circularity must be considered across the life cycle of a chemical or material. The 2022 Commission

Recommendation on 'safe and sustainable by design' sets out a new framework on how to achieve these objectives. Communicating results, impacts and achievements is important not only to the scientific community but also to stakeholders and people affected by the new approaches and innovative thinking. R&I activities should contribute to strengthen EU's critical raw materials capacities along all stages of the value chain, increasing our resilience by reducing dependencies, increasing preparedness and promoting supply chain sustainability and circularity, in line with the Critical Raw Materials Act. It is necessary to improve the energy and process efficiency of extractive and processing activities and minimise their environmental impact, including GHG emissions. Advancements need to be made on finding options for replacing critical raw materials with other (advanced) materials offering at least the same functionality and taking into account the existing environmental concerns. Advanced materials (including amongst others nano- and 2D materials) and chemicals are designed with functionality in mind. Compared to conventional materials, they have novel properties that significantly step-up performance. New digital tools are needed such as common data spaces, digital twins, industrial virtual worlds, as well as novel (autonomous) design, synthesis, development, characterisation and fabrication tools as well as continuous training of scientists on these new tools. To secure unimpeded market entry, appropriate test methods are needed. New chemicals and materials should be developed using the 'safe and sustainable by design' framework and with the efficiency and circularity of materials in mind, also for their inclusion in products. This calls for tools, models and data for robust 'safe and sustainable by design' assessment, including animal-free new approach methodologies and systematic life-cycle assessments. Bio-based advanced materials/chemicals and the integration and interaction of biological and artificial materials and components offer new opportunities to reduce resource dependencies and maintain sustainability. Achieving the circularity of both raw materials and advanced materials is a key future challenge. Establishing new material flows, recovery, recycling and upcycling of materials from waste are challenges in themselves, but they also require information sharing along and across value chains and development of new business models allowing to foster innovative solutions related to technological progress, such as in materials design. Uptake of advanced materials as well as a more efficient use of materials should be fostered in product and materials-based technology developments. This also requires new business models to be developed for the deployment of circular technologies and value chains as well as for providing product-as-a-service models, on-demand manufacturing, take-back-schemes and other service-based businesses. Strong support to SMEs is required so they can thrive in this materials ecosystem.

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.

Raw Materials

Proposals are invited against the following topic(s):

HORIZON-CL4-INDUSTRY-2025-01-MATERIALS-61: Technologies for critical raw materials and strategic raw materials from End of Life products (IA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 7.00 and 8.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 24.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 6-7 by the end of the project – see General Annex B.

Expected Outcome: The projects' outcomes will enable the expected impacts of the destination by increasing supply security and access to secondary raw materials, in particular

critical and strategic raw materials for EU[35] industrial value chains and strategic sectors which will alleviate critical raw materials dependency.

Projects are expected to contribute to the following outcomes:

- Increased recovery rate of critical and strategic raw materials as set out in the Critical Raw Materials Act [36] through developing raw materials recycling and re-use of components and/or products from end-of-life (EoL) products, including recovery of raw material by-products.
- Improved competitiveness of secondary raw materials production by enhancing cost effectiveness and
- Improved efficiency of technologies for separation and recycling and the sustainable embedment of the process in terms of energy, resource and water use, waste and emissions (including Green House Gases and air pollutants) footprint.
- Improved responsible supply of raw materials to Europe from EoL streams in line with the EU principles for sustainable raw materials[37], which are a non-regulatory set of principles based on the EU acquis. They set out requirements for sustainable raw materials and extraction and processing in Europe in terms of social, environmental and economic performance.
- Actions are expected to contribute to the implementation of the EU Critical Raw Materials Act[38]..

Scope:

- Actions should develop material efficient high-quality re-use and recycling of one or more of the following end-of-life product categories/key waste streams: waste electrical and electronic equipment (WEEE), waste batteries, end-of-life vehicles, waste wind turbines/, waste solar photovoltaics, waste heat pumps, waste electrolysers and high-performance alloys in machine tools.

35 Annex I and II, Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020 (OJ L, 2024/1252, 3.5.2024, ELI: http://data.europa.eu/eli/reg/2024/1252/oj).

36 Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020 (OJ L, 2024/1252, 3.5.2024, ELI: http://data.europa.eu/eli/reg/2024/1252/oj).

37 European Commission. Directorate General for Internal Market, Industry, Entrepreneurship and SMEs. (2021). EU principles for sustainable raw materials. Publications Office. https://doi.org/10.2873/12856

38 To be updated after publication in the Official Journal

- Actions should focus on the whole chain of re-using and recycling processes and procedures – from collection, logistics, characterisation, sorting, cleaning, refining and purification of secondary raw materials and quality of produced outputs.

- Actions should focus on functional re-use and recycling. Recycling where the recycled material is of lower functionality than the original material (downcycling) is to be avoided.

- Actions should envisage clustering activities with other projects aiming at recycling, second life, re-use, repurposing, remanufacturing of products and/or components relevant selected projects for cross-projects co-operation, consultations and joint activities on cross-cutting 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.

- Actions should facilitate the market uptake of solutions developed through industrially- and user-driven multidisciplinary consortia covering the relevant value chain and should consider standardisation aspects when relevant. The action should also include the analysis of financial opportunities ensuring the market exploitation and replication of the circular business model behind the developed solutions as new processes, products and/or services.

Proposals submitted under this topic should include a business case and exploitation strategy, as outlined in the introduction to this Destination. For TRLs 6-7, 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.

In this topic the integration of the gender dimension (sex and/or gender analysis) in research and innovation content is not a mandatory requirement, however, should you consider it to be of relevance for your specific proposal, you are strongly encouraged to do it.

HORIZON-CL4-INDUSTRY-2025-01-MATERIALS-62: Strategic Partnerships for Raw Materials: Innovative Approaches for sustainable production of Critical Raw Materials (IA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 7.00 and 8.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 30.00 million.
Type of Action	Innovation Actions

Technology Readiness Level	Activities are expected to achieve TRL 6-7 by the end of the project – see General Annex B.

Expected Outcome: Projects outcomes will enable the expected impacts of the destination by increasing supply security and access to primary raw materials and secondary raw materials, in particular critical and strategic raw materials for EU[39] industrial value chains and strategic sectors.

Projects are expected to contribute to the following outcomes:

- Strengthen EU cooperation with countries the EU established strategic partnerships on Raw Materials with[40];
- Improved industrial viability, safety and environmental impacts of the operation in a way that leads to measureable improvements;
- Improved EU sourcing diversification of critical raw materials from third countries;
- Improved responsible supply of raw materials to Europe in line with the EU principles for sustainable raw materials[41], which are a non-regulatory set of principles based on the EU acquis. They set out requirements for sustainable raw materials and extraction and processing in Europe in terms of social, environmental and economic performance.
- Dissemination and exploitation of projects outputs is tailored for organisations and industry dealing with raw materials in the EU and project partner from Strategic partnership countries.
- Actions are expected to contribute to the implementation of the EU Critical Raw Materials Act[42]..

Scope:

- Actions are expected to develop and demonstrate extraction, processing and metallurgy technologies to facilitate and increase of optimise recovery in exploitation of primary raw critical raw materials (minerals and metals only) for the EU to strengthen the EU

39 Annex 1 and Annex 2, Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020 (OJ L, 2024/1252, 3.5.2024, ELI:http://data.europa.eu/eli/reg/2024/1252/oj).

40 https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/raw-materials-diplomacy_en

41 European Commission. Directorate General for Internal Market, Industry, Entrepreneurship and SMEs. (2021). EU principles for sustainable raw materials. Publications Office. https://doi.org/10.2873/12856

42 Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020 (OJ L, 2024/1252, 3.5.2024, ELI: http://data.europa.eu/eli/reg/2024/1252/oj).

supply chains, with the minimum environmental and social impact, duly measured and assessed. Projects could include exploration aspects if duly justified.

- Actions have to collaborate with countries the EU has signed Strategic Partnerships on Raw Materials[43] .
- A project has to focus on one single group among these four groups: Group 1 (Argentina, Chile), Group 2 (Democratic Republic of the Congo , Namibia, Rwanda, Zambia,), Group 3 (Kazakhstan, Uzbekistan), Group 4 (Australia, Greenland). The consortium has to include at least one raw material producer from the targeted country in the focussed group, as well as downstream users for those materials from the EU.
- Technology should be demonstrated on mineral resources of the targeted partner country. The environmental (including GHG and other air pollutant emissions, water, soils, biodiversity) and social impacts of technology must be duly measured and assessed.
- Actions should envisage clustering activities with other relevant selected projects for cross-projects co-operation, consultations and joint activities on cross-cutting 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.
- Actions should facilitate the market uptake of solutions developed through industy- and user-driven multidisciplinary consortia covering the relevant value chain and should consider standardisation aspects if relevant. The action should also include the analysis of financial opportunities ensuring the market exploitation and replication of the circular business model behind the developed solutions as new processes, products and/or services.

Proposals submitted under this topic should include a business case and exploitation strategy, as outlined in the introduction to this Destination. For TRLs 6-7, 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.

In this topic the integration of the gender dimension (sex and/or gender analysis) in research and innovation content is not a mandatory requirement, however, should you consider it to be of relevance for your specific proposal, you are strongly encouraged to do it.

HORIZON-CL4-INDUSTRY-2025-01-MATERIALS-63: Innovative solutions for the sustainable production for Semiconductor raw materials (IA)

Call: INDUSTRY 2025

[43] https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/raw-materials-diplomacy_en

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 7.00 and 8.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 24.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 6-7 by the end of the project – see General Annex B.

Expected Outcome: Projects outcomes will enable achieving the expected impacts of the destination by increasing access to primary raw materials and secondary raw materials, in particular critical raw materials for EU[44] industrial value chains and strategic sectors.

Projects are expected to contribute to the following outcomes:

- Decreased dependency of the EU on imported raw materials for semiconductor production and decreased risk in European semiconductor supply chains. The actions targeting strategic raw materials[45] should contribute to the benchmarks as set out in the Critical Raw Materials Act [46].

- Raw materials for semiconductors competitively produced and refined in the EU in a sustainable and socially acceptable way improving the competitiveness of European industry.

- Increase recovery rates of particularly raw materials from low grade or complex ores and/or from residues and/or by-products and/or extractive waste and/or manufacturing waste.

- Increase the competitiveness and sustainability of mineral processing and metallurgical processes in terms of cost-effectiveness, higher material-, water-, energy-efficiency,

[44] Annex 2, Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020 (OJ L, 2024/1252, 3.5.2024, ELI:http://data.europa.eu/eli/reg/2024/1252/oj).

[45] Annex 1, Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020 (OJ L, 2024/1252, 3.5.2024, ELI:http://data.europa.eu/eli/reg/2024/1252/oj).

[46] Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020 (OJ L, 2024/1252, 3.5.2024, ELI:http://data.europa.eu/eli/reg/2024/1252/oj).

emission reduction and flexibility. This may also include the development of sustainable solvents, reagents, and low-carbon manufacturing processes.

- Foster collaboration among industry stakeholders along the value chain, research institutions, and technology providers to accelerate the development and adoption of sustainable production solutions.

- Improve responsible supply of raw materials to Europe in line with the EU principles for sustainable raw materials[47], which are a non-regulatory set of principles based on the EU acquis. They set out requirements for sustainable raw materials and extraction and processing in Europe in terms of social, environmental, and economic performance.

Scope: Actions should focus on raw materials for semiconductors necessary for the green and digital transition and strategic sectors, such as aero-space and dual-use applications; including one or more of the following raw materials: arsenic, bismuth, boron, gallium, germanium, indium, selenium, silicon metal, tellurium.

Actions should facilitate the market uptake of solutions developed through industrially- and user-driven multidisciplinary consortia covering the relevant value chain from extraction to semiconductor grade raw materials and alloys, as well as relevant downstream industry. Standardisation aspects should be considered when relevant.

Proposals submitted under this topic should include a business case and exploitation strategy, as outlined in the introduction to this Destination. For TRLs 6-7, a credible strategy to achieve future full-scale deployment in the EU and encourage long-term industrial collaboration is expected, indicating the commitments of the industrial partners after the end of the project.

Actions should envisage clustering activities with other relevant selected projects for cross projects co-operation, consultations and joint activities on cross-cutting 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.

Actions should also contribute to improving the awareness of relevant external stakeholders and the general public across the EU about the importance of raw materials for society, the challenges related to their supply within the EU and about proposed solutions which could help to improve society's acceptance of and trust in sustainable raw materials production in the EU.

In this topic the integration of the gender dimension (sex and/or gender analysis) in research and innovation content is not a mandatory requirement, however, should you consider it to be of relevance for your specific proposal, you are strongly encouraged to do it.

[47] European Commission. Directorate General for Internal Market, Industry, Entrepreneurship and SMEs. (2021). EU principles for sustainable raw materials. Publications Office. https://doi.org/10.2873/12856

HORIZON-CL4-INDUSTRY-2025-01-MATERIALS-64: EU Co-funded Partnership on raw materials for the green and digital transition (Programme Co-fund action)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 45.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 45.00 million.
Type of Action	Programme Co-fund Action
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties.The support to third parties can only be provided in the form of grants.Financial supprot provided by the participants to third parties is one of the primary activities of the action in order to be able to achieve its objectives. Given the type of action and its level of ambition, the maximum amount to be granted to each third party is EUR 2.00 million []. The funding rate is 30% of the eligible costs [].

Expected Outcome: Projects outcomes will enable achieving the expected impacts of the destination by increasing supply security and access to primary and secondary raw materials, in particular critical and strategic raw materials[48] for EU industrial value chains and strategic sectors.

Projects are expected to contribute to the following outcomes:

- Align national R&I priorities in raw materials with EU policy on raw materials.
- Strengthen EU cooperation with countries the EU established strategic partnerships on Raw Materials[49];

[48] Annex 1 and Annex 2, Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020 (OJ L, 2024/1252, 3.5.2024, ELI:http://data.europa.eu/eli/reg/2024/1252/oj).

[49] https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/raw-materials-diplomacy_en

- Improve industrial viability, safety and environmental impacts of the operation in a way that leads to measurable improvements;

- Improve EU sourcing diversification of critical raw materials from third countries;

- Improve responsible supply of raw materials to Europe in line with the EU principles for sustainable raw materials[50], which are a non-regulatory set of principles based on the EU acquis. They set out requirements for sustainable raw materials and extraction and processing in Europe in terms of social, environmental and economic performance.

Dissemination and exploitation of projects outputs is tailored for organisations and industry dealing with raw materials in the EU and project partner from Strategic partnership countries.

Actions are expected to contribute to the implementation of the EU Critical Raw Materials Act[51], particularly to the 2030 benchmarks.

Scope:

- The objective of the European Partnership on Raw Materials is to strengthen the co-ordination of national and regional research programmes in the field of non-energy and non-agricultural raw materials, ensuring common understanding of R&I challenges to achieve the objectives of the Critical Raw Materials Act[52].

- The Partnership will build on the experience of ERA-NETs: ERA-MIN, ERA-MIN 2 and ERA-MIN 3. The Partnership should cover the whole raw materials value chain including exploration, extraction, processing technologies, and recycling.

- Proposals should pool the necessary financial resources from the participating national (or regional) research programmes with a view to implementing joint annual calls for proposals resulting in grants to third parties with EU co-funding in this area. *Financial support provided by the participants to third parties is one of the primary activities of this action in order to be able to achieve its objectives*.

- As specified in the eligibility conditions, the Partnership is open to all EU Member States, associated countries to Horizon Europe, OECD countries, African Union Member States [53], MERCOSUR, CARIFORUM, Andean Community and countries with which

50 COM(2023) 165 - A secure and sustainable supply of critical raw materials in support of the twin transition

51 Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020 (OJ L, 2024/1252, 3.5.2024, ELI: http://data.europa.eu/eli/reg/2024/1252/oj).

52 Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020 (OJ L, 2024/1252, 3.5.2024, ELI: http://data.europa.eu/eli/reg/2024/1252/oj).

53 *African Union member states* includes countries whose membership has been temporarily suspended

the EU has concluded strategic partnerships on raw materials [54]. Participation remains open to those wanting to join during the Partnership's lifetime.

- Beneficiaries should preferably be national, regional or local institutions responsible for programming research and innovation activities in raw materials. To ensure alignment of R&I activities and raw materials policy participation is also additionally open to relevant Ministries and public institutions responsible for raw materials and R&I policy.

- This Partnership should be implemented through a joint programme of activities ranging from research to coordination and networking activities, including training, demonstration, piloting and dissemination activities, to be structured along the following main building blocks:

  - Joint annual calls for R&I activities;

  - Facilitating further uptake of developed R&I results;

  - Clustering of projects and synthesising of R&I results;

  - Coordinating research programmes between EU and its Member States and associated countries and trigger combined action;

  - Serving as a centre for knowledge on partner countries' R&I activities in raw materials.

- Partners are expected to provide financial and/or in-kind contribution, in line with the level of ambition of the proposed measures. The partnership should be open to including new partners over the lifetime of the partnership. Its governance should create a clear and transparent process for engaging with a broad range of stakeholders, together with the full members of the partnership, to ensure that the work strategically covers a wide range of views in the field of biodiversity, nature-based solutions and ecosystem services throughout the lifetime of the partnership. To ensure that all work streams are coherent and complementary, and to leverage knowledge investment potential, the partnership is expected to foster close cooperation and synergies with the projects funded under Cluster 4 Digital, Industry and Space.

- Financial support provided by the participants to third parties is one of the primary channels under this action to enable the partnership to achieve its objectives. The maximum amount to be granted to each third party is EUR 2 million. It is expected that the partnership organises joint calls on an annual base from 2026 to 2032 and therefore it should factor ample time to run the co-funded projects.

[54] https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/raw-materials-diplomacy_en

- The total indicative budget for the partnership is EUR 300 million. The EU contribution will be limited to 30% of the total eligible costs of the action with a maximum of EUR X mln of EU contribution.

- The starting date of grants awarded under this topic may be as of the submission date of the application. Applicants must justify the need for a retroactive starting date in their application. Costs incurred from the starting date of the action may be considered eligible." as the text for this condition.

Innovative Advanced Materials

Proposals are invited against the following topic(s):

HORIZON-CL4-INDUSTRY-2025-01-MATERIALS-42: Innovative Advanced Materials (IAMs) for product monitoring, smart maintenance and repair strategies in the construction sector (RIA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 20.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to start at TRL 3 and achieve TRL 5-6 by the end of the project – see General Annex B.

Expected Outcome: Projects are expected to contribute to the following outcomes:

- Support the implementation of the Commission Communication on Advanced Materials for Industrial Leadership[55].

- Break frontiers between functional and structural materials by applying a variety of monitoring applications enabling infrastructure management such as tracking, self-powering and self-sensing.

- Reduce the resources needed for buildings and civil infrastructures by applying innovative advanced materials (IAMs) with improved performance, repairability and optimised circularity improving overall materials circularity by at least 30%;

[55] COM(2024) 98 final

- Reduce maintenance costs by at least 30% compared to the state-of-the-art;
- Improve performance of structural or functional components and products, combining longevity and efficiency;
- Proof of concept of the 'safe and sustainable by design' (SSbD) framework during the development phase of the new IAMs;
- Support acceptance of innovative construction materials for housing to achieve maximized user experience and comfort.

Scope: Extending the lifetime of materials used in the construction sector (e.g. cement, concrete, technical textile, plaster board, pipes) since their durability is often limited by poor stability and low flexibility and/or by increasingly aggressive and changing environments. Extending a products' life (use phase) is an important pillar of a solid sustainable and circular strategy because it reduces materials demands. Thus, it is crucial to monitor and assess the actual condition of products, components and materials, and to implement smart maintenance and repair functions, ideally at the level of individual products or components. Autonomous repair systems often use sensors to detect changes in the material's condition through physical principles or mechanical deformation. Advanced sensing techniques and the smart (AI) exploitation of this data, including distributed sensor networks and embedded microsensors, enable real-time monitoring of the material's condition. The surfaces created in the building process are ideal for smart solutions incorporating ubiquitous electronic systems. In addition, new materials fit for the circular economy must be easily dismantlable into reusable or recyclable components.

Proposals should develop new and/or improved IAMs that:

- Increase durability and reliability and reduce maintenance requirements (e.g. self-cleaning and/or self-healing properties, increased stress resistance and innovative protection treatments such as corrosion and/or erosion resistance, increased fatigue resistance);
- Improve the microstructure of construction materials, significantly increasing compressive, tensile and flexural strength, reducing curing periods, microcracking, permeability and/or corrosion, increasing the fracture toughness and making the materials lighter;
- Improve circularity and safety of construction materials;
- Support smart material functionalities for continuous monitoring and in-service inspections, e.g. through integrated sensors, with multifunctional features (such as asset management tracking, self-powering and/or self-sensing for several parameters).

Multidisciplinary research activities should address some of the following:

- Enhance sensor capabilities for tailored solutions through IAMs with extended physical sensor functionalities for mechanical-technological traits;
- Improve decision-making processes (at the design, engineering and end-of-life stage of IAMs and products) supported by FAIR data collected throughout the entire IAM value chain;
- Develop self-repairing and -healing materials for complex and resource-intensive structures, receptive to digital stimuli to retroactively influence material properties and integrating autonomous repair mechanisms to enhance their reliability (such as in composites, ceramics, coatings, etc), and extend their lifespan, while reducing costs to support their widespread adoption;
- Develop (AI based) models like digital twins to utilize high-dimensional new sensor data and generate multimodal stimuli and functionalities for customised maintenance and repair plans, extending product lifetime economically and environmentally;
- Develop and validate suitable models for predictive materials degradation (mechanical and/or environmental);
- Develop methodologies to assess and validate the longevity of materials, components and products through accelerated testing;
- Develop IAMs fit for modular off-site processing or 3D printing onsite;
- Assess safety, sustainability and circularity of all components during the entire innovation cycle as well as how to decompose and sort for enhanced recyclability of all components at the end of life, in line with the safe and sustainable by design (SSbD) framework;
- Contribute to the standardisation of technologies encompassing sensing, self-repairing or self-healing materials.

Proposals need to address both the IAM development and all the supporting technologies (digital and physical) needed (not existing yet) to cover the entire value chain (material development, validation, production, processing, use and end of life). Any existing technologies that do not require development or adaptation should be mentioned in the proposal.

Proposals should involve appropriate expertise in Social Sciences and Humanities (SSH), in particular with regards to the acceptance of innovative construction materials for housing to achieve maximized user experience and comfort.

Research should build on existing standards or contribute to standardisation. Interoperability for data sharing should be addressed.

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.

International cooperation is encouraged, especially with Japan.

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

Proposals funded under this topic are part of the IAM4EU partnership portfolio and are expected to develop synergies with the related stakeholder community and contribute actively to the objectives of the partnership. These contributions aim at allowing the different stakeholder communities in IAM4EU to coordinate amongst and across communities, e.g. in particular proposals investigating 2D materials are expected to contribute with activities and resources to the Graphene Flagship([56]). In addition, outreach to relevant national projects in EU Member States and Associated Countries is encouraged. Adequate resources for all these synergies should be foreseen in the proposals.

HORIZON-CL4-INDUSTRY-2025-01-MATERIALS-43: Innovative Advanced Materials (IAMs) for robust, fast curing sealants and coatings for manufacturing and final assembly (IA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 20.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to start at TRL 3-4 and achieve TRL 6-7 by the end of the project – see General Annex B.

Expected Outcome: Projects are expected to contribute to the following outcomes:

- Support the implementation of the Commission Communication on Advanced Materials for Industrial Leadership[57].
- Prolong lifespan and performance of components and products across sectors by the use of IAMs-based coatings, functionalised surfaces and/or sealings capable to withstand

[56] https://graphene-flagship.eu/
[57] COM(2024) 98 final

specific or challenging requirements and/or harsh environments while enhancing the products' recyclability at end of life;

- Lower maintenance needs and overall reduced Cost of Ownership for essential, structural or functional components and products;
- Promote industrial uptake of IAMs by integration into more complex, multi-functional materials (semi-products) and in leaner industrial production processes;
- Lower environmental impact through improved resource efficiency, reduced energy consumption, increased recyclability and/or substitution of hazardous substances.

Scope: One of the main factors limiting the lifespan of products (and their components) is their prolonged exposure to environmental elements. The combination of different stressors and changing conditions (operational, daily, seasonal) results in accelerated aging and premature or unanticipated failures. To prevent the resulting adverse effects, protective coatings and sealings are key to provide additional protection without requiring the reassessment of the physical design of the product/component, nor the inherent properties of the parts to be coated/sealed.

Curing times for sealants and coatings such as liquid-based paints are a bottleneck in manufacturing and final assembly of e.g. cars, trains, aircraft, or large components for buildings or for wind turbines. Curing time is inversely proportional to curing temperature, so shorter curing times can be achieved, but at the cost of higher energy consumption.

Moreover, performance evaluation of coated samples to select coating solutions which meet the demands of industrial end users constitute another bottleneck in the fast development of IAM-based coatings.

In addition, recyclability is often hampered by the sealants and coatings used. The new IAMs-based coatings, functionalised surfaces and sealings should allow to decompose products and structures into recyclable or reusable parts.

Proposals should develop new and/or improved IAMs-based coatings, functionalised surfaces and/or sealings that:

- Combine multiple functionalities, e.g. fast curing and drying, mechanical robustness, protection from environmental agents (sun, rain, snow, humidity, corrosion, erosion, temperature, …), compatibility with polymer and composite processing, or a combination of thermal, acoustic, magnetic, electrical and tribological properties;
- Facilitate product recyclability and improve circularity;
- Strategies to accelerate the time-consuming performance evaluation step should greatly reduce the times to prototyping and then to market.
- Take into account the Safe and Sustainable by Design (SSbD) framework in their design and development to protect the environment;

- Satisfy multiple requirements across different application areas such as electronics; (renewable) energy production and storage; automotive; maritime; aviation and rail infrastructures; construction, including HVAC[58] components;

- Reduce costs of production, manufacturing and disassembly.

Multidisciplinary research activities should address some of the following:

- Develop functionalised surfaces (directly functionalised or via coatings), which can substantially improve the integrity, efficiency and overall performance of products;

- Design and develop new sealants and coatings that can be applied by automated processes (higher speed and precision by digitalization), cured at room temperature (no extra heating or air conditioning of large paint shops or hangars required) and with curing times reduced by at least 90% compared to the state-of-the-art (increased productivity and decreased energy consumption);

- Master batch synthesis of IAMs with cutting-edge properties that allow production and processing of robust, fast curing sealants and coatings to be applied in the manufacturing and final assembly lines in industries, and transferable between sectors;

- Cope with sometimes extreme surface areas (small/large) and complex and/or high aspect ratio geometries requiring advanced processing and tooling;

- Develop methodologies to predict material degradation and assess release rates from coatings and sealants used in harsh environments;

- Use analytical technologies and infrastructures to characterise the efficiency, quality and effectiveness of the novel sealants and coatings on appropriate scales and/or to directly functionalise surfaces;

- Use new digital technologies including data driven approaches to push the frontiers of designing and producing IAMs with new functionalities/performance and improve scalability for materials and processes;

- Produce and share new knowledge on underlying multi-scale and multi-physics phenomena to better understand the behaviour of IAMs inside complex industrial products during their lifetime;

- Contribute to the availability of FAIR data and methods for safety and sustainability assessment of IAMs;

- Contribute to the standardisation of technologies for IAM-based sealings and coatings.

[58] Heating, Ventilation and Air Conditioning

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.

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

Research should build on existing standards or contribute to standardisation. Interoperability for data sharing should be addressed.

International cooperation is encouraged, especially with Japan.

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

Proposals funded under this topic are part of the IAM4EU partnership portfolio and are expected to develop synergies with the related stakeholder community and contribute actively to the objectives of the partnership. These contributions aim at allowing the different stakeholder communities in IAM4EU to coordinate amongst and across communities, e.g. in particular proposals investigating 2D materials are expected to contribute with activities and resources to the Graphene Flagship([59]). In addition, outreach to relevant national projects in EU Member States and Associated Countries is encouraged. Adequate resources for all these synergies should be foreseen in the proposals.

HORIZON-CL4-INDUSTRY-2025-01-MATERIALS-44: Innovative Advanced Materials Innovation Procurement (CSA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 2.00 million.
Type of Action	Coordination and Support Actions

Expected Outcome:

- Leverage innovation procurement processes to stimulate innovation in advanced materials addressing specific needs or challenges faced by public procurers.

[59] https://graphene-flagship.eu/

- Drive market transformation by aligning public procurement strategies with broader policy objectives, such as the twin transition.

- Establish market dialogue between the public demand side and the supply side, industry, and research organisations, reducing the gap between innovation procurement strategies and innovative solution development roadmaps on both sides.

- Develop proposals for amending Commission guidelines and sharing best practice on innovation procurement targeting resource and energy efficiency gains due to innovative technologies related to advanced materials.

- Identify standardisation needs for procurers in line with the Commission communication on Advanced Materials for Industry Leadership ([60]).

Scope: The use of advanced materials ([61]) has the potential to reinforce the Union's resilience and competitiveness as well as achieving circularity, materials efficiency and overall sustainability targets. Public procurers can play a leading role in driving innovation and fostering the uptake of advanced materials, thereby speeding up the market introduction of technologies that enable the twin transition and EU's resilience and economic security. Advanced materials drive innovations in new clean energy technologies provided for in the Net-Zero Industry Act and have the potential to substitute certain Critical Raw Materials (CRMs), thus contributing to the objectives of the CRM Act. Advanced materials can also replace hazardous substances, improve the environmental performance of products and processes, and facilitate circularity.

Public Procurements that make better use of advanced materials can potentially achieve a substantial impact towards these policy objectives in all areas where the public sector is an important customer such as construction, mobility, electronics and energy. Examples of functionalities that could potentially be realised through advanced materials include thermal isolation and protective coatings in construction, superior reliability and durability of energy and mobility infrastructures, improved performance of electronic devices, increased circularity and cost-efficient maintenance of products.

The 2023 Energy Efficiency Directive ([62]) requires that public procurers should only purchase products, services, buildings and works offering high energy efficiency performance. More generally, the EU Public Procurement Directives allow contracts to be awarded not only based on lowest price, but also on other criteria linked to the subject matter of the contract, such as improved performance/functionalities provided by advanced materials.

The objective of this coordination and support action (CSA) is to create a Europe-wide consortium of public procurers that define together unmet procurement needs for innovative solutions based on advanced materials.

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The consortium should prepare future procurement topics to conduct Pre-Commercial Procurements (PCP)/Public Procurements of Innovative Solutions (PPI) that make use of advanced materials with novel functionalities for sectors where public procurers and key customers, in particular aligned with objectives pertinent to advanced materials.

The 2023 Energy Efficiency Directive ([63]) requires that public procurers should only purchase products, services, buildings and works offering high energy efficiency performance. More generally, the EU Public Procurement Directives allow contracts to be awarded not only based on lowest price, but also on other criteria linked to the subject matter of the contract, such as improved performance/functionalities provided by advanced materials.

Proposal objectives should reflect making best use in public procurements of innovative material properties that contribute to superior product performance (including the impact on e.g. production, maintenance or recyclability) and/or contribute to policy objectives such as those formulated in the Green Deal, the Net-Zero Industry Act, the Critical Raw Materials Act and the Ecodesign for Sustainable Products Regulation (ESPR) while having the potential to be exploited as widely as possible.

More generally, the EU Public Procurement Directives allow contracts to be awarded not only based on lowest price, but also on other criteria linked to the subject matter of the contract, such as improved performance/functionalities provided by advanced materials. For example, the 2023 Energy Efficiency Directive ([64]) requires that public procurers should only purchase products, services, buildings and works offering high energy efficiency performance.

Activities supported by this CSA should include the following aspects:

- open market consultation with the industry;
- market analysis and analysis of potential barriers (status of going market developments regarding advanced materials versus the procurement needs, standardisation, certification, regulatory requirements, intellectual property rights, contracting models, payment schemes);
- consultations with other public buyers and relevant stakeholders such as end-users to prepare for a future market uptake of the solutions.

HORIZON-CL4-INDUSTRY-2025-01-MATERIALS-45: Materials Commons (IA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per	The Commission estimates that an EU contribution of around EUR 20.00 million would allow these outcomes to be addressed appropriately.

63
64

project	Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 20.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to start at TRL 3-4 and achieve TRL 5-6 by the end of the project – see General Annex B.

Expected Outcome: The project is expected to contribute to the following outcomes:

- Create the basis for a federated digital infrastructure for advanced materials, which will serve as a sustainable central hub for storing, managing, and sharing data, tools and resources related to advanced materials research and development;
- Give researchers from industry and academia access to interoperable heterogeneous data sources and computational tools (incl. for modelling and characterisation) that support the workflows for the design and development of advanced materials;
- Make state-of-the-art artificial intelligence (AI) technologies, machine learning algorithms, and predictive modelling techniques accessible to researchers in industry and academia.

Scope: This action will accelerate R&I in the area of advanced materials by federating at EU level national existing experience, knowledge and resources. It will support the implementation of a long term sustainable European digital infrastructure for advanced materials R&I, the Materials Commons, as announced in the Communication on Advanced Materials for Industrial Leadership[65]. By federating data resources and tools to exploit this data, the action will have a strong impact on the design, development and testing of new advanced materials across different sectors.

The creation and interconnection of resources within the Materials Commons should support academic and industrial collaborations, in particular by leveraging novel technologies, streamlining data exchange, managing and exploiting large datasets with advanced digital tools, and integrating AI technologies and machine learning.

The Materials Commons should:

- Help researchers and innovators from across Europe to significantly accelerate the design, development and testing of new advanced materials in a controlled environment, supported by AI tools;

[65] COM(2024) 98 final

- Create trust in data sharing among stakeholders, including researchers, research organisations, industry and SMEs based on FAIR[66] data principles;

- Foster common materials taxonomies, ontologies and data interoperability, while also supporting both the virtual design of materials and the digitalisation of manufacturing processes.

To achieve these goals, leading entities are envisioned to be Research and Technology Organisations (RTO), or similar organisations, which can function as national hubs and contact points for the infrastructure. They should foresee the integration of RTO-driven national initiatives such as Material Digital[67] and DIADEM[68], while also benefitting from related initiatives such as BIGMAP[69]. Together they should engage in an inclusive approach that fosters participation from both academia and industry, as contributors to and users of, the digital infrastructure. As the funding rate for this action will be set to 70%, proposals should gather sufficient resources at national level and also explore operational models that foster industrial participation and contributions.

No more than one proposal will be funded. The applicants are encouraged to consider a project duration of around four years.

Proposals should address:

- A joint strategic vision and proposed joint programme of activities to establish a digital infrastructure and each partner's commitment to play a pivotal role in the Member States in they are located;

- An agreement amongst partners on what they will achieve, supported by a concrete action plan;

- The implementation process that will be followed, the necessary activities, and the research and innovation assets that will be mobilised;

- Exploring permanent solutions to ensure sustainability of the infrastructure, including a business plan targeted at industry as users of, and contributors to such an infrastructure.

The envisioned project should follow the following phases, each of which should be successfully completed before entering the next phase:

- Phase 1: Planning and Framework Establishment

    - Developing functional and non-functional requirements and identifying existing solutions (e.g., cloud solutions, middleware, data spaces) that can be used to accelerate, or be integrated into, the infrastructure.

66 Findable, Accessible, Interoperable and Reusable
67 https://www.materialdigital.de/
68 https://www.cnrs.fr/en/pepr/pepr-exploratoire-diademe-materiaux
69 https://www.big-map.eu/

  - Planning the governance framework and management, including risk management.
  - Exploring and agreeing on long-term sustainability, such as through the creation of a legal entity.
  - Determine compatibility issues and standardisation needs.
  - Setting out key stakeholders, including from academia and industry and related projects and initiatives which will be the users of the infrastructure,
  - Liaise with the Technology Council on Advanced Materials for political support.

- Phase 2: Initial build-up
  - Adopting standards, e.g., for data formats, taxonomies, ontologies, etc.
  - Setting up a data governance framework:
  - Building connectors that enable the interconnection of existing databases and tools.
  - Building up trust infrastructure and enabling remote access.
  - Ensuring scalability.
  - Explore data storage solutions and advanced computing capabilities.
- Phase 3:
  - Building demonstrators to validate the initial capacity of the infrastructure.
  - Establish a feedback mechanism to gather insights from the pilot tests.
  - Integration of workflows and digital tools.
  - Deliver5 uses cases by academia, 5 uses cases by SME and 5 uses cases by large industry reflecting the agreed business plan
  - Concrete steps for ensuring long-term sustainability.

Complementarity and synergies should be sought with innovation-related strategies, policies, programmes and plans at national and/or regional level. This includes existing initiatives at national level but also extends to EU initiatives such as the proposed “Innovative Materials for EU” partnership, Data Spaces including in particular EOSC, and Open Innovation Testbeds).

The action should also envisage the inclusion of a possible mutual learning exercise (MLE) on this topic, targeted to countries leading on this area and those who still need to improve national digital infrastructure, enabling an exchange of experience with digital infrastructures, and creating synergies with ongoing related initiatives.

Proposals should involve appropriate expertise in Social Sciences and Humanities (SSH), in particular to achieve a user-centred design that facilitates access by different communities and across different sectors.

Research should build on existing standards or contribute to standardisation. Interoperability for data sharing should be addressed.

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

HORIZON-CL4-2025-03-MATERIALS-46: Innovative Advanced Materials (IAMs) for photonics, enabling low-power and ultra-broadband performance for telecommunication (IA/RIA) (New European Partnership on innovative advanced materials)

Call: DIGITAL - CNECT	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to start at TRL 3-4 and achieve TRL 5-6 by the end of the project – see General Annex B.

Expected Outcome:

- Demonstrated added value of Innovative Advanced materials (IAMs) such as Two-dimensional materials and EO polymers for integrated photonic devices and systems, with focus on low power consumption, enabling future telecommunication networks in which Europe can build competitive value chains.
- IAMs for miniaturized and outperforming photonic integrated technologies e.g. in terms of performance, power, cost, novel functionality enabling the development of future-proof, scalable, low-power and high-bandwidth devices.

Scope: IAMs can be the ideal candidate for several applications in photonics and optoelectronics. These include ultrafast integrated photonic circuits, with modulators, waveguides, detectors, emitters and switches, which play a crucial role in the ongoing quest to increase the speed of data transmission in telecommunications networks. In addition, they find utility in high-frequency transmitter modulators and receiver demodulators, which are essential for advancing wireless telecommunications technologies. They can also serve as

integral components in optical interconnects for data centers, high-performance computing (HPCs), and artificial intelligence/machine learning (AI/ML) computing systems.

The main objective of this call is to explore innovative solutions based on IAMs, including 2DMs, that offer state-of-the-art performance and low power consumption, while demonstrating scalability for volume production, thus exploiting the semiconductor manufacturing infrastructure. The envisioned compact devices will be designed to be compatible with low-power driving electronics and thus reduce energy consumption. Solutions should be compatible with existing photonic integrated platforms and low-voltage electronics.

Proposals are expected to integrate the value chain and include relevant manufacturing technologies required to bring the developed devices to market. Prototypes will be developed using packaged devices, including electronics, to enable testing in relevant environments.

Efforts will be focused on envisioning optimized routes for electronic and photonic design, fabricating photonic circuits, producing IAMs, conducting testing, executing wafer-scale fabrication, and performing co-integration and co-packaging, ultimately leading to demonstrations of the developed technologies and their added values.

Where relevant, proposers are encouraged to take advantage of and connecting to European analytical research infrastructures and services such as the ones in the ARIE network [70].

Proposals should also consider building their innovations on top of relevant existing standards and consider standardisation as part of innovation and dissemination activities.

Proposals funded under this topic are part of the IAM4EU partnership portfolio and are expected to develop synergies with the related stakeholder community and contribute actively to the objectives of the partnership. Proposals should seek collaboration, with existing projects and develop synergies with other relevant European, national, or regional initiatives, funding programmes such as the Graphene FlagshiP [71] for proposals investigating 2D materials. In addition outreach to relevant national projects in EU Member States and Associated Countries is encouraged. Adequate resources for all these synergies should be foreseen in the proposals.

HORIZON-CL4-2025-03-MATERIALS-47: Innovative Advanced Materials (IAMs) for conformable, flexible or stretchable electronics (RIA) (New European Partnership on innovative advanced materials)

Call: DIGITAL - CNECT	
Specific conditions	
Expected EU	The Commission estimates that an EU contribution of around EUR 5.00

[70] https://arie-eu.org/
[71] Graphene Flagship: https://graphene-flagship.eu/

contribution per project	million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to start at TRL 2-3 and achieve TRL 4-5 by the end of the project – see General Annex B.

Expected Outcome:

- Conformable, flexible or stretchable electronic devices and circuits, enabling improved user experience and adoption;
- Sustainable electronics based on low environmental impact materials, promoting reparability and/or recyclability and compatible with energy and resource efficient manufacturing processes;
- Materials tailored for solution-processed electronics such as semiconductor, conductive, dielectric, electroactive polymers, low environmental impact and/or functional substrates, etc. enabling high performance and reliable flexible electronics devices.

Scope: The concept of "ubiquitous electronics" can be a unique opportunity for the EU, opening up new avenues for e.g., wearable electronics, e-textile, e-skin, wellbeing solutions and Internet of wearable things (IoWT), which represent strategic markets for the EU. Innovative and advanced materials (IAMs) can enable new technologies and the much-needed paradigm of an electronic device that can adapt to any substrate. Despite the progress made in this field, current devices are made up of a limited proportion of flexible, conformable, and stretchable components, mainly sensors, while the rest of the circuit remains rigid, limiting this technology shift.

The overall objective is to discover Innovative Advanced Materials (IAMs), including 2DMs, with improved properties in terms of flexibility, conformability and stretchability that can enable novel flexible electronic applications, with a focus on environmentally friendly technologies with reduced carbon footprint processing. Proposals should address most of the following challenges:

- Discomfort of existing wearables leading to non-adoption
- Environmental impact of current electronics due to the use of hazardous and/or critical raw materials, energy-hungry and resources intensive processes
- Low or limited performance and durability of existing materials for high performance and reliable flexible electronic devices and circuits

- Limited integrability of current electronics: size and/or weight, complex cabling, interface between flexible and rigid components, design limitations (i.e., pattern geometry, thickness, dimensions).

Proposals should address reparability and/or recyclability of devices and circuits e.g. reversible adhesives and interconnects, low temperature soldering, bio-based or recycled substrates such as low thermal budget paper and inks, bio-resorbable conductive materials for the next generation of transient implanted medical devices, etc., compatibility with energy and resource efficient manufacturing processes e.g., printing, thermoforming, high pressure forming, lamination, injection moulding, etc.

Where relevant, proposers are encouraged to take advantage of and connecting to European analytical research infrastructures and services such as the ones in the ARIE network [72].

Proposals should also consider building their innovations on top of relevant existing standards and consider standardisation as part of innovation and dissemination activities.

Proposals funded under this topic are part of the IAM4EU partnership portfolio and are expected to develop synergies with the related stakeholder community and contribute actively to the objectives of the partnership. Proposals should seek collaboration, with existing projects and develop synergies with other relevant European, national, or regional initiatives, funding programmes such as the Graphene Flagship [73] for proposals investigating 2D materials. In addition outreach to relevant national projects in EU Member States and Associated Countries is encouraged. Adequate resources for all these synergies should be foreseen in the proposals.

Safe and Sustainable by Design

Proposals are invited against the following topic(s):

HORIZON-CL4-INDUSTRY-2025-01-MATERIALS-51: Development of safe and sustainable by design alternatives to PFAS (IA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 30.00 million.

[72] https://arie-eu.org/
[73] Graphene Flagship: https://graphene-flagship.eu/

Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to start at TRL 3-4 and achieve TRL 6-7 by the end of the project – see General Annex B.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [74].

Expected Outcome: Projects are expected to contribute to the following outcomes:

- Make safer and more sustainable alternatives to per- and poly-fluoroalkyl substances (PFAS) available to industries offering products with targeted performances supporting their competitiveness;
- Give the Commission, regulatory agencies, Member States and associated countries access to new and publicly available knowledge about PFAS alternatives;
- Support EU strategies, policies and legislation, such as future PFAS restrictions under the REACH Regulation [75], as well as requirements for the EU Ecolabel [76], EU Taxonomy[77] and Eco-design for Sustainable Products Regulation (ESPR)[78], by making safe and sustainable alternatives to PFAS available;
- Demonstrate the applicability of the 'Safe and Sustainable by Design' framework[79] to avoid regrettable substitution when developing innovative safe alternatives to PFAS.

Scope: PFAS are a large class of substances used in a wide range of applications (for instance, as adhesives, coatings, lubricants, sealants, surfactants), for their technical and/or safety

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

75 Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02006R1907-20231201

76 https://ec.europa.eu/environment/ecolabel/the-ecolabel-scheme.html

77 https://ec.europa.eu/environment/publications/proposal-ecodesign-sustainable-products-regulation_en

78 https://commission.europa.eu/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/sustainable-products/ecodesign-sustainable-products-regulation_en

79 See documents defining the SSbD framework and criteria on: https://ec.europa.eu/info/research-and-innovation/research-area/industrial-research-and-innovation/key-enabling-technologies/advanced-materials-and-chemicals_en

functions (*e.g.*, water and oil repellence, antiadhesion, thermal & chemical stability)[80]. Nevertheless, PFAS have been detected in groundwater, surface water and soil, the remediation of which is extremely costly or very difficult[81,82]. Their accumulation in the environment has been linked to negative effects for the wildlife and the human health, including carcinogenic, mutagenic, reprotoxic and toxic effects for the endocrine system[83]. In January 2023, five national authorities from Denmark, Germany, the Netherlands, Norway and Sweden submitted to the European Chemicals Agency (ECHA) a PFAS restriction dossier to ban the manufacture, placing on the market and use of PFAS as a chemical class in all uses, with few exemptions and transition periods of 6.5 and 13.5 years for several uses[84]. The restriction dossier aims to address the risk posed by PFAS and reduce PFAS emissions in the environment. This restriction dossier is currently being assessed by ECHA's Scientific Committees, which will provide their opinion to the Commission for decision-making.

The Commission initiative for 'Safe and Sustainable by Design' sets a framework for assessing safety and sustainability of chemicals and materials and should be a reference in the proposal. The new alternatives to be developed should meet the technical functions required in the specific applications and align with the 'Safe and Sustainable by Design' framework.

Proposals should address at least one industrial application and should develop one or more new chemical substances or technologies to replace existing PFAS used, according to abovementioned applications and functions, in one of the following areas:

- **Electronics, electrical appliances and grids (***e.g.*, wires, cables, heat transfer fluids, transformers, switchgears), where PFAS are currently used to provide a combination of technical and/or safety functions to withstand impact of high temperature, pressure and chemicals, ensure corrosion inhibition and non-flammability.

- **Construction technologies** (*e.g.*, carpeting, drywall, paintings, foams) where PFAS are currently used to provide a combination of technical functions such as resistance in harsh environments and for wetting agents.

- **Technical textiles** (*e.g.*, personal protective equipment, construction textiles, filtration and separation media, technical textiles for transport applications) where PFAS are currently used for their repellence but also heat stability and corrosion inhibition.

- **Automotive parts** (*e.g.* electrical parts including batteries, membranes, hoses and pipes, brakes, rubber processing) where PFAS are also currently used[85].

80 This list of applications and functions are not exhaustive, unless explicitly mentioned.
81 https://www.eea.europa.eu/en/european-zero-pollution-dashboards/indicators/pfas-contamination-and-soil-remediation-signal
82 PFAS in European seas (Signal) (europa.eu)
83 https://doi.org/10.2903/j.efsa.2022.e200418
84 Per- and polyfluoroalkyl substances (PFAS) - ECHA (europa.eu)
85 The use of (gaseous) PFAS in air conditioning is outside the scope of this call.

All actors along the value chain should be involved to ensure the new substance has a clear use case, market and potential to grow.

Multidisciplinary research activities should address all of the following:

- The 'Safe and Sustainable by Design' framework shall be applied when developing the alternative(s) and the assessment results be published and underlying methods and data made FAIR across the whole value chain;
- The selection of the PFAS alternatives to be developed should be justified with a technology and socio-economic analysis;
- The substitution barriers for the selected applications shall be identified and a driving mechanism for a maximal substitution in the targeted value chains proposed;
- Challenges for the adaption of existing production lines shall be identified and solutions proposed;
- Communication actions to all stakeholders and specifically citizens about the benefits of the developed 'Safe and Sustainable by Design' alternatives to PFAS substances.
- Policy briefs will be reported to the European Commission on a yearly basis to communicate on the key results and achievements.

Proposals should indicate to which chapters of the Strategic Research and Innovation Plan for chemicals and materials[86] they will contribute.

Proposals submitted under this topic should include a business case and exploitation strategy.

Proposals should involve appropriate expertise in Social Sciences and Humanities (SSH), *e.g.* with communities of citizens to engage in product reliability and consumer rights.

Collaboration with existing Open Innovation Test Beds (OITBs)[87] should be explored - where relevant.

International collaboration is encouraged.

The challenge of developing PFAS alternatives should also cooperate with relevant topics under other clusters and calls of Horizon Europe (*e.g.* HORIZON-CL4-2021-RESILIENCE-01-08 [88] , HORIZON-CL4-2022-RESILIENCE-01-23 [89] , HORIZON-CL6-2023-

86 https://ec.europa.eu/info/research-and-innovation/research-area/industrial-research-and-innovation/key-enabling-technologies/advanced-materials-and-chemicals_en

87 https://ec.europa.eu/info/research-and-innovation/research-area/industrial-research-and-innovation/sustainable-production-processes_en

88 https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/horizon-cl4-2021-resilience-01-08

89 https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/horizon-cl4-2022-resilience-01-23

ZEROPOLLUTION-02-2-two-stage[90], Horizon 2020 LC-GD-8-1-2020[91]), including topics under the Chips Joint Undertaking and the Clean Hydrogen Joint Undertaking (*e.g.* HORIZON-JTI-CLEANH2-2024-05-02: Development of non-fluorinated components for fuel cells and electrolysers). Proposals should specifically allocate the necessary resources for collaboration with the other relevant projects.

HORIZON-CL4-INDUSTRY-2025-01-MATERIALS-52: Accelerate the uptake of life-cycle assessment (LCA) for Safe and Sustainable by Design (SSbD) chemicals and materials and resulting products (RIA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 4.00 and 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 15.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to start at TRL 4 and achieve TRL 5-6 by the end of the project – see General Annex B.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [92].

Expected Outcome: Projects are expected to contribute to the following outcomes:

90 https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/horizon-cl6-2023-zeropollution-02-2-two-stage

91 https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/lc-gd-8-1-2020

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

- Support the implementation of EU strategies such as the proposed Eco-design for Sustainable Products Regulation (ESPR)[93], the EU Ecolabel[94], the Green Claims Directive proposal[95], the One-Substance-One-Assessment package[96], the Batteries Regulation[97], the Critical Raw Materials Act[98] and the Net Zero Industry Act[99] with scientific evidence on sustainability throughout the entire life cycle of chemicals and materials, from raw materials to end of life;

- Reduce significantly the cost to apply Life Cycle Assessment (LCA) at company level, including for SMEs, compared to current costs;

- Allow an efficient and simplified LCA application at early stage of design and facilitate decision making for companies and policy makers by providing user-friendly and cost-effective tools, methods and data;

- Provide advanced, reliable and predictive life cycle models and impact assessment methods, allowing for a satisfactory measurement of planetary boundaries;

Scope: Proposals should identify and fill the gaps in Life Cycle Assessment (LCA) tools, methods and data used for improving the environmental sustainability and efficiency of chemicals, materials and resulting products, taking also into account the criticality of raw materials. The Environmental Footprint (EF) methods should in particular be built on. All stages from raw material extraction to end-of-life disposal of products should be included. Data-driven decisions and actions for a greener and more sustainable future should be enabled, while respecting planetary boundaries. The tools should be in compliance with the Safe and Sustainable by Design[100] framework, the Commission initiative for assessing the safety and sustainability of chemicals and materials and hence to be considered as a reference in the proposal.

Multidisciplinary research activities should address all the following:

- Develop advanced, user-friendly LCA tools and methodologies that allow for a comprehensive assessment of the environmental sustainability of the entire lifecycle of chemicals, materials and resulting products whilst considering planetary boundaries;

- Develop LCA datasets, in particular building on EF methods, from design to end-of-life of at least three relevant chemicals or materials and a selection of their resulting products. The selected substances should be emerging alternatives to substances of

93 Proposal for Ecodesign for Sustainable Products Regulation
94 EU Ecolabel
95 Green Claims Directive proposal
96 'One substance, one assessment' chemicals assessment reform
97 Batteries Regulation
98 European Critical Raw Materials Act
99 Net-Zero Industry Act
100 See documents defining the SSbD framework on: https://ec.europa.eu/info/research-and-innovation/research-area/industrial-research-and-innovation/key-enabling-technologies/advanced-materials-and-chemicals_en

concern (as defined in the ESPR proposal) and should have a high socio-economic value;

- Develop solutions to fill in the identified data and assessment gaps and to estimate LCA uncertainty, using advanced digital technologies, modelling, machine learning and artificial intelligence;
- Feed relevant sustainability databases managed by the European Institutions and Agencies, such as the European Platform on LCA[101] (EPLCA), with FAIR data and ensure new tools developed are findable by stakeholders.
- Provide guidance for LCA modelling of circularity scenarios for chemicals, materials and resulting products, in alignment with EF methods and the SSbD framework;
- Ensure that the developed tools, methods and datasets are cost-effective and user-friendly in order to increase uptake and use in industry;
- Enable a seamless integration of the new LCA tools and methodologies with existing safety assessment tools and methods (notably the EF method) to ensure a holistic SSbD assessment;
- Engage with the wider stakeholder community, especially with SMEs, to promote a harmonised use of the proposed tools and methodologies;
- Projects should also contribute to yearly policy briefs and technical discussions, for example under the Eco-design for Sustainable Products Regulation (ESPR)[102] or with the EF Technical Advisory Board;

Proposals should indicate to which chapters of the Strategic Research and Innovation Plan for chemicals and materials[103] they will contribute.

Proposals should involve appropriate expertise in Social Sciences and Humanities (SSH), to support the socio-economic parts of LCA[104].

International collaboration is encouraged.

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. Specifically, projects should collaborate with the Partnership on Assessment of Risks from Chemicals[105] (PARC) and ensure complementarity with the SSbD toolbox[106] and

101 European Platform on LCA | EPLCA
102 Proposal for Ecodesign for Sustainable Products Regulation
103 https://ec.europa.eu/info/research-and-innovation/research-area/industrial-research-and-innovation/key-enabling-technologies/advanced-materials-and-chemicals_en
104 SSbD - Methodological Guidance
105 Partnership for the Assessment of Risks from Chemicals | Parc
106 Safe and sustainable by design toolbox | Parc

also engage with the IRISS project[107] on the different value chains. Additionally, projects should build on the results obtained by the ORIENTING[108] project funded under the CE-NMBP-42-2020[109] topic which has aimed to operationalise methodologies for LCA and to propose options to further advance the Product Environmental Footprint (PEF). Proposals should allocate the necessary resources for the above activities.

Synergies with Horizon Europe missions as relevant are encouraged.

Textiles

Proposals are invited against the following topic(s):

HORIZON-CL4-INDUSTRY-2025-01-MATERIALS-31: Digitally enabled local-for-local textile and apparel production (IA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Research and Innovation Actions
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [110].

Expected Outcome:

107 About IRISS
108 Orienting EU Project
109 Materials life cycle sustainability analysis
110 This decision is available on the Funding and Tenders Portal, in the reference documents section for Horizon Europe, under 'Simplified costs decisions' or through this link: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/ls-decision_he_en.pdf

- Demonstration of economic viability of local on-demand production of fashion and other complex textile products, including for professional or public end markets, through integration of advanced digital technologies across the full product life cycle from creation, production, distribution, use and end-of-life;

- Accelerated adoption of advanced digital product creation and manufacturing technologies by European textile and fashion SMEs; and

- Increased share of re- or near-shored production of time-critical textile products, made in socially and environmentally responsible ways.

Scope: Up to 80% of textile and apparel products consumed in Europe are partially or fully made outside Europe, exploiting lower labour cost as well as laxer local standards and regulations with regards to environmental, human health and labour rights protection. This offshoring of production has slowed textile manufacturing technology innovation in Europe and led to a complex long-lead time supply chain, generating unnecessary production and pre-consumer waste from unused mass-produced materials and unsold products not meeting actual demand.

Digitalisation in product development, production and on-demand supply chains has the potential to significantly reduce such overproduction, and enable business models that can competitively offer rapid short run or single piece production as well as related repair or end-of-life dismantling services for effective local recycling.

These aspects are particularly important in view of the new requirements to be set under the Ecodesign for Sustainable Products Regulation under which textiles are flagged as one of the priority product groups for the elaboration of a sustainable policy framework that could consider durability, recyclability, repairability and recycled content the most important product aspects

Proposals should address at least one of the two following activities:

1. Small scale demonstration, experimentation or piloting of approaches, processes or technologies for:

- Complex manufacturing operations including yarn or fabric production and final product assembly that go beyond state-of-the-art processes such as digital garment printing.

- Seamless interoperable data flows and transparency towards the end user that pursue and harness waste minimisation, short time to market and trust-building between supply chain partners and end users.

- Valorisation of locally available renewable raw materials (biobased or recycled) and regional production capacities that allow for shortest time to market and lowest environmental footprint

- Micro-manufacturing that can flexibly combine small-scale local production, repair as well as re- and de-manufacturing operations

1. Uptake of innovative service-driven business models that maximise consumer value creation and lowers total cost of ownership from high-quality long-lasting products.

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

Proposals should include financial support to third party (FSTP) to maximise the number of SMEs involved in small-scale innovation projects. All such innovation projects should include at least one advanced technology provider; one manufacturing SME; and one end-market facing company, such as a retailer or a professional or consumer service provider. The partners should be from at least two different countries. FSTP funding can be provided only to SME participants, while the active participation of larger companies in such innovation projects is encouraged. The involvement of start-ups is also specifically encouraged. To ensure a focused effort, each third-party beneficiary should receive funding up to EUR 60 000, in projects with an indicative duration of 18 months.

International cooperation may be considered, in particular with countries that are advanced in the field.

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

This topic implements the co-programmed European Partnership ‘Textiles for the Future’.

Destination 3: Developing an agile and secure single market and infrastructure for data-services and trustworthy artificial intelligence services

The next stage of the data economy will shift data flows from the consumer-to-business model to business-to-business, business-to-consumer, consumer-to-consumer, business-to-government and government-to-business models.

Cluster 4 will continue to support technologies that are crucial for the next stages of the data economy, such as privacy preserving technologies and compliance technologies, source and transaction integrity (such as blockchain), and technologies underpinning interoperable and compliant industrial, public and personal data spaces and secure data exchanges. Rebalancing the data, computing, and learning capacity across the cloud-to-edge/internet of things continuum will let businesses, public organisations and individuals exploit data for trustworthy and bias-free decision making.

Wide availability of reliable data, like from the European data spaces in the Digital Europe Programme, together with new interactive, immersive and context-aware technologies – digital twins, cyber-physical systems, internet of things and virtual worlds – will make this

easier than ever before. This will help all people groups benefit from the power of data and AI in a fair, unbiased and compliant way.

Industrial virtual worlds that are open and interconnected bring alternative but realistic and coherent views on what are widely distributed, diverse and complex devices, processes and value chains. Beyond visualisation and simulation, and thanks to new types of interfaces (like XR/VR), secure data sharing and distributed computing technologies, they allow for safe and natural ways of interaction and control, high level of response to local events, real-time optimisation and dynamic re-configuration in key application areas like for: i) the integration of renewable energy sources, ii) smart farming, iii) agile supply chains and logistics, and iv) hyperflexible manufacturing and manufacturing-as-a-service. Similarly, data-driven tools, AI, language technology, adaptive and self-programmed robotics, and new energy-aware programming solutions will improve operational and energy efficiency in lead sectors like healthcare, manufacturing, mobility, and the energy sector itself.

Quantum technologies will further expand the data economy in high value-added areas where traditional approaches struggle to deliver, for instance, highly secure communication of critical data, or on exponentially complex simulations, machine learning and optimisation. Quantum networks will provide highly secure, tamper-free data storage and transmission, which can be critical in situations where the integrity and confidentiality of the data are paramount, like in the health sector, smart cities, energy systems or other critical infrastructure.

Connected Collaborative Computing Networks (3C networks)

Proposals are invited against the following topic(s):

HORIZON-CL4-2025-03-DATA-08: Large-scale pilots for supply end-to-end infrastructures integrating device, network computing and communication capabilities for Telco Edge Cloud deployments, as a basis for Connected Collaborative Computing Networks (3C networks) (RIA)

Call: DIGITAL - CNECT	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 80.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 80.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply:

	Specific Art22.5 condition TBD
Technology Readiness Level	Activities are expected to start at TRL 3-4 and achieve TRL 6-7 by the end of the project – see General Annex B.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties up to 15 % of the proposal total budget. The support to third parties can only be provided in the form of grants. The maximum amount to be granted to each third party is EUR 500 000 to support one or more of the following: • Extension of the pilots' technological capacities; • Addition of new technology or infrastructure providers; • Extension of the vertical domains covered in order to cover new or more advanced application domains. Participation of additional user groups.

Expected Outcome:

- Strengthen European industrial ecosystems for the 3C Network, while enabling the path towards sustainability and competitiveness of key vertical sectors in the EU, to be supported in the work programme 2026-2027 of Horizon Europe by future large-scale pilot focusing on 3Cs demand in vertical industrial sectors such as "industrial virtual worlds" (automotive, aerospace, processing, manufacturing, agriculture, electronics), services (mobility, energy, smart communities) or others.

- Strategic industrial cooperation among network and data processing stakeholders which enable new revenue streams in support of viable communication infrastructures by building open platforms, underpinning an emerging industrial open telco edge cloud ecosystem to be established in Europe.

- The pilot should devise appropriate cooperation mechanisms with the Open Europe Stack action, to help defining the requirements for the development of the building blocks and ensure their integration in the pilots, including envisaging mechanisms for testing and integration of the solutions developed by the Stack.

- A European vision of advanced digital infrastructures through the convergence of connectivity with interoperable edge and cloud computing services. Moreover, the large-scale pilot should seek and include sufficient evidence of a clear commitment from the major European telecom, cloud and edge providers to industrialise further the results of the pilot among the major stakeholders, in particular by considering the necessary business adaptations and future perspectives, etc. In this context, an advisory group of end users should be set up to discuss and advise about user requirements to be

considered in relation to the pilots. This group will collect requirements from a large range of users and test them through small demonstrations.

Scope: The recent Commission White Paper "How to master Europe's digital infrastructure needs?" highlights the convergence of electronic communications networks and cloud services, and call for the strengthening of the EU "Telco Edge Cloud" infrastructure, by creating the 3C Network (Connected Collaborative Computing).

The convergence of connectivity, including mobile networks (5G and 5G advanced), combined with computing environments at the edge and cloud is a unique opportunity for the European telecom industry to drive a European vision of next generation digital infrastructures and meet future processing demands of IoT and AI. Investing into future computing and connectivity paradigms will strengthen the industrial European supply side and deliver an enablement for the path towards sustainability of key sectors in the demand side.

Increased density of edge and cloud facilities is needed to sustain adoption of innovative and sovereign telco edge cloud technologies across Europe. Backed by ubiquitous connectivity to deliver the right performance in terms of bandwidth and latency, Europe's infrastructure will require advanced network management and orchestration technology as well as neutral interconnection services to guarantee efficient infrastructure utilisation and enable innovative use cases at scale.

The 3C Network large-scale pilot (focusing on the supply side) aims at setting up end-to-end integrated infrastructures and platforms, bringing together players from different segments of the connectivity and compute value chain and beyond. The main target is to research and validate the integration of device, network, cloud and edge computing, and communication capabilities for telco edge cloud deployments to realize a ubiquitous mesh of computing and communication resources. This will complement the Telco Edge Cloud reference deployments of Digital Europe and will feed into future deployment initiatives.

Therefore, the scope for the action would be the following:

- Researching and prototyping at scale end-to-end telco edge cloud integrated infrastructures and platforms, bringing together players from different segments of the connectivity value chain and beyond, such as operators, system integrators, network/cloud/edge suppliers, experts on AI and (wireless) communication, experts on testing and validation of network technologies and services, IoT platform providers et al.

- Developing open orchestration platforms across the telco edge cloud continuum, to support unlocking the transformative value of AI for European businesses and driving business growth in multiple industries strategic for Europe and associated countries.

- Integrating AI solutions for optimising the orchestration of the different resources to be managed by the pilot actions, such as bandwidth, spectrum, computing, hardware, other user requirements.

- Investigation, testing, validation and demonstration of solutions and prototypes of the simultaneous use of integrated devices, edge and cloud computing and communication resources in operational environments (including both public networks and large private networks), ensuring high level of security and privacy, energy efficiency, transparency and control of the ecological footprint.

- Investigation, Testing, validation and demonstration of integration of available infrastructures as cloud-edge continuum with distributed systems such as blockchain infrastructure and services, data spaces and seamless and comprehensive AI systems in the process of creation of decentralised digital infrastructure network.

- Exploration of novel approaches for cybersecurity by design and sustainability in advanced communication infrastructure.

With radical changes triggered by GenAI, as well as AI applications penetrating more and more industrial domains, demands for low latency are looming. The pilot should have to tackle the network evolution complementing the cloud with progress towards the edge, as well as needing reliability from the mobile networks.

Key aspects to be researched, validated and demonstrated by the 3C Network end-to-end infrastructures include:

- AI-enabled orchestration and quality assurance tools, algorithms and techniques which cater for hybrid multi-cloud technologies.

- Enablers for multi-level (networks, edge, cloud, and services) federation management and interoperability.

- Tools and mechanisms that facilitate the standardised exposure of network functions.

- Enablement of Edge-as-a-Service approaches that effectively integrate cloud computing's multi-tenancy and resource sharing concepts into access networks.

- Security and Compliance mechanisms targeted for telco edge cloud.

- Tools for guaranteed end-to-end QoS and QoE across heterogeneous network, cloud and edge infrastructures.

- Mechanisms to exploit specialised hardware and accelerators to address the strict the requirements (e.g. latency, energy efficiency) of virtualised network functions.

- Investigation on the trade-offs associated to Edge nodes density and placement required in telco edge cloud deployments to achieve the target latency rates. .

- Lightweight virtualisation and cloud-native approaches for virtualised network functions.

- Novel approaches to handle user mobility to ensure edge service continuity and quality of service.

Thanks to these, the pilot and its associated research should support the emergence of telco edge cloud as-a-service approaches that successfully implement multi-tenancy and resource sharing notions from cloud computing into access networks,. In addition, the project infrastructures should cater for the pragmatic complexities associated with the physical placement of the various types of telco edge cloud platforms (near, far, regional,) across the territory considering the necessary trade-offs between performance, capacity, and costs.

Furthermore, the pilot should tackle the need for multi-cloud and edge service orchestration at scale, which enables workload portability across providers and technologies as well as effective service placement and lightweight and cloud-native forms for NFV and optimisation by means of acceleration, multi-cloud orchestration, multi-level federation and mobility management.

Moreover, the technical solutions in the pilot should investigate the use of AI to handle the optimal allocation and optimisation of the operation of the digital infrastructures resultant of the combination of distributed compute and network resources of the edge cloud compute continuum in a predictive and efficient manner and at scale. These should take into consideration the appropriate QoS trade-offs in relation to bandwidth, spectrum, computing, hardware and other functional and non-functional requirements, cater for the need for AI/ML to improve optimisation of assets and process and closed-loop automation, and target development and life-cycle management of AI models and resource management tools for the optimal management of combined and converged network, cloud and edge infrastructures. It will integrate security and privacy by design into account and seek to incorporate mechanisms such as edge discovery and deployment as-a-service delivery, end-to-end network and compute performance, energy efficiency and mobility management, including the Non-Terrestrial Network component for ubiquity.

The pilot should provide an ***open, multi-supplier, multi-vendor, and interoperable Telco Edge Cloud reference architecture and ecosystem*** that encourages cooperation and cooperative development among all key stakeholders, owing to the joint research to be implemented. Furthermore, the pilot must define open access policies and mechanisms that aim to maximise the impact of the provided infrastructure which take into consideration the long-term sustainability and addressing different uses by industrial and research communities. When necessary, these should explore collaboration with complementary actions addressing the demand side.

Project participants should analyse the existing standards landscape as a key state-of-the-art input when planning their project activities.

The pilot should help maturing the technologies resulting from medium TRLs projects, while performing its own research towards enabling and prototyping of converged telco cloud edge platforms in operational and multi-suppliers, multi-domain and multi-tenant environments.

The pilot should cover research on infrastructure and platforms mid-TRLs telco edge cloud technologies, including development of telco-cloud network resources orchestration, demos, proof of concepts and early deployment of technologies.

The main achievements of the pilot should be showcased by means of small-scale demonstrations, that could be scaled up in future work programmes, for instance demonstrators on virtual worlds for industrial settings.

The pilot should ensure a high degree of participation of stakeholders from the relevant technological sectors, including SMEs, scaleups and start-ups, as well as properly consider the demand side from vertical sectors. In this regard, proposals should clearly define the roles and responsibilities of the participating stakeholders in developing, testing, validating, updating, maintaining and/ or using the technologies and services of the 3Cs network. The pilot's Consortium should also define a policy on the ownership and access of 3Cs network resources and facilities, during the Horizon Europe project and beyond.

Links with topics in other WPs: SNS JU Work Programme 2022-2024, Digital Europe Programme WP2023-2024, IPCEI-CIS, Connecting Europe Facility

The large-scale pilot would ideally reuse and extend relevant open-source frameworks and capitalise on existing testing and trial platforms from European or national initiatives [111] among which the IPCEI-CIS, SNS Stream C (dedicated to the development of EU-wide experimentation platforms incorporating promising 6G enablers) and D projects (which focuses on implementing large-scale trials and targets specific verticals of high economic and societal importance), results from Open Internet Stack action, the Cloud-Edge-IoT HE projects, and the Digital Europe Programme's Reference edge-cloud deployments, the "Empowering AI across the continuum" and the "Software engineering for AI" R&I areas, as well as research results on infrastructure and platforms. It should also establish a high degree of relations and collaborate with complementary EU-funded research activities, and also ensure close interaction with the relevant constituencies driving that research, including the Open Internet Stack constituencies. Relevant research from both the supply and the demand side of 3C networks should be considered in this regard, thus ensuring participation of research organisations from all across the value chain.

Finally, digital autonomy in edge and cloud implies that computation infrastructure should be able to be sourced from European technology. The subsequent step following the EU investments in processors for HPC (under the EuroHPC Joint Undertaking) is to extend its success to the rest of the computing continuum. Therefore, the project will also seek to coordinate with other EU (HE) research activities with a view to integrating new processor architectures into cloud edge infrastructures as they become available.

[111] Such as UNICO 6G in Spain, CAMPUS-OS in Germany, 6G Flagship in Finland, etc.

HORIZON-CL4-2025-03-DATA-09: Alignment of stakeholders towards the supply-side large-scale pilot of end-to-end infrastructures integrating device, network computing and communication capabilities (CSA)

Call: DIGITAL - CNECT	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 1.80 and 2.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 2.50 million.
Type of Action	Coordination and Support Actions

Expected Outcome: The supply-side large-scale pilot (LSP) of end-to-end infrastructures integrating device, network computing and communication capabilities will develop horizontal facilities for the benefit of constituencies represented in the supply LSP and also beyond, including those focusing on the demand side of the referred infrastructures. This CSA will bring together all those stakeholders. In any case, the CSA action should be prepared, managed and coordinated by key stakeholders in the field.

The expected outcomes are the following:

- Coordination of the different stakeholder communities in the scope of the supply LSP work (software, hardware, computing, telcos, AI, cloud...), bringing stakeholders together to work on a common plan and technology roadmap on supply and demand of end-to-end infrastructures integrating device, network computing and communication capabilities, monitoring implementation and identifying gaps.

- Enable the supply-side LSP to consider the demand-side perspective, , including requirements from the different applications/user communities.

- Help stakeholders build small, and later larger-scale, demos based on the developments of the supply-side LSP, as well as developments from future Horizon research actions as possible and appropriate.

- Assist stakeholders from the different segments of the value chain (telecoms, software providers, middleware stack providers, etc.) to converge towards a shared approach, while modular and flexible, for telco-edge-cloud infrastructure and services

- Put in place mechanisms for exchange, collaboration and shared governance to facilitate smooth cooperation between supply and demand-side activities, including the Open Europe Stack, towards a common platform approach across industrial actors, including a

repository with critical mass of largely open-source building blocks, as well as maintenance and support services.

Scope: The expected scope of the CSA for this governance mechanism to function would be the following:

- Consolidate priorities and maximise benefits across different demand perspectives and timelines for key infrastructure services to be implemented.
- Ensure alignment of demand and supply side strategies and roadmaps, in line with (and contributing to) the White Paper on communication infrastructures and other relevant EU policy.
- Ensure coordination and integration of the work of the actions on the supply side pilot and the Open Europe Stack.
- Open-source delivery of Telco Edge Cloud building blocks by the supply side pilot, which will be the foreseen backbone to articulate the cooperation among supply- and demand-side LSPs.
- These open-source modules should be aligned with industrial interests and with the developments at IPCEI-CIS Telco Edge Cloud community initiatives (i.e. Sylva and CAMARA).
- The demand-side developments in the relevant verticals will offer a continuous feedback loop to the supply side endeavours, while they will benefit from the progressive developments of the supply LSP.
- Provide a foundation for exploitation of European technology developed under the 3C initiative as an alternative to the platforms led by large multinationals. The project should provide a forum for consultation and input of the demand-side application sectors and verticals into the development of the supply-side architecture and building blocks.
- Identification of paradigms shifts evolving in relevant vertical domains like virtual worlds as a driver for emerging network virtualisation and performance as well as vertical services like mobility, communities or energy.
- Assessment of monetising edge computing, interoperability of middleware and SW framework through trend scouting on markets, value chains and ecosystems in the area of dynamic content delivery, AI adoption for telco operation and edge computing, convergence across the telco-cloud-edge- IoT continuum.

HORIZON-CL4-2025-03-DATA-10: Roadmap for next generation computing technologies from IoT device level to edge to cloud to HPC (CSA)

Call: DIGITAL - CNECT

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 1.80 and 2.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 2.50 million.
Type of Action	Coordination and Support Actions

Expected Outcome: The CSA action should be prepared, managed and coordinated by key stakeholders in the field. Proposal results are expected to contribute to the following expected outcomes:

- Support structure for the European Computing ecosystem: networking events (including conferences, summer schools etc.) and vision workshops for the academic and industrial computing community;
- Yearly updated roadmaps on computing addressing the area from a broad perspective from edge device to edge cloud to cloud to HPC, from scientific to industrial to societal and research applications, and addressing all relevant aspects such as real-time, security, support to artificial intelligence, use of generative AI for computing system engineering, etc.

Scope: To support the European Commission and the European computing constituency by providing to them annually updated roadmaps for research and innovation related to computing. This topic is overarching and building the bridge between Destinations 3 (heading "From Cloud to Edge to IoT for European Data"), Destination 4 ("Ultra Low Power Processors"), as well as the Joint Undertakings (JU) on Chips, Smart Networks and Services, and high-performance computing (HPC). This effort builds on the achievements and structures established by the HIPEAC project and think tank of renowned European research centres on computing "at large" and their key experts. Both the academic visions as well as the industrial perspective complementing the Strategic Research and Innovation Agendas of the JUs should be taken into consideration.

HORIZON-CL4-2025-03-DATA-11: Open Internet Stack: development of technological commons/open-source 3C building blocks (RIA)

Call: DIGITAL - CNECT	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 10.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and

	selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Research and Innovation Actions
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties. The support to third parties can only be provided in the form of grants. The maximum amount to be granted to each third party is EUR 400 000 to allow 1/ cases where a given legal entity may receive several grants (e.g. from different calls) 2/ reaching the maturity level for third party's project to ensure sustainability with multiple awards. To support and mobilise internet innovators, a maximum of 70% of the total requested EU contribution could be allocated to financial support to third parties, selected through open calls.

Expected Outcome: Projects are expected to contribute to the following outcomes:

- A publicly available and operational stack of strategic commons focusing on internet technologies for trust, transactions, connectivity, and decentralisation implementing the European vision of next generation digital infrastructures, in particular the 3Cs networks (in close cooperation with the 3Cs large scale pilots), and the wider Web 4.0.
- A library of inclusive, trustworthy, interoperable, and human-centric applications and services leveraging open-source commons building blocks which will increase the value of the network in the respect of European values. These open source solutions will be integrated and tested / validated in the 3C large scale pilot.
- A flourishing European ecosystem of contributors to digital commons– e.g., individuals, SMEs, academics - stimulated by critical challenges around sovereignty, trust, and user empowerment.

Tools, services, and in-sights supporting compliance with and implementation of EU legal framework e.g., EUDI, CRA, DMA, DSA, GDPR.

Scope: This action will foster an open-source framework, developed through commons, i.e. open source software governed by communities of contributors, that will provide key technology components for the operation of the 3C large scale pilot. They will be addressing relevant areas, structuring them in a stack and supporting the development of 3C building blocks making them available through a library of digital commons supporting applications on top of the European providers ecosystem.

It will mainly cover three technology areas:

- Trust technologies such as privacy enhancing technologies, AI-based agents and trusted technologies for identities allowing exchanges across multiple 3C networks, providing the users with transparent, auditable, secure, and resilient building blocks and tools across the internet stack.

- Network and connectivity technologies according to the identified needs of the 3C large scale pilot.

- Decentralised technologies for an immersive world notably based on open standards ensuring interoperable flow of data and events across the 3C pilot networks and operators.

In order to implement the European vision of next generation digital infrastructures (3Cs networks), applicants should devise appropriate mechanisms for cooperation with the 3C Pilot:

- To ensure the integration of requirements and specifications stemming by the 3C Large Scale Pilots.

- To ensure the 3C Large Scale pilot's swift integration of the building blocks developed by the Open Internet Stack, including envisaging mechanisms for testing and integration of the solutions.

Applicants should provide concrete plans on how such work should be organised in close cooperation with the 3C large scale pilot to decide the building blocks that will be prioritised, facilitate their integration in the 3C large scale pilot and avoid any duplication of the work. If applicants opt for financial support to third parties, the solutions selected under the Open Calls should form a coherent portfolio and duplications should be avoided. The 3C CSA will ensure co-ordination and monitoring for duplication risks across the 3C projects' activities.

Applicants could also decide to select and fund third party projects, wherever required, through up to 70% of their project's budget for financial support to third parties based on excellence and addressing requirements for transparency, publicity, confidentiality, fair treatment, and adequate handling of conflict of interest.

If applicants opt for financial support to third parties, they should target calls towards the open-source communities actively influencing the course of the Internet. The calls should aim at improving trust, transactions, decentralisation implementing optimal balance between distribution, security (including AI for security), AI usage and energy efficiency targeting climate neutrality objectives. Applicants should then also define the mechanisms for maturing third parties' projects e.g., security and accessibility audits, packaging of the stack for easy deployment, localisation of the software in EU languages, documentation best practices, performance optimisation and advising on licensing.

Applicants should detail the path to growth for third parties' projects e.g., by actively animating communities, creating momentum among like-minded efforts, defining how

projects will gain critical mass and what services will be provided for reaching such stage. Proposals should also detail the strategy for standardisation.

In addition to contributing to the 3C large scale pilot, applicants should demonstrate how the software produced will be operationalised as a stack of open libraries accessible through a common European repository and maximising re-use, reproducibility, and resilience for adopters.

Applicants should actively manage the portfolio of funded projects and provide a coherent overall picture in relation to the 3Cs objectives, describing how mature solutions are and ensuring trusted and easy deployment capabilities for each building block through packaged stack.

Applicants should strive for identification of common tools and stimulate maximum re-use of components coming from other funded projects e.g., interoperable identity and credential management tools, common packaging solutions, tools for decentralised social media.

Applicants should seek active collaboration with other initiatives addressing internet commons of relevance to 3Cs at national, European levels and beyond Europe including with European technology industries.

Applicants should demonstrate their experience and understanding of open-source communities and their expertise covering the full open-source life cycle through proven track record including years of experience and indication of volume of open-source projects supported.

The Commission considers that proposals in this topic with an overall duration of typically 36 months would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other durations.

Financial support to third parties

The proposal should detail the calls logic including criteria for eligibility and award, procedure for awarding, eligible costs, third parties' costs calculation and maximum per calls. Third parties will be funded through projects typically in the EUR 50 000 to 150 000 range per project, with indicative duration of 9 to 12 months. The consortium should provide the programme logic for the third-party projects, managing the projects lifecycle, and provide the necessary technical and non-technical support: these tasks cannot be implemented using the budget earmarked for the financial support to third parties.

HORIZON-CL4-2025-03-DATA-12: Preparing the Advancement of the state of the art of submarine cable infrastructures (CSA)

Call: DIGITAL - CNECT
Specific conditions

Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 1.90 and 2.10 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 2.10 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: Specific Art22.5 condition TBD

Expected Outcome: Defining specific R&I roadmap at EU level to establish leadership in all relevant submarine cable technology domains (EU research roadmap on submarine cables). This CSA should be prepared, managed and coordinated by the key stakeholders in this field.

The project should take into consideration the overarching challenges of:

- Reinforcing European leadership in submarine cable connectivity, with European capabilities and best practices shaping future connectivity standards, promoting their secondary use (e.g. for a pre-warning system of natural hazard) as well as synergies and collaboration with CEF-Digital backbone projects;

- A digital and green transition towards low carbon footprint of connectivity platforms through principles of the circular economy, including reduction of pollution, regenerating natural systems etc. while targeting long-term sustainability, resilience and security of submarine cable networks; and

- Ensuring resilience for the most demanding cases requiring a very high grade of quality of service (QoS) and performances.

Against this background, the objectives of the target support actions are outlined below:

- Analysis and definition of the expected critical hardware and software components of future submarine cable infrastructure systems, and indication on where Europe should seize opportunities and strengthen its capabilities, taking into account the characteristics and architectures, including components, security, and operations of future submarine connectivity infrastructures;

- Definition of the main required R&I work and assessment of associated research investment needs related to the identified domains;

- Definition of an appropriate industry roadmap (SRIA), in close partnership with relevant EU actors both from industry and academia, indicating research & innovation actions to be undertaken in priority, their scope, and a timetable showing the main milestones and targets. The project could envisage organising thematic workshops to consult all interested communities.The results of this action will feed into the work of relevant groups working on submarine cable infrastructures, such as the European Submarine Cable Expert Group, the NIS 2 Coordination Group or the CER Group.

Scope:

- Enabling technologies applicable to submarine connectivity infrastructures and systems, including its secondary use for pre-warning systems against natural hazards, are increasingly important to ensure Europe's strategic autonomy as well as economic security. Achieving such goals requires that Europe remains at the technological edge not only with regards to the cable technology itself but also all the other critical elements composing the submarine cable infrastructure such as repeaters, landings stations, operational control centres, underwater acoustic sensor networks (UASN) or cable communications cybersecurity.

- While some of the necessary research is indirectly conducted through mainstream research activities in generic technologies (e.g., optical communications or network management software), more specific research is needed to address the particular needs and advancement of submarine cable infrastructures and systems. However, the specific research needs still need to be identified, which supports the need to develop a specific roadmap and SRIA for research and innovation in submarine cable technologies. Such research efforts may address some of the following (non-exhaustive) domains: Multi-core fibre (MCF) technology, Digital Signal Processing, repeater systems, intelligent sensing, advanced Digital Acoustic Sensing (DAS), strain and temperature sensing, oceanographic sensors for continuous, real-time trans-oceanic measurements (monitor water body), logical layer and cable network management systems, robotics to improve the construction, maintenance and repair of submarine cable infrastructures, and other innovations, such as wireless sensor networks (WSN) to monitor permanently submarine cable infrastructure and to detect possible threats.

Links with topics in other WPs: CEF Digital, SNS JU

AI-GenAI / Data / Robotics

Proposals are invited against the following topic(s):

HORIZON-CL4-2025-03-DATA-13: Fostering Innovative and Compliant Data Ecosystems (IA) (AI, Data and Robotics Partnership)

Call: DIGITAL - CNECT
Specific conditions

Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 7.00 and 9.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 45.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to start at TRL 5-7 and achieve TRL 7-8 by the end of the project – see General Annex B.

Expected Outcome:

- Easing the compliance process of businesses and professionals with the relevant EU legislation, in particular reporting obligations, and alleviating administrative burdens for businesses, and professionals
- Development and integration of advanced technology for data collection, data sharing and data analytics for simplifying and automating compliance.
- Generating, managing, and leveraging synthetic data to improve fitness for purpose. These initiatives aim to address limitations of real-world data, enhance data quality, diversity, and representativeness, while mitigating bias and addressing other ethical issues.
- Ensuring broad user training and support for rolling out and scaling up "compliance by design" and the FAIR[1] principles in the constantly evolving regulatory landscape

Scope: As the European Union (EU) legislation continues to expand, both in the digital (GDPR, Open Data Directive (ODD), Data Governance Act, AI Act, Data Act) and non-digital realm (green deal, due diligence, healthcare), businesses and professionals face increasing challenges in maintaining compliance. Also, the complexity and volume of reporting obligations are growing, posing difficulties for both regulatory bodies to enforce laws and for entities trying to comply. These challenges underscore the need for innovative solutions to streamline compliance processes and enhance competitiveness within the EU.

Another current challenge are limitations of real-world data such as issues with availability, confidentiality, and bias. Synthetic data is becoming increasingly vital in addressing these problems. By generating and utilizing synthetic data, actions within this framework aim to enhance data quality, diversity, and representativeness, making it a crucial tool for AI-powered innovation and regulatory compliance.

Where relevant, the actions should address **cybersecurity, interoperability, reproducibility and standardization**, and/or liaise with other actions working on those aspects, in view of facilitating effective data sharing across platforms and sectors, while ensuring an adequate level of security and protection.

Actions should provide necessary comprehensive **user training and support**, (also involving the users/stakeholders outside the project), ensuring adaptability and scalability to accommodate evolving regulations and diverse organizational needs and to raise awareness and improve understanding of relevant compliance issues. Proposals for all three areas should analyse and address the real needs of real users and stakeholders, and how these will be addressed in the proposed action. The training and user needs should be linked to tangible progress indicators in the proposal.

The proposal must clearly state (in the abstract and in the introduction) which of the following three areas it addresses. A proposal can address more than one area, but it should indicate one of them as the main focus of the proposal, and it will be evaluated accordingly under that area.

- Area 1: Actions to develop advanced compliance technology integrating AI, cybersecurity, language technologies, and privacy preservation. This framework could include the creation of NLP-driven semantic analysis tools for deciphering complex legal texts and translating them into clear compliance tasks, energy-efficient neuromorphic approaches or machine learning algorithms trained on historical data to predict and mitigate potential compliance violations. With the capability to detect changes in EU legislation, these advanced AI systems and analytics tools will provide deep insights into compliance performance, risk management, and help forecast upcoming regulatory trends to strategically prepare for future requirements.

- Area 2: Actions to ensure auto-compliance of data transactions and data spaces with applicable regulation (e.g. data and sectoral legislation). Actions in this area should anticipate compliance tasks within the context of Common European Data Spaces and coordinate with them as necessary. Actions in this area are required to develop automatic or semi-automatic tools that analyse and take into account the specific architecture, exchange mechanisms, tools, data types, identity management, smart contracting and other user needs or operational features of the actual data spaces, liaising with and building on other actions working in this area, in particular the Data Spaces Support Centre.

- Area 3: Actions to generate, manage and leverage **sy**nthetic data in order to improve data quality, availability, representativity, fitness for purpose and compliance. The actions should in particular address the inherent shortcomings of real world data that would necessitate synthetic data (e.g. data availability, confidentiality, privacy protection, enhancing quality, diversity, representativeness, bias). Additionally, actions may target generating synthetic data for sparse or unusual domains, integrating synthetic and real data effectively, or advancing technological capabilities in generative models and simulation-based approaches to drive synthetic data generation forward and/or addressing or modelling rare events and complex dynamic systems. All actions under this Area are required to address the evaluation, validation and benchmarking of synthetic data to ensure fitness for purpose and safe, ethical and compliant use of synthetic data. For this purpose, collaboration with simulation/digital twins actions could be explored.

Proposals will be selected so that each area is addressed at least by one selected proposal.

This topic implements the co-programmed European Partnership on AI, Data and Robotics

Links with topics in other WPs:

- All Digital Europe programme topics implementing Common European Data Spaces, especially the Data Spaces Support Centre (DSSC).
- HORIZON-CL4-2024-DATA-01-01 AI-driven data operations and compliance technologies (IA).
- HORIZON-CL4-2021-DATA-01-01 Technologies and solutions for compliance, privacy preservation, green and responsible data operations (RIA).

HORIZON-CL4-2025-04-DATA-02: Empowering AI/generative AI along the Cognitive Computing continuum (RIA) (AI/Data/Robotics Partnership)

Call: DIGITAL - HADEA	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 6.00 and 8.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 30.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to start at TRL 3 and achieve TRL 6-7 by the end of the project – see General Annex B.

Expected Outcome: Projects are expected to contribute to the following outcomes:

- **Novel AI-enabled Cloud and Edge management solutions** tailored for the processing needs of AI workloads across the cognitive cloud-edge-IoT continuum.
- Strategic industrial cooperation across the Cloud-Edge-IoT cognitive computing continuum to support future **hyper-distributed AI applications.**
- Seamless and trustworthy integration across diverse computing and data environments spanning from core cloud (including HPC) to edge to IoT.
- Enhanced openness and open strategic autonomy in the evolving data and AI-economies across the computing continuum **validated through key business/societal sectors**.

- Better international collaboration with trusted partner regions, guaranteeing a minimum level of interoperability and portability thereby facilitating European access to foreign markets.

Scope: The Cloud to Edge Continuum needs to provide seamless and trustworthy integration of diverse computing and data environments spanning from core cloud to edge to IoT and support the enormous data, processing needs, and new resource types brought by next generation AI technologies.

Different types of AI processes pose different requirements that compute infrastructures need to meet to execute them. The state-of-the-art in generative AI and large language models is heavily reliant on high-performance processing and very large AI models. Cutting-edge hardware accelerators that power these processing systems are scarce on the market and only available in highly specialised, high-performance infrastructures in certain cloud and HPC environments at considerable costs. At the same time, the requirement to gather, process, and transmit massive amounts of data to the central data processing environment remains a barrier for many AI applications. All these factors urge the emergence of efficient tools and mechanisms **to empower the distribution of AI training and inference processes throughout the computing continuum.**

Empowering the next generation AI technologies with on-demand, agile and situation-aware infrastructure that brings data- and computing power to where and when it is needed will let end-users exploit Artificial Intelligence across the computing continuum without compromising on security and trust and optimising their energy use. These **challenges** span various aspects of the continuum, including **on-device data processing, data orchestration, AI integration, decentralised intelligent management, decentralized and global optimization, energy and resource heterogeneity support, data management, security/privacy, and synergies with 5G/6G.** Addressing these challenges is crucial for realizing the vision of a cognitive cloud-to-edge continuum as a key enabler for any emerging trends such as AI/generative AI.

The Cognitive Computing Continuum could eventually be extended to i**nclude other computational resources**, such as **HPC**, and provide abstraction layers to maximize the benefits of available hardware.

Addressing all the above complexities calls for innovative research to overcome these challenges. **The aim is to develop generic and AI-enabled cloud-edge technologies encompassing the whole computing continuum to empower the development of AI/generative AI technologies and applications.** The proposals should demonstrate the generic applicability of the proposed technological solutions across various application domains.

The following (one or more) research areas need to be addressed:

- **Development of novel mechanisms for the efficient development, deployment, and operation of AI workflows** across heterogeneous and distributed infrastructures along

the Edge to Cloud to HPC continuum that optimise training times, model accuracy and data management while factoring in performance metrics such as memory usage, energy efficiency, application processing and data transfer latency, and network overheads. These should factor in virtualisation and orchestration techniques that seamlessly integrate heterogeneous processor architectures and cater for the explainability of the applied cognitive optimisations.

- **Decentralised and federated computing continuum tools and mechanisms to enable distributed AI architectures.** These include scheduling, orchestration, and placement mechanisms that leverage the wide range of Edge computing environments available in the compute continuum, including on-device edge. Tools and mechanisms should take into consideration - where appropriate - data security and privacy aspects. The focus is on enhancing AI process execution through techniques such as model, data, hybrid parallelism and data compression, gossip, and federated training, or conditional computing.

- **Cloud and edge processing tools and techniques to reduce AI processing power usage and emissions across the cognitive computing continuum**, relying on hardware efficiency (for example, thanks to special-purpose accelerators and heterogeneous hardware processor architectures) and energy optimisation techniques, such as hardware and software approximation.

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

This topic implements the co-programmed European Partnership on AI, Data, and Robotics.

Links with topics in other WPs:

Projects are expected to develop synergies and relate to activities and outcomes of the Digital Europe Programme (DEP) and any existing or emerging Important Projects of Common European Interest (IPCEI) initiative, such as IPCEI-CIS.

All proposals are expected to share communicable results with the European R&D community, through the AI-on-demand platform, and if necessary other relevant digital resource platforms in order to enhance the European AI, Data and Robotics ecosystem through the sharing of results and best practice.

HORIZON-CL4-2025-04-DATA-03: Software Engineering for AI and generative AI (RIA) (AI/Data/Robotics Partnership)

Call: DIGITAL - HADEA	
Specific conditions	
Expected EU contribution per	The Commission estimates that an EU contribution of between EUR 4.00 and 6.00 million would allow these outcomes to be addressed

project	appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 15.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to start at TRL 4 and achieve TRL 7 by the end of the project – see General Annex B.

Expected Outcome:

- Improved methods and tools to optimally develop and deliver bias-free AI algorithms and generative AI.
- New concepts of the auto-evolution-enabled software elements that AI algorithms can autonomously select and integrate.

Scope:

The latest developments in AI are demanding computation infrastructures designed to maximize the number of FLOPS. Europe has a window of opportunity to leverage open source and ensure that the European industry is at the cutting edge of these new processing infrastructures. The current methods and tools to develop and efficiently deliver AI pipelines and complex generative AI applications present several shortcomings.

Current identified challenges include the continuous management of data pipelines, novel testing methods (e.g. differential testing or improved performance testing), optimized deployment strategies (in terms of using energy efficient resources or the best performant), management of dependencies with a diverse set of types of hardware, algorithm bias and discrimination against certain groups, determined by characteristics such as gender, ethnicity, age or disability, as well as the maintenance of the effectiveness of AI applications, notably generative AI ones. The explainability of AI models is another crucial challenge that must be also tackled at the software engineering level, possibly in synergy with explainability methods at the machine learning stage. Also, large language models and foundational models require the development and operation of complex system architectures that need to handle data processing at large scale, continuous training of models and inference. Furthermore, AI pipelines and generative AI application also strongly suffer from poor protection against learning dataset poisoning, as well as prompt poisoning; software engineering methods and tools providing support to protect against those attacks are thus direly required. This presents novel challenges for developers that will need to be addressed with the development of new methods, mechanisms and tools covering the above, including neuromorphic computing, but not limited to.

The main objectives for the advancements of Software Engineering in this field are:

- Increasing the productivity of generative AI application developers, and operators, especially of foundational models and large language models.
- Define a reference architecture and framework for generative AI application developers to simplify integration and system modularity.
- Simplifying and automating the development and operation of such applications.
- Including novel techniques for the generation of labelled training sets for reinforcement learning from human feedback.
- Facilitating AI progress and advancement beyond the state-of-the-art in the EU at a faster rate vis-à-vis the rest of the world and contributing to the implementation of the AI Act.
- Establishing collaboration with EU-based chips designers to maximize how the hardware resources are fully optimized with the software to develop[BPLC(1]

Actions could build on, provide support or seek collaboration with existing projects and develop synergies with other relevant European, national or regional initiatives currently demanding this kind of optimisations possibly in different verticals: e.g. digital twins leveraging GenAI, data quality enhancement leveraging GenAI, development of energy-efficient AI algorithms.

1. HORIZON-CL4-2024-HUMAN-03-01: Advancing Large AI Models: Integration of New Data Modalities and Expansion of Capabilities
2. HORIZON-CL4-2023-DATA-01-01 AI-driven data operations and compliance technologies (IA)
3. HORIZON-CL4-2021-DATA-01-01 Technologies and solutions for compliance, privacy preservation, green and responsible data operations (RIA)

Proposals may seek to exploit potential synergies with the projects funded under the topic HORIZON-CL4-2021-HUMAN-01-24 - tackling gender, race and other biases in AI.

This topic implements the co-programmed European Partnership on AI, Data, and Robotics.

Links with topics in other WPs:

Projects are expected to develop synergies and relate to activities and outcomes of the Digital Europe Programme (DEP) and any existing or emerging Important Projects of Common European Interest (IPCEI) initiative.

Destination 4: Achieving open strategic autonomy in digital and emerging enabling technologies

Cluster 4 ensures Europe’s strategic autonomy while preserving an open economy in those technologies that will be key for a deep digital transformation of industry, public services and

society, while fully playing its enabling role in the twin transition. As set out in the European Chips Act, the top-priorities are to i) strengthen processes undertaken at critical stages in the semiconductor and quantum chips value chain, including chip design and manufacturing technologies, and ii) address the use of new materials and green technologies, energy efficiency and the integration of circularity and life-cycle assessment.

Cluster 4 will address high value-added hardware needs for core, cloud and edge, fast-sensing, low-latency and high-bandwidth data transmission, and help secure the supply of critical components for key markets, such as automotive, health, automation and mobility systems. For this purpose, significant human capacity will be required in chip manufacturing to ensure: (i) the strengthening of processes undertaken at critical stages in the value chain; and (ii) that workers can take up quality jobs created as part of these priorities, including through the activities undertaken by the joint undertaking initiative.

In addition, future needs in microelectronics (such as performance, size, cost, energy efficiency, environmental impact, new materials, concepts, architectures, integration) may also be addressed to make sure Europe's microelectronics industry remains competitive. Opportunities may come from non-volatile memories, spintronics, in-memory computing, neuromorphic and other emerging technologies. Photonics research will lead to fast and versatile sensing and imaging, and energy-efficient building blocks for networks and data centres. The cluster will also push for chip-level integration of photonics and optoelectronics.

The cloud/edge/internet of things will be transformed into an agile and situation-aware infrastructure that brings data to where and when it is needed. Within these smart digital infrastructures, end-to-end artificial intelligence, from the core to the edge and across all technology layers, will be key for on-demand supply of optimal data-, communication-, and computing resource orchestration, with optimal use of energy while preserving privacy and ensuring resilience. European sovereignty in the cloud-edge server market will be strengthened through the power of open-source software, complementing the RISC-V based European Processor Initiative that aims to increase Europe's independence in high performance computing hardware.

Cluster 4 will transform the user experience. It will push the frontiers of virtual and extended realities (VR/XR) and of open, human-centric virtual worlds for industry, entertainment and arts, public services and people alike, e.g. by leveraging social innovation. It envisages a vibrant R&I ecosystem that strategically joins-up research and development on sophisticated VR/XR optics and displays, multimodal human-computer interaction, authoring tools, realtime spatial computing, rendering, integration and application research. Improved sensing, fast processing and low-latency will be challenging for the underlying cloud/edge/Internet of things. Along similar lines, the way in which the virtual world meets the physical world will continue to evolve, thanks to all kinds of robots and other smart devices that involve self- and context awareness, spatial intelligence, exploiting the best in bias-free AI, engineering and design for game-changing physical characteristics, functional or cognitive capabilities, acute perception, autonomy and safe interaction.

Artificial intelligence underpins many of these changes and Cluster 4 will strengthen and consolidate R&I in this area. For example, today's generative models are a preview of how virtual worlds and multimodal user-experiences could be produced on-demand. Research on core learning and analysis techniques (incremental, frugal and collaborative), as well as next generation smart robotic systems, will keep Europe at the cutting edge of AI. Artificial Intelligence is also key to keep the competitiveness and strategic autonomy of the EU scientific sector.

Europe's long-term competitiveness in the digital area requires continuous scouting and early, low-TRL cross-disciplinary work on new and emerging technologies, dissociated from the main roadmaps. This would encourage collaboration in research and cross-fertilisation between disciplines and sectors on new approaches in: (i) microelectronics; (ii) power electronics; (iii) photonics and photon/phonon/spin/electron integration; (iv) unconventional, hybrid, neuromorphic, nature-inspired or bio-intelligent paradigms; and (v) novel systems and infrastructure architectures.

Europe's strength in quantum technologies (including in quantum communications and optical satellite communications, etc.) is a strategic asset for its future security and independence. Cluster 4 supports early and mature quantum technologies and stimulates their industrial uptake, e.g. through experimentation and testing environments for integrating them into standard industrial design and manufacturing. Equally transformative, two-dimensional materials (2DM) could positively affect many industries, including ICT. While further exploring the vast range of 2DMs, Cluster 4 will also work towards completing a fully European supply chain and scaling up the development and piloting of 2DM technologies and devices for more industrial fields.

Quantum and High Performance Computing

Proposals are invited against the following topic(s):

HORIZON-CL4-2025-03-DIGITAL-EMERGING-01: Continuation of the Quantum Technologies Flagship (CSA)

Call: DIGITAL - CNECT	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 4.00 million.
Type of Action	Coordination and Support Actions

Expected Outcome: The new Quantum Flagship CSA is expected to:

1. Act as a global observatory of quantum technologies, systematically reporting on the latest advancements and breakthroughs occurring worldwide. It will provide regular assessments to the European Commission and Member States, specifically to the Quantum Expert Group of the Quantum Pact, offering a detailed analysis of Europe's standing relative to global competitors. This will ensure Europe can strategically respond to emerging trends and innovations.

2. Capitalize on the accomplishments and infrastructure (e.g. online presence) established by the current CSA to further elevate Europe's leadership in quantum technologies.

3. Provide comprehensive support to Flagship projects, researchers, and innovators, fostering synergies, knowledge sharing, and best practices.

4. Develop and implement targeted communication strategies to raise awareness and understanding of quantum technologies across varied audiences, including students, specialists, and the general public.

6. Promote the sustainable growth of quantum technologies in Europe by exploring new applications and markets, ensuring the field's dynamism and competitiveness.

7. Serve as a pivotal entity for coordinating efforts between the EU and Member States, especially in light of the new Quantum Pact. This includes aligning national and European strategies and enhancing international relations to fortify Europe's stance in the global quantum landscape.

8. Assist the Flagship's governance bodies and facilitate the integration of new structures or initiatives, ensuring a cohesive and efficient approach to advancing quantum technologies in Europe.

9. Act as a globally-oriented data observatory for quantum, systematically collecting data (e.g. on patents, scientific publications and the current and future evolution of markets for quantum technologies) related to the state of quantum in Europe and worldwide. Once or twice a year, this data should be disseminated to stakeholders, including the Commission and Member States, as well as countries associated to Horizon Europe.

10. Propose a clear, service-oriented model detailing the CSA's offerings to various stakeholders, including research support, data business intelligence, strategic analysis, international collaboration facilitation, event organization, and communication activities.

Scope: The scope of the new Quantum Flagship CSA encompasses:

1. The global observatory role of quantum technologies, systematically reporting on the latest advancements and breakthroughs occurring worldwide.

2. Fulfil the dissemination requirement of five articles every two months highlighting EU success stories in quantum technologies. These articles must be widely promoted in Europe and beyond via social media, popular newspapers, and technical magazines to ensure maximum visibility and impact.

3. Building upon the established infrastructure by the previous CSA, support the European Commission and current and future projects within the Quantum Flagship, including organisation of events and ensuring they have access to the necessary resources and expertise.

4. Developing comprehensive communication plans tailored to different target audiences, enhancing the visibility and understanding of quantum technologies and their societal implications.

5. Acting as a central hub for coordinating actions between the EU, Member States, and international partners. This involves compiling and disseminating information critical for harmonizing strategies at different levels.

6. Providing support to the Flagship's governance structures, contributing to the smooth execution of its strategic vision and operational goals. This may include aiding the establishment and integration of new bodies or initiatives.

The project should aim to link to the activities of relevant standards developmnet organisations with e.g. participation of project beneficiaries in the relevant standards technical committees. The Commission encourages the inclusion of partner(s) with direct experience -of participation in relevant standards committees at national, European or international level(s) in project consortia.

Proposals are encouraged to build on, or seek collaboration with, existing projects and develop synergies with other relevant European, national, or regional initiatives and funding programmes. In particular, links are encouraged with:

- the project funded under the topic HORIZON-CL4-2021-DIGITAL-EMERGING-01-32: Support and coordination of the Quantum Technologies Flagship Initiative (CSA) – QUCATS project;
- all quantum technologies-related projects from Horizon Europe, the EuroHPC Joint Undertaking and the Chips Joint Undertaking.

Proposals should also cover synergies with other relevant European, national, or regional initiatives and funding programmes such as those mentioned above.

Proposals should also contribute to spreading excellence across Europe; for example, through the involvement of EU Widening Countries.

HORIZON-CL4-2025-03-DIGITAL-EMERGING-02: Quantum Computing – complementing the quantum computing FPAs with the development of a technology agnostic software stack (RIA)

Call: DIGITAL - CNECT	
Specific conditions	
Expected EU	The Commission estimates that an EU contribution of between EUR

contribution per project	4.00 and 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: Specific Art22.5 condition TBD
Technology Readiness Level	Activities are expected to start at TRL 3-4 and achieve TRL 5-6 by the end of the project – see General Annex B.

Expected Outcome: Proposals under this call are anticipated to achieve pivotal advancements in quantum computing by:

1. Establishing a universal, interoperable quantum computing ecosystem that supports diverse hardware platforms through the creation of technology-agnostic software stack.

2. Seamlessly integrating quantum computing with classical computing systems, including HPC and cloud services (including the European High Performance Computing Joint Undertaking's supercomputers, and the quantum computers and simulators already integrated into them), and demonstrating practical quantum computing applications by showcasing use cases that combine quantum and classical computing capabilities

3. Advancing the development of standardized software architectures, compilers, and simulators that ensure application portability and performance across different quantum computing platforms.

4. Demonstration of workflows that effectively combine quantum and classical computing to address complex computational challenges, providing clear examples of the added value of quantum acceleration.

5. Support for initiatives aimed at training software developers in quantum programming and developing libraries for basic quantum algorithms, including the integration of quantum error correction mechanisms.

This call for proposals emphasizes the strategic importance of collaboration between Horizon Europe quantum computing software and hardware projects and the EuroHPC Joint Undertaking's quantum projects, including high-performance computing-quantum middleware, integration, and Quantum Excellence Centres. Successful applicants will be required to closely collaborate and agree on the interfaces for the main layers of the software stack at the beginning of their projects. It is crucial that the projects collaborate from the outset to define open interfaces for the main layers of the software stack. These interfaces should be open for consultation and incorporate input from existing initiatives to ensure they

are well aligned with current developments in the field. All interface specifications must be properly documented as they will serve as the foundational basis for the development of different layers and facilitate seamless collaboration across projects.

In line with the European Commission's commitment to open access and reuse of software, when possible, all developments under this call must utilize open-source software platforms and be published in open repositories such as GitHub. Additionally, when possible, all software must be licensed under the European Union Public Licence (EUPL).

For all the above outcomes, the use of appropriate software licenses, such as those listed as free by the Free Software Foundation and listed as open source by the Open Source Initiative, is strongly recommended. Moreover, the beneficiaries will have to ensure open access to other research outputs like data and workflows under the principle 'as open as possible and as closed as necessary'.

Scope: Quantum APIs and cloud access form the transition layer between users and quantum machines in the quantum computation stack. This layer includes general-purpose quantum software development kits that are used to implement quantum algorithms for both gate-based systems, simulators and quantum annealers. This call seeks proposals that address the creation of a cohesive software stack that is agnostic to quantum hardware, facilitating the development, testing, and deployment of quantum applications across various platforms.

Projects are expected to deliver results under Open Source licenses and shall include source code and data sets used as part of open repositories available to the EU community at large.

Proposals are encouraged to build on, or seek collaboration with, existing projects and develop synergies with other relevant European, national, or regional initiatives and funding programmes. In particular, links are encouraged with:

- HORIZON-CL4-2021-DIGITAL-EMERGING-02-17: Framework Partnership Agreement for developing large-scale quantum simulation platform technologies (FPA)
- HORIZON-CL4-2021-DIGITAL-EMERGING-02-15: Framework Partnership Agreement for developing the first large-scale quantum computers (FPA)
- HORIZON-CL4-2023-DIGITAL-EMERGING-01-43: Framework Partnership Agreement for developing large-scale quantum Computing platform technologies (FPA)
- HORIZON-CL4-QUANTUM-02-SGA - Developing large-scale quantum simulation platform technologies (SGA)
- HORIZON-CL4-QUANTUM-01-SGA - Developing the first large-scale quantum computers (SGA)

Proposals should also contribute to spreading excellence across Europe; for example, through the involvement of EU Widening Countries.

HORIZON-CL4-2025-03-DIGITAL-EMERGING-03: International cooperation: joint research and development with Korea (RIA)

Call: DIGITAL - CNECT	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 2.50 and 2.70 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 8.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to start at TRL 2-3 and achieve TRL 3-4 by the end of the project – see General Annex B.

Expected Outcome: The overall objective of this call is to support the implementation of the EU-Republic of Korea Digital Partnership by strengthening cooperation with Republic of Korea (ROK) in quantum technologies, in the areas identified in the Partnership.

Joint EU-ROK proposals are expected to contribute to the following outcomes:

- Strengthening the European quantum ecosystem, enabling stakeholders to enhance quantum technologies' applications in academic, industrial, and relevant cases for the EU and ROK.
- Improving the exchange of information and expertise to tackle societal challenges utilizing quantum technologies.
- Sharing best practices in deploying quantum technologies and integrating them with other technologies.
- Facilitating researcher and engineer exchanges between the EU and ROK for mutual access to quantum infrastructures.
- Enhancing international cooperation between the EU and ROK quantum communities, with a roadmap for future collaboration in targeted areas.

Scope: Proposals for the Joint Call EU-ROK are expected to address quantum technology challenges in the fields of quantum communication, computing, simulation, and sensing, identifying the added value and mutual benefits for both EU and Korean partners. This includes integration across various disciplines such as physics, engineering, computer science, cybersecurity, theory, algorithms, software, manufacturing, control, infrastructures, etc.

Relevant technological and societal challenges to address include:

• Co-design of hardware and software to accelerate quantum computing and simulation applications, ensuring interoperability across platforms and foundational quantum algorithm and architecture theories.

• Development of secure quantum communication protocols, including quantum key distribution and beyond, with a focus on device independent protocols, quantum network architecture, and certification of quantum states.

• Application-specific quantum sensor development, covering areas like device fabrication, characterization for purposes like navigation, imaging, and biomedical applications, and optimizing sensor control and advanced approaches.

Proposals should link to the activities of relevant standards development organisations, with e.g. participation of project beneficiaries in the relevant standards technical committees. The Commission encourages the inclusion of partner(s) with direct experience of participation in relevant standards committees at national, European or international level(s) in project consortia. dded at the

Proposals should clearly define the benefit of EU-ROK collaboration, aiming to enhance the technology readiness level (TRL) through comprehensive engineering approaches involving public and/or private partners.

Proposals should also contribute to spreading excellence across Europe; for example, through the involvement of EU Widening Countries.

International cooperation: Joint or coordinated calls

Proposals must be submitted by consortia involving entities from both the EU and ROK.

Participants are expected to adhere to the rules of participation and funding outlined in the Horizon Europe Framework Programme.

All proposals must include a detailed plan for collaboration, including objectives, methodologies, and expected outcomes.

HORIZON-CL4-2025-03-DIGITAL-EMERGING-04: Post-exascale HPC (CSA)

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

Type of Action	Coordination and Support Actions

Expected Outcome:

- Delivery of a high-quality roadmap addressing the post-exascale HPC research challenges for applications, algorithms, software, hardware and systems
- Contribution to the development of a competitive European converged HPC/Quantum/AI ecosystem
- Interaction and collaboration with similar international efforts

Scope: Proposals are invited for a Coordination and Support Action that will guide and prepare European HPC for the post-exascale era of converging supercomputing, quantum computing and artificial intelligence worlds.

The action should bring together the key scientific and industrial players in Europe and should liaise with RIAG, INFRAG, ETP4HPC, international post-exascale efforts, DARE FPA on RISC-V hardware, CoEs and other relevant European projects and initiatives.

The action should analyse the research challenges of all relevant technologies in the post-exascale era and produce and maintain a high-quality research roadmap with recommendations for research actions at the European level. Issues like hardware-supported mixed-precision, HPC as a service, real-time HPC, digital continuum, convergence of HPC/AI/Quantum/Cloud/Edge, should be part of the analysis.

The Commission considers that proposals with an overall duration of typically 36 months would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other durations.

Photonics

Proposals are invited against the following topic(s):

HORIZON-CL4-2025-04-DIGITAL-EMERGING-01: Advanced sensor technologies and multimodal sensor integration for multiple application domains (IA) (Photonics Partnership)

Call: DIGITAL - HADEA	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 4.00 and 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Indicative budget	The total indicative budget for the topic is EUR 25.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to start at TRL 3-4 and achieve TRL 6-7 by the end of the project – see General Annex B.

Expected Outcome: Photonics sensor technologies enable precision and versatility in sensing across multiple domains. The integration with multimodal systems enhances data accuracy, speed and reliability. Advancements in photonics sensors and their multimodal integration aim to elevate diagnostics, monitoring, and sensing of the environment by improving efficiency, performance, and reliability while reducing size and manufacturing costs and power consumption.

The development of sensor technologies and multimodal integration is closely aligned with several key EU policies. These include achieving open strategic autonomy in digital and emerging enabling technologies, enhancing Europe's technological sovereignty, and supporting the twin transition to a digital and green economy by promoting energy-efficient, competitive, and resilient digital infrastructures.

The initiative also aims to advance the digital transformation by providing access to high-quality environmental data, supporting the development of technologies for privacy, compliance, and data integrity to empower decision-making and foster a fair data economy.

Lastly, it contributes to the green transition by leveraging photonics sensor technologies for environmental monitoring and sustainable practices. It aligns with the EU's objectives for a green and digital economy, enhancing system operations and promoting innovation in eco-friendly practices, thus strengthening Europe's technological leadership for societal and economic progress.

Projects are expected to contribute to at least three of the following outcomes to fully exploit the potential of photonics for a digital, green and healthy future in Europe:

- Increase the efficiency of developed photonic sensors, surpassing existing technologies in aspects such as energy consumption, data acquisition and processing speed, as well as measurement accuracy.
- Significantly reduce the size, weight, or footprint of the sensors and quantify advancements over current technologies.
- Improve both intrinsic and extrinsic performance metrics to boost measurement accuracy for at least three user-case scenarios.
- Extend the sensing and testing capabilities of photonic sensors by linking them to non-photonic sensors such as acoustic sensors, electromagnetic sensors etc.

- Contribute to reducing manufacturing costs and increasing resource-efficiency, while also enhancing reliability and durability of the targeted sensor systems.

They are additionally expected to:

- Help secure the strategic autonomy for Europe by ensuring intellectual property and production means of key technologies are maintained within the EU, reducing dependencies and enhancing negotiation power in technological cooperation.
- Help maximise international competitiveness by increasing the uptake and translation of photonics technologies into new products and services, guided by key technology requirements.

Scope: The scope of this call focuses on the advancement and application of photonics sensor technologies and their integration into multimodal systems. Proposals are expected to address the development of sensor technologies and their validation through trials in realistic use cases. This includes exploring multi-modal sensor capabilities, as well as employing sensor fusion and machine learning approaches for the analysis of sensor data. Techniques should address at least two different technology approaches, i.e. sensor modalities, of which at least one must be photonic from the following areas:

- 3D sensing and imaging such as LIDAR, optical coherence tomography (OCT), optical tomography etc.
- Communication fiber sensing
- Chemical and gas sensing
- Bio- and medical sensing and/or imaging
- Particle sensing
- Integrated photonic solutions

In addition, the proposals could focus on developing and integrating algorithms designed to enhance the processing capabilities and decision-making accuracy of photonic sensors. These algorithms may help to optimize the interpretation of complex sensor data, enable real-time analytics, ambient intelligenceand adaptive responses in dynamic environments.

Furthermore, projects should aim to provide significant improvements in one or more of the application domains listed below and to demonstrate these in at least three use case scenarios. This expectation underlines the call's objective to foster innovations that have a substantial and beneficial impact on society and various industry sectors:

- Healthcare (medical diagnostics, treatment through improved imaging techniques and diagnostic accuracy).

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- Transportation Safety (enhanced safety features in automotive and aerospace industries through better sensing capabilities).
- Industrial efficiency and sustainability (industrial processes such as manufacturing, quality control, and automation through improved sensing technologies).
- Agricultural/Food Sector (precision agriculture, food safety, food waste reduction and supply chain management through improved sensing techniques for monitoring crop health, detecting contaminants, and optimizing production processes and raw material utilisation).
- Environmental Monitoring and sustainable energy (pollution monitoring, climate research, renewable energy infrastructure and natural disaster mitigation).
- Security and resilience of people and critical infrastructure (face identification, long distance observation by day and night, (infra-)structural health monitoring, chemical and gas sensing, explosive detection)
- Protection and efficient operation of optical communications, risk management of data transport and processing including icnreased resilience to cyber security.

Proposals submitted under this topic should include a business case and exploitation strategy.

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

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.

AI-GenAI / Data / Robotics

Proposals are invited against the following topic(s):

HORIZON-CL4-2025-03-DIGITAL-EMERGING-07: Enhanced Learning Strategies for General Purpose AI: Advancing GenAI4EU (RIA) (AI/Data/Robotics Partnership)

Call: DIGITAL - CNECT	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 15.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 30.00 million.

Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to start at TRL 2-3 and achieve TRL 4-5 by the end of the project – see General Annex B.

Expected Outcome:

- Development of General Purpose AI (GPAI) models and architectures demonstrating enhanced capabilities, such as formal reasoning, mathematical problem-solving, confidence level estimation, long-term planning, and seamless adaptation to dynamic environments.
- Innovative learning approaches combining self-supervised learning with hybrid learning, active learning, reinforcement learning, relational learning or continual learning and evolutionary learning.
- Theoretical insights to advance the understanding of synergies between self-supervised and complementary learning paradigms in GPAI model development.

Scope: Current large-scale AI models have demonstrated remarkable capabilities that have transformed numerous fields. They excel at tasks like natural language processing, image generation, and playing complex games. However, despite these successes, current models often struggle in several key areas. They lack the adaptability to seamlessly adjust to changing conditions in real-world environments. Additionally, their reasoning abilities remain limited, when facing complex tasks that require logical deduction, mathematical problem-solving, or multi-step planning. Moreover, current GPAI models frequently fail to recognise their own limitations, leading them to generate erroneous outputs when presented with queries outside their domains of knowledge. These limitations underscore the need for advancements in General Purpose AI (GPAI) that go beyond pattern recognition and towards robust, adaptive systems capable of a wider range of intelligent behaviours, for example, taking inspirations from biological systems.

To push the boundaries of current AI technology, this topic seeks the development of groundbreaking GPAI models that combine self-supervised learning with complementary learning strategies. These strategies include hybrid learning, which integrates symbolic reasoning and knowledge representation; active learning, which allows models to actively seek information to improve their performance; reinforcement learning, which enables models to learn through interaction with their environment; relational learning, which focuses on learning from relational data structures; continual learning, which allows models to continuously adapt and acquire new knowledge without forgetting previous tasks; and evolutionary learning, which draws inspiration from biological evolution to optimize model architectures and parameters; and physics-based learning, which considers physical properties in the models' architectures. By leveraging these complementary approaches, the aim is to create GPAI models that exhibit enhanced capabilities, overcome existing limitations, and pave the way for a new generation of intelligent systems capable of tackling complex, real-world challenges.

This call prioritizes proposals that explore innovative approaches to developing GPAI models, focusing on at least one of the following key research areas:

- Hybrid Learning Architectures for Advanced Reasoning: Development of architectures integrating self-supervised learning with symbolic reasoning, knowledge representation, and neuro-symbolic methods to foster robust reasoning, complex planning, and problem-solving abilities within GPAI.

- Continual and Evolutionary Learning for Dynamic Environments: Research on paradigms enabling GPAI models to seamlessly adapt, learn from changing conditions, and retain knowledge essential for operation in dynamic, real-world environments.

- Reinforcement Learning Integration: Research on the fusion of self-supervised learning and reinforcement learning to overcome challenges like non-stationary data, algorithm sensitivity, and computational cost.

- Explainable AI and Trustworthy Decision-Making: Integration of robust XAI methodologies, exploring causal inference and counterfactual reasoning techniques to enhance transparency, accountability, and responsible use of GPAI models in alignment with European values and principles.

- Other Novel Paradigms: Research on the combination of self-supervised learning with other learning paradigms, such as active learning, relational learning, and embodied learning, to equip GPAI models with new advanced capabilities.

Proposed projects should aim for a balanced approach between theoretical advancements and practical applications, with a strong emphasis on the development of GPAI models that align with European values and principles, including the AI Act.

The potential impact of this research extends beyond scientific advancements, as it has the potential to transform key European industries and sectors, including advanced robotics, personalized healthcare, mobility, manufacturing, sustainable energy solutions, and the scientific sector. Successful projects will contribute to the development of GPAI models that enhance productivity, improve decision-making, and foster innovation across a wide range of domains.

This call strongly encourages the formation of interdisciplinary teams combining the necessary technical expertise. Such a collaborative approach will ensure that assessments accurately capture real-world capabilities and risks, and that the developed tools are responsive to the concerns of all relevant stakeholders.

Proposals must adhere to Horizon Europe's guidelines regarding Open Science practices. Open access to research outputs should be provided unless there is a legitimate reason or constraint.

All proposals are expected to incorporate mechanisms for assessing and demonstrating progress, including qualitative and quantitative KPIs, benchmarking, and progress monitoring.

This should include participation in international evaluation contests and the presentation of illustrative application use-cases that demonstrate concrete potential added value. Communicable results should be shared with the European R&D community through the AI-on-demand platform, and if necessary, other relevant digital resource platforms to bolster the European AI, Data, and Robotics ecosystem by disseminating results and best practices.

This topic implements the co-programmed European Partnership on AI, data and robotics (ADRA), and all proposals are expected to allocate tasks for cohesion activities with ADRA. Proposals should also build on or seek collaboration with existing projects and develop synergies with other relevant European, national or regional initiatives, funding programmes and platforms.

HORIZON-CL4-2025-04-DIGITAL-EMERGING-04: Assessment methodologies for General Purpose AI capabilities and risks (RIA) (AI/Data/Robotics Partnership)

Call: DIGITAL - HADEA	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 3.00 and 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 7.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to start at TRL 2-3 and achieve TRL 4-5 by the end of the project – see General Annex B.

Expected Outcome:

- New assessment and validations methodologies developed allowing to evaluate General Purpose AI (GPAI) models, including multimodal systems, and systems' capabilities and risks.
- Use of the research outcomes by GPAI providers, policymakers, public institutions, and other relevant stakeholders to create benchmarks for evaluating GPAI models and systems' capabilities and risks.
- Support to the AI Office in its function to conduct evaluations of general purpose AI models with a view to enforce the AI Act' rules for general purpose AI models.

Scope: The rapid advancement of artificial intelligence (AI) has led to the development of increasingly sophisticated general-purpose AI (GPAI) models and systems. These models, such as large language models and multimodal AI systems, demonstrate remarkable capabilities across a wide range of tasks. However, assessing the capabilities of these models

remains a significant challenge. Traditional evaluation methods often fail to capture the full spectrum of abilities exhibited by GPAI models and systems. Therefore, there is a pressing need for the development of ***new assessment frameworks, methodologies and tools*** that can comprehensively evaluate these models in terms of their trustworthy and ethical behaviour and operation, ensuring their reliability, fairness, and alignment with human values.

This topic aims to develop robust assessment tools, techniques, and benchmarks specifically designed to rigorously evaluate GPAI models and systems, including multimodal systems. Proposals should cover one or more of the following research areas:

- Innovative methods for proactively identifying and forecasting emergent capabilities in GPAI models and systems. This encompasses the identification of capabilities with both beneficial and potentially detrimental uses.
- Assessment of GPAI capabilities with a significant economic impact or potential for misuse. This includes assessing capabilities that drive beneficial innovation and societal good, as well as evaluating potential risks in areas such as chemical, biological, radiological, and nuclear (CBRN) hazards or cybersecurity threats.
- Developing assessment techniques that illuminate the underlying mechanisms of emergent capabilities in AI systems, emphasising interpretability and explainability.

Projects should generate example benchmark tests to examine trained AI models, systematically uncovering latent capabilities. These benchmarks will be made available to GPAI providers, policymakers, and other relevant stakeholders to implement robust evaluation tools.

This call strongly encourages the formation of interdisciplinary teams combining the necessary technical expertise. Such a collaborative approach will ensure that assessments accurately capture real-world capabilities and risks, and that the developed frameworks, methodologies and tools are responsive to the concerns of all relevant stakeholders.

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.

Proposals must adhere to Horizon Europe's guidelines regarding Open Science practices. Open access to research outputs should be provided unless there is a legitimate reason or constraint; in such cases, the proposal should detail how GPAI providers, policymakers, and other stakeholders will access the research outcomes.

All proposals are expected to incorporate mechanisms for assessing and demonstrating progress, including qualitative and quantitative KPIs, benchmarking, and progress monitoring. This should include participation in international evaluation contests and the presentation of illustrative application use-cases that demonstrate concrete potential added value. Communicable results should be shared with the European R&D community through the AI-

on-demand platform, and if necessary, other relevant digital resource platforms to bolster the European AI, Data, and Robotics ecosystem by disseminating results and best practices.

This topic implements the co-programmed European Partnership on AI, data and robotics (ADRA), and all proposals are expected to allocate tasks for cohesion activities with ADRA.

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

HORIZON-CL4-2025-04-DIGITAL-EMERGING-05: Soft Robotics for Advanced physical capabilities (IA) (AI/Data/Robotics Partnership)

Call: DIGITAL - HADEA	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 10.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 20.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to start at TRL 2-3 and achieve up to TRL 6

Expected Outcome: Increased exploitation of novel materials, design methods, and control techniques for soft robotics, enabling the creation of inherently safe and versatile robotic systems with applications in various industries, including healthcare, manufacturing, and transportation.

Scope: Soft robotics [112] is an important avenue to advance robotics physical capabilities. Such approach offers both intrinsic and functional safety in the physical world while surpassing the limitations of rigid robotic systems, such as their limited adaptability and reduced safety around humans. Advancing robotic performance relies on novel design methods and physical architectures as well as the use of novel materials. In parallel, advances in robotic controllers are necessary to guide soft robotic structures in order to reach the required level of performance and precision.

The proposals should include at least three different demonstrators from different sectors that clearly show the advantage of soft robotics in the context of some chosen application scenarios. The objective is to develop and disseminate general purpose tools and systems,

[112] soft robotics concerns the design, control, and fabrication of robots composed of compliant materials, instead of rigid links. Hence such robots can be composed of rigid parts linked by compliant links

therefore the results should not be limited to the demonstration scenarios selected in the proposals to demonstrate the technological progress.

All proposals are expected to incorporate mechanisms for assessing and demonstrating progress, including qualitative and quantitative KPIs, benchmarking, and progress monitoring. This should include participation in international evaluation contests and the presentation of illustrative application use-cases that demonstrate concrete potential added value. Communicable results should be shared with the European R&D community through the AI-on-demand platform, and if necessary, other relevant digital resource platforms to bolster the European AI, Data, and Robotics ecosystem by disseminating results and best practices.

This topic implements the co-programmed European Partnership on AI, data and robotics (ADRA), and all proposals are expected to allocate tasks for cohesion activities with ADRA.

HORIZON-CL4-2025-04-DIGITAL-EMERGING-06: Challenge-Driven GenAI4EU Booster (RIA) (AI/Data/Robotics Partnership)

Call: DIGITAL - HADEA	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 15.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 30.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to start at TRL 3-4 and achieve at least TRL 6 by the end of the project – see General Annex B.
Procedure	The procedure is described in General Annex F. The following exceptions apply: To ensure a balanced portfolio covering the different strategic sectors, grants will be awarded to applications not only in order of ranking but at least also to one proposal that is the highest ranked addressing the aerospace sector and to one proposal that is the highest ranked addressing the pharma/drug development sector, provided that the applications attain all thresholds.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries must provide financial support to third parties. The support to third parties can only be provided in the form of grants. The maximum amount to be granted to each third party is EUR 250.000 at

	the end of the first stage of the challenge to prepare for the next stage.

Expected Outcome:

- Significant technology progress and innovation through challenge-driven approach in the fields of aerospace and pharma/drug development.
- Increased competitivity and visibility of the Generative AI community in Europe, in demonstrating their capability to achieve challenging tasks within the aerospace and pharma/drug development sectors.
- Increased adoption of Generative AI in aerospace and pharma/drug development through tangible progress and achievement demonstrated via the process.

Scope: Generative AI promises to transform most industry sectors and public administration. This challenge-driven initiative aims to boost both Europe's developer community and the adoption of powerful trustworthy generative AI solutions in the strategic sectors of aerospace and pharma/drugs, key for their competitiveness.

The user industry participating in the consortium should have a genuine interest in the projects results and therefore support the participants in the challenge to exploit the results, they should sponsor the winners at the various stages with different types of support (financial and others, such as partnerships) and provide the necessary support resources during the project (technical, business support, but most importantly provide the data necessary to fine-tune models and build powerful applications). The results will be pre-competitive but commitments on future exploitation are expected in the proposal.

Proposals will be driven by impactful use-cases where generative AI can make the difference: a number of industries will join forces to define challenging problems to solve, that will then drive the rest of the project. This will be followed by a staged approach with an increasing level of complexity, whereby third party participants, either companies or consortia of organisations, will compete to address the challenge.

For each proposal:

- At the end of the first stage, the 20 highest ranked participants to receive 250k€ funding to prepare for the next stage.
- At the end of the second phase, the four highest ranked participants will be invited to join the consortium and will receive 2M€ to prepare for the grand finale, where the best performing team will have the opportunity to conclude partnerships or contracts with the user industry/public administration leading the consortium.

The core consortium, including several major industry players will define a clear methodology to implement the various steps of the approach, define the calls specification, timelines, targets, KPIs, a solid evaluation methodology including evaluation criteria. They will also be in charge of implementing the evaluation methodology, and providing the

necessary infrastructure/technical support for the participants. They will also be in charge of ensuring sponsorship and high visibility of the action.

Around 2M€ will be allocated for the core consortium to carry out these activities.

Visibility would be important; therefore dissemination and communication campaigns will be key. The project should also seek sponsorship, which would be key for the visibility and prestige of the challenge, and to attract the best developers from the EU and associated countries to compete, particularly SMEs and startups, alone or within a consortium.

Proposals should clearly define use-case and KPIs as well as the methodology to accompany the participants to the various steps during the project, and the assessment methodology during the various selection phases.

Resources and tasks to cooperate with HORIZON-CL4-2025-03-HUMAN-18: GenAI4EU central Hub and ADRA will be included in the proposals, as well as plans to integrate/publish the results on the AI on Demand platform.

This topic implements the co-programmed European Partnership on AI, Data, and Robotics.

HORIZON-CL4-2025-04-DIGITAL-EMERGING-07: GenAI4EU in Robotics and industrial automation (RIA) (AI/Data/Robotics & Made in Europe Partnerships)

Call: DIGITAL - HADEA	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 40.00 and 45.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 85.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: TBC
Technology Readiness Level	Activities are expected to start at TRL 2-3 and achieve TRL 4-6 by the end of the project – see General Annex B.
Procedure	The procedure is described in General Annex F. The following exceptions apply: To ensure a balanced portfolio covering the two type of proposals, the budget will be split in a balanced way between

	Type A and Type B proposals, provided that the applications attain all thresholds.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: A minimum of EUR 10 million of the EU funding requested by the proposal should be allocated for the purpose of financial support to third parties.
Exceptional page limits to proposals/applications	For Type B) proposals: in order to include a business case and exploitation strategy , the page limit of the General Annexes is exceptionally extended by 3 pages.

Expected Outcome: Proposals are expected to address at least one of the expected outcomes, either type A) or B). The type must be clearly identified within the proposal.

Type A) GenAI4EU[113]: Generative AI for Robotics for industrial automation:

- Development of advanced foundation models for robotics, fostering increased autonomy and generalization capabilities, thus enabling robots to dynamically learn and comprehend their physical surroundings in real-time, ensuring adaptability and reliability across diverse and complex scenarios.
- Validation of the model through fine-tuning and downstream application to address industrial automation use-cases

Type B) Trustworthy and robust generative AI for improved manufacturing:

- Increased productivity by high quality, flexible and resource-efficient industrial automation, both on the shop floor and in engineering/business processes;
- Significantly improved facilitation of product and process certification and compliance assessment, as well as reliability, efficiency and sustainability of manufacturing processes, supporting easier high-mix production and manufacturing of products based on sustainable and advanced technologies; and
- Significantly facilitated installation, commissioning and decommissioning of production facilities, through tools that enable faster industrialisation of factory automation well beyond the pilot phase, while reducing the need for manual on-site interventions.

Scope: Proposals are expected to address at least one of the expected outcomes, either type A) or B). The type must be clearly identified within the proposal.

[113] GenAI4EU is an initiative launched in the context of the AI innovation package, fostering the development of innovative Generative AI solutions to support the competitiveness of Europe's strategic sectors and industries: https://digital-strategy.ec.europa.eu/en/news/commission-launches-ai-innovation-package-support-artificial-intelligence-startups-and-smes

The budget will be split in a balanced way between Type A and Type B defined below. Proposals should clearly identify the area they are addressing.

Type A) While it is widely acknowledged that current use of generative AI has the potential to impact certain tasks in robotics such as improving user interaction or providing explanations about why a robot system made a particular decision, these are, in general, not within the critical operating flow of a robot. To reach next level of autonomy, generative AI must also enable planning, decision making and control fitting the physical constraints imposed both by the environment and by the physical construction of the robot. This includes integrating 'Human-in-the-loop' mechanisms, where AI systems collaborate with human operators to enhance decision-making processes and adaptability, particularly in dynamic environments.

This represents a significant advancement in robotics, requiring the development of AI models that can adeptly navigate the complexities of the physical world while ensuring safety. Generative AI is expecting to bring such a step-change in robots adaptability, versatility and robustness, enabling them to efficiently achieve real world tasks with higher level of autonomy.

In the context of advancing robotics capabilities, the use of generative AI stands as a transformative force, amplifying robots' learning, interaction, and operational abilities. By enabling robots to learn from experiences, simulate diverse environments for training, and enhance human-robot interaction, it drives adaptability and efficiency. Additionally, generative AI facilitates the augmentation of robot situational awareness and planning capabilities, empowering them to predict outcomes of various actions, thereby elevating their autonomy and decision-making prowess.

Training current generative AI models, in particular Large Language models, requires high volumes of data to achieve effective levels of performance. The vast amount of data required present a significant challenge when it comes to robotics. Further research is necessary to find the appropriate balance between the quality, adequacy, and volume of data with regards to the performance of the AI model. Model distillation techniques may play a key role in this regard, as well as for the portability of the generative AI solution at the edge, in power-limited devices. The training data should come from the real world or from physical aware simulations of the real world.

Proposals should detail strategies to leverage cutting-edge generative AI techniques to enhance the adaptability and reliability of these models across complex and dynamic scenarios, as well as how to ensure human-centricity and environmental considerations. The goal is to train and fine-tune generative AI models that meet the necessary standards for ensuring the safe operation of robotics hardware. These models should empower robots to autonomously plan and execute actions while maintaining high levels of performance and generalization capabilities.

Research activities should explore the training methodologies for these foundation models, emphasizing their ability to process multimodal data and derive actionable insights to inform robotic decision-making processes.

The proposals are also expected to include the validation of the trained models through applications. Proposals should detail methodologies for conducting rigorous testing procedures, incorporating both simulation-based evaluations and physical experiments. These tests aim to evaluate the performance and scalability of developed foundation models.

The research will be driven by impactful scenarios defined by major manufacturing industry players, that should be well integrated in the consortium. They should be deeply involved in the proposed work in order to provide the use-case, the corresponding data and they wil play an important role to accompany the validation process. They will define a number of representative real-world use-cases with gradually increased level of complexity to drive the technology development. They will provide existing relevant data and collect further data necessary to train and fine-tune the models, but also to validate the solutions. Given the sensitivity of sharing industrial data, manufacturers present in the consortium have to define upfront mechanisms to collectively provide and pool a sufficiently large dataset for training the models (this might involve a trusted third party as intermediary), ensuring sufficient quality and quantity of data needed to train the models. If necessary, they will have to put in place mechanisms to acquire data from sources outside the consortium.

Proposals are expected to enhance the accuracy and robustness of generative AI systems in robotics, ensuring that the solutions developed are trustworthy and reliable in their applications, hence in line with the AI Act requirements.

Proposals should address both the safety of robotic operations, ensuring protection against physical risks, and cybersecurity measures to safeguard against digital threats and ensure system integrity.

The emphasis lies in creating and disseminating general-purpose models and tools rather than being limited to narrowly focused solutions. Projects should also build on or seek collaboration with existing and upcoming projects and develop synergies with other relevant European (e.g. projects funded under HORIZON-CL4-2024-HUMAN-03-01: Advancing Large AI Models: Integration of New Data Modalities and Expansion of Capabilities), national or regional initiatives, funding programmes and platforms.

Type B)

The objective is to enhance productivity and provide a competitive advantage to EU industry in the transition towards more sustainable, zero-carbon production, addressing the uncertainties and tensions on supply chains and the lack of highly-skilled workers. A new generation of digital technologies will integrate generative Artificial Intelligence, robotics, and advanced human interfaces in industry-grade applications with a high degree of autonomy. This will enable the development, production, and operation of complex and advanced high-tech products at lower cost while improving sustainability and flexibility,

ultimately becoming a powerful tool for accelerating innovation in both processes and products.

The manufacturing sector should strongly benefit from increased levels of automation made possible by breakthroughs provided by AI, in particular by the family of technologies know as generative AI, including (e.g.) AI foundation models, large language models, transformers, multimodal generative AI. A priority of this topic is the development of Generative AI solutions dedicated to the manufacturing sector and making use of manufacturing data available in production lines.

Proposals should address at least one of the following use-cases:

1) Robustness and trustworthiness of digital technologies and data management at industry-grade quality, to raise the automation levels on production sites and across industry and supply chains;

2) Enhance product and process qualification/certification and compliance assessment through higher levels of automation, digitalisation and data management, taking into account related requirements;

3) Automation of manufacturing processes to achieve higher reliability, efficiency and sustainability;

4) Automated tools for fast and large-scale deployment and reconfiguration of production assets and for rapid innovation cycles.

Proposals should accomplish these objectives exploiting the most suitable approach(es) among the ones described below:

- The integration of generative AI applications exhibiting trained model(s) specifically designed for manufacturing, providing measurable advantages in one of more of these key areas: manufacturing cost, increased productivity, quality, flexibility, resilience, sustainability, circularity, time to market and usability. Applications can target factory-floor operations and/or management of data, knowledge and documentation associated to products and production (for use-case 1 or 2);

- Development and integration of digital production systems capable of significantly increasing productivity and managing high-mix production with close to zero time needed for re-purposing and capability to manage different mixes of materials and components (for use-case 3);

- Development of deployment tools to automate the management of production lines, namely through automatic configuration, integration with legacy systems, placement of data translators and connectors, and deployment of machines and sensors on the shop floor (for use-case 4).

Proposals should indicate which approach they are targeting. Proposals may combine several approaches above, indicating which is the main approach, provided there is added value in such a combined approach; arbitrary combinations without integration are excluded.

The use of generative AI techniques is encouraged for all the approaches. The applicants will specifically describe how they will secure the acquisition of quality manufacturing data from real-world industrial use cases of industry partners or companies outside the consortium in the context of the data volume necessary to train and finetune the models used in the proposal.

For both Type A and Type B projects, proposal should allocate up to EUR 30 million towards the development of the foundation model. Each project is anticipated to focus on up to six use cases.

A minimum of EUR 10 million of the proposal budget will be allocated via FSTP for the fine-tuning phase. This phase aims to create Generative AI applications tailored to impactful industry-driven use cases.

- FSTP will be allocated for up to EUR 2 million per use case, either for a single company (including SME/Start-up), user industry providing their data and use-case, or to a small consortium complementing such user industry company with one or two additional partners, such as AI developer/integrator. Such FSTP initiatives will develop mini-projects, working in close collaboration with the consortium partners, that will dedicate sufficient resources for such projects, in order to develop advanced applications and demonstrate with quantitative KPIs the power of Generative AI solutions. These mini-projects will include data preparation, fine-tuning, validation of the Generative AI solution in the selected impactful use-cases.

Proposed projects should aim to develop models that align with European values and principles and regulation, including the AI Act. Research must build on existing standards or contribute to standardisation, particularly addressing the needs and requirements of the industry.

Where relevant, interoperability for data sharing should be addressed, focusing on open specifications and standards, enabling effective cross-domain data communities, and new data-driven markets.

If high computing resources are necessary, for both Type A and Type B of proposals the primary source of computing resources for pretraining should be sought from external high-performance computing facilities such as EuroHPC or National centres. The proposal should describe convincingly the strategy to access these computing resources.

Resources and tasks to cooperate with HORIZON-CL4-2025-03-HUMAN-18: GenAI4EU central Hub and ADRA will be included in the proposals, as well as plans to integrate/publish the results on the AI on Demand platform.

This topic implements the co-programmed European Partnerships on AI, Data, and Robotic and Made in Europe.

Artificial Intelligence in Science

Proposals are invited against the following topic(s):

HORIZON-CL4-INDUSTRY-2025-01-DIGITAL-61: AI Foundation models in materials science (RIA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 4.00 and 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 12.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to achieve TRL 4-6 by the end of the project – see General Annex B.

Expected Outcome: Projects are expected to contribute to the following outcomes:

- Accelerate research and development in materials science, for example: discovery of materials, prediction of materials property;
- Advance AI technology for the materials science community that is adaptable to a multitude of subsets and tasks in the field of materials science;
- Advance solutions to societal or scientific challenges that depend on materials design and discovery: alternatives to hazardous materials used in the industry, materials that lower environmental footprint, materials for quantum technology, higher capacity batteries, more efficient photovoltaic devices, etc.;
- Bridge existing knowledge gaps and induce interdisciplinarity by design across different fields necessary to advance materials science;
- Contribute to the development of a Materials Commons, as announced in the Communication on Advanced Materials for Industrial Leadership[114];
- Support open-source and open science, democratising science, especially for research communities with limited access to modern AI tools; and
- Facilitate reproducibility of scientific results.

[114] COM(2024) 98 final

Scope: The objective of this topic is to advance the development of AI technology for materials design and discovery and for predicting materials properties. The call also aligns with the GenAI4EU initiative of the European Commission.[115]

The development of new, innovative and advanced materials is essential for EU's strategic autonomy and for achieving EU's priorities for a competitive and sustainable economy Employing AI in the process of materials design and discovery could significantly accelerate and scale potential innovative solutions that the EU industry (especially sectors such as energy, mobility, construction, health and electronics) relies on.

More precisely, proposals should focus on the development of AI foundation models in materials science.

Foundation models in science is a novel and evolving idea in the scientific community, currently being explored at different scale[116]. The purpose of this topic is to tap into the potential promises of foundation models for science and be at the forefront of this technology development.

A foundation model[117] can integrate information from various modalities of data. This model can then be adapted to a wide range of downstream narrower, more specialized tasks. To build downstream applications the foundation model is fine-tuned with additional training and task-specific examples. Therefore, a foundation model is itself incomplete but serves as the common basis from which many task-specific models can be built via adaptation.

In science, such foundation models could be trained on data from a specific scientific field and then be fine-tuned for a variety of tasks and used by a wider community in this specific scientific field. Proposals under this call should focus on 1) developing foundation models in the field of materials science 2) show its usefulness by adapting it to a subtasks/scientific problems in a specific area of materials sciences and 3) illustrating other possible areas of application in materials science

A foundation model in materials science should provide researchers with access to essential AI-enabled capabilities for materials discovery, employ machine learning algorithms and model architectures best suited for materials science (for example using hybrid methods that use both statistical data and explicit knowledge) and be adaptable to different problems in the

115 Communication on boosting startups and innovation in trustworthy artificial intelligence | Shaping Europe's digital future (europa.eu)

116 Some examples in science include: Trillion Parameter Consortium (https://www.anl.gov/article/new-international-consortium-formed-to-create-trustworthy-and-reliable-generative-ai-models-for), NASA (NASA and IBM Openly Release Geospatial AI Foundation Model for NASA Earth Observation Data | Earthdata), Helmholtz (Helmholtz Foundation Model Initiative - Helmholtz Home), or the University of Michigan (Scientific Foundation Models (scifm.ai))

117 Foundation models is a term defined by the Center of Research on Foundation Models of Stanford University in: "On the Opportunities and Risks of Foundation Models", https://arxiv.org/pdf/2108.07258.pdf

domain of materials science[118]. It should be based on a robust and reliable architecture, as any potential errors and problems would be propagated to the downstream applications.

The foundation model should be placed at the disposal of the scientific community as an open model, including the source code (unless thoroughly justified otherwise). This will serve a wider scientific community, thus democratising access to such scientific infrastructure and facilitating the use and adaptation of the model to different problems. The project team should provide a clear documentation on its use and limitations, alongside case studies demonstrating the model's application for a variety of tasks/problems in materials science

Proposals should:

- Prove access to high quality (multimodal) data needed for the development of the model. If in the process of developing the model, there is a need to create new data sets or adapt existing ones, they should follow the FAIR[119] principles.
- Contribute to efforts to reach common standards for data formats, metadata, taxonomies and ontologies.
- Demonstrate a strategy to access computational resources needed for model training and evaluation.
- Prove the engagement of a multidisciplinary team.
- Employ methodologies for integrating domain/interdisciplinary knowledge into the model and seek synergies with solutions that facilitate the managing and making sense of vast amounts of data (for example knowledge graphs[120]) and thus enhance data-driven discovery in materials science.
- Identify at least four possible use cases and scientific challenges that can be addressed with the model and its adaptations (examples for inspiration include but are not limited to: alternatives to hazardous materials like PFAS, materials that lower environmental footprint, materials for quantum technology, for higher capacity batteries, for more efficient photovoltaic devices, etc.)
- Identify and assess the potential risks of misuse of the foundation model.
- Propose a plan to make the model public and provide access to it to the scientific community
- Explore collaboration and synergies with projects funded Horizon Europe calls in Cluster 4 Digital and emerging technologies and with projects funded under the topic of EU Materials Commons infrastructure.

118 An example in materials science, for inspiration only: *2401.00096.pdf (arxiv.org)
119 Findable Accessible Interoperable Reusable data.
120 Example for inspiration only: https://www.nature.com/articles/s41597-024-03039-z

Multidisciplinary research activities between AI and domain scientists should address some of the following:

- Conceptualisation and planning: the scope, objectives and expected outcomes of the foundation model
- Suitable interfaces for domain experts without computer science background to contribute to and utilize the outcomes
- Data identification, collection and management of (preferably diverse) datasets through semantically annotation data schema
- Model development, validation, testing [and, as appropriate, model evaluation and benchmarking, as for example DOME[121]]
- Integration of domain knowledge into the model, for example through machine readable representations like RDF (Resource Description Framework).

Proposals should involve, if needed, appropriate expertise in Social Sciences and Humanities (SSH), in particular in the cases where legal and ethical experts should be involved to address data privacy, sharing agreements, and compliance with regulations.

International cooperation is encouraged, where the EU has reciprocal benefit, like the Trillion Parameter Consortium.

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

HORIZON-CL4-INDUSTRY-2025-01-DIGITAL-62: Facilitated cooperation for AI in Science (CSA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 3.00 million.
Type of Action	Coordination and Support Actions
Technology Readiness Level	Activities are expected to achieve TRL 6-7 by the end of the project – see General Annex B.

[121] https://dome-ml.org/

Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [122].

Expected Outcome: Projects are expected to contribute to the following outcomes:

- Identify the long-term research challenges where AI can make a meaningful breakthrough contributing to EU's competitive edge in selected scientific disciplines/areas, through a Strategic Research and Innovation Agenda.
- Provide evidence to structure the resources for AI in Science at European level, as a feasibility test towards potential R&I initiatives beyond the CSA that could optimise access to relevant data, infrastructure and talent across different scientific domains for more and better AI-enabled research.
- Coordinate, strengthen the network and raise awareness and a community of scientists, research organisations and stakeholders towards new paradigms of research with AI.

Scope: Artificial intelligence is a game-changer for science and innovation, and promises significant opportunities to boost the European competitive edge in R&I that need to be capitalised on. The aim of the CSA is to structure AI-enabled research in Europe and assess options towards optimising the ecosystem for AI in Science in Europe, through a Strategic Research & Innovation Agenda and assessing the potential for possible future R&I initiative(s), in line with the recommendations of the Scientific Advice Mechanism[123].

The project should develop a Strategic Research and Innovation Agenda for AI in Science by mobilising large groups of domain and AI researchers in different fields **to identify key long-term research challenges in a diverse range of scientific areas where AI can make a meaningful difference for scientific breakthroughs,** which are compelling to the EU competitive, environmental and social policy agenda. The project should come up with pilot areas from across Horizon Europe Pillar II Clusters, building on Europe's competitive advantages in science and AI technologies. The research challenges should be related to prediction and design problems in the different scientific fields identified that could be solved with AI.

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

123 See European Commission's Group of Chief Scientific Advisors (2024). Successful and timely uptake of artificial intelligence in science in the EU: scientific opinion. Brussels: European Commission.

The SRIA should also include areas where AI can improve generic scientific tasks e.g virtual research assistant / tools for literature-based discovery, for improving / enabling research workflows, lab automation and collaborative human-AI work in science. Research priority areas involving the use of models based on frugal AI, which are more compact, more efficient and less energy intensive, as well as human-centric and trustworthy AI for scientific work should also be explored.

The project should build evidence and assess the needs and potential for R&I initiatives for AI in Science beyond the CSA, in an effort to identify ways to improve the EU landscape for support for AI in Science, to be discussed and **agreed upon with the Commission and the Member States and Associated countries.**

The assessment should identify the ways for improving data access, infrastructure and support services, as well as skills and talent-related needs to boost the integration of AI in different fields of science at larger scale in Europe in research processes and lab automation, while promoting reproducibility, transparency and open science. It should also identify options for EU to better enable cooperative development and sharing of AI models for scientific discovery across different scientific fields. It should also take into account existing EU efforts to support access to data, research infrastructures, networks, HPC.

Different scenarios of R&I initiatives and infrastructure improvements should be prototyped together with a diverse range of users and stakeholders from the research community, industry, start-ups, civil society and policy-maker communities. Based on the feasibility test results, the project should **develop a roadmap** on the needed steps for a more effective coordination between the domain and AI scientific communities in Europe and the needed upgrades in service and infrastructure provision at EU level for the integration of AI in different scientific fields.

The proposals should also provide coordination and dissemination for interdisciplinary AI-enabled science to facilitate stakeholder engagement, coordination and promotion of AI in Science initiatives across Europe The CSA should develop a website, organise awareness raising events for the benefits of AI in Science and create opportunities for exchanging on good practices.

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, in particular with EU-level initiatives such as EOSC, other Data spaces, EuroHPC, ESFRI, AI Factories as well as the Partnership on AI, Data, Robotics or other relevant initiatives should be achieved. Projects should also create synergies with collaborative platforms like AI4EOSC, AI on Demand and the GenAI4EU Central Hub.

Destination 5: Open Strategic Autonomy in Developing, Deploying and Using Global Space-Based Infrastructure, Services, Applications and Data

Today, EU citizens enjoy watching satellite TV, increasingly accurate global navigation services for all transport modes and users, extended Earth monitoring for land, marine,

atmosphere and climate change, global meteorological observation and accurate cartographies of a wide number of variables. Space also makes important contributions to security crisis management and emergency services. EGNSS and Copernicus are key assets for the EU policies on climate, environment, transport, agriculture and secure society. Finally, the Space sector is a source of economic growth and jobs.

This Destination is structured along the following building blocks:

1. Accessing Space, i.e. the ability to transport satellites, cargo, and humans into space; build and launch the required vehicles, including re-usable systems; and operate the related facilities and services;

2. Using Space on Earth, i.e. the ability to provide space-based secure communication, navigation and Earth observation services and applications, including through the EU Space flagships Galileo, Copernicus and IRIS^2;

3. Monitoring Space, i.e. the ability to detect, track and anticipate the trajectory of spacecraft, Near-Earth objects, and space debris during their full lifetime; to share data with relevant stakeholders; and to provide solutions for safe international space traffic management. It also includes the tracking and anticipation of other impacts on the space environment, such as Space weather events;

4. Acting in Space, i.e. the ability to inspect, rendezvous and dock, grasp, repair, reconfigure, build, assemble and disassemble, reuse/recycle, relocate, remove and transport operational, non-operational, and other objects in space, including platforms or larger structures;

5. Exploring Space, i.e. the ability to conduct high profile space exploration activities, perform excellent science and exploit space data to increase our knowledge about the Universe and celestial bodies, with a view to their exploration for scientific and socio-economic benefits;

6. Boosting Space, i.e. the ability to sustain the above strategic capabilities through fostering the competitiveness of the EU space sector; improving education and developing the required skills; accelerating the pace of innovation; supporting EU non-dependency on critical technologies; and strengthening international cooperation.

Those building blocks are implemented through the following headings:

- **Heading 1: Accessing Space**

Autonomous access to space is a prerequisite for the strategic autonomy of the EU. It is a key enabler and indispensable element in the space ecosystem and value chain. European launch systems allow the autonomous deployment of satellites for the Union's flagships Copernicus, Galileo/EGNOS and IRIS^2 and contribute to the security and resilience of Europe's sovereign space infrastructure.

In a context of fierce competition and launch services paradigm changes, ensuring that Europe improves the resilience and the cost-effectiveness of its autonomous access to space is crucial. This requires urgent activities to enable and further consolidate operational capacities before 2030.

This challenge will be tackled by fostering space transportation solutions through the support to building blocks for smart technologies and digital solutions and contributing to facilitate access to European spaceports. Inducement prizes and new funding models will support the consolidation of new solutions to serve EU launch services needs and enhance the resilience of European autonomous access to space.

In a forward-looking approach and thanks to the implementation of a European parliament Preparatory Action, a new R&I approach will be applied toward a more service-oriented and less prescriptive support of the full development cycle of access to space innovations. At the same time, a reflection will be carried out to envisage follow-up actions through the 26-27 WP and FP10.

- **Heading 2: Acting in Space**

Act in space is a key enabler of the future freedom of action of the EU. In-Space Operations and Services (ISOS) will ensure EU's freedom of action in space and increase the resilience, sustainability, safety and protection of its space infrastructure, and contribute to the strengthening of the competitiveness of the EU space sector. R&I activities should bring the Europe to the forefront of emerging service applications, including inspection, rendezvous and docking, grasping, repair, reconfiguration, assembly and disassembly, manufacturing, resource extraction, reuse/recycling, removal and transport of objects in space, for satellites, platforms and larger structures. Key space R&I activities will be driven by a pilot mission that will contribute to establish and foster a new in-space economy.

Game-changing innovations and enabling technologies are at the heart of ISOS and an important focus of future actions. The paradigm shift towards adaptive space systems builds on automation and robotics, artificial intelligence, modular and reconfigurable spacecraft concepts. Together with other enabling technologies such as electric propulsion, they will provide new ways on how space assets are designed, produced, tested, transported, and operated. Different means realised with AppStore-like approaches will benefit the future space ecosystem and foster a circular economy.

- **Heading 3: Using Space on Earth related to telecommunications**

The Union Secure Connectivity programme aims to develop a secure and autonomous space-based connectivity system for the provision of guaranteed and resilient satellite communications on Earth. Among the objectives are to develop, build and operate a multiorbital space-based state-of-the-art connectivity system, continuously adapted to governmental satellite communications demand evolution; to complement the Union pool of satellite communication capacities and services; and to integrate the GOVSATCOM ground

segment infrastructure, as well as the European quantum communication infrastructure (EuroQCI).

- **Heading 4: Using Space on Earth related to Earth Observation**

Copernicus core services (Climate Change, Marine Environment Monitoring, Land Monitoring, Atmosphere Monitoring, Emergency Management and Security) should evolve and improve to better respond to new and emerging policy needs, and to leverage the latest science and technology developments. The Copernicus service evolution research topics will focus on further enhancing the services in the areas of coupled Earth system reanalysis and exploitation of past and emerging satellite and other data streams, soil-vegetation-atmosphere modelling for volatile organic compounds and pollen, wildfire risk forecasting and related carbon emissions, and ocean data assimilation and ensemble prediction. The digital transformation across services and value chains will be promoted via a dedicated broad topic on AI to stimulate innovation and know-how exchange. In connection with the Space Data Economy, downstream market uptake research activities will focus on energy, climate adaptation and environmental footprint reduction, green financing and insurance, and liveable cities of the future. Innovation in Earth observation services will also be supported in the field of ship source pollution detection in the context of evolving maritime policies.

- **Heading 5: Using Space on Earth related to satellite navigation**

For Galileo/EGNOS, the international context, the competitive environment with emerging actors and novel techniques in the value chain, the increasing threats, and the evolution of the technologies, components and systems, including dual-use technology, call for a constant adaptation of the EU space infrastructure to these changing realities.

To meet these challenges, EU needs sustained investments in R&D for innovative mission concepts, technology and systems. These will ensure the continuity of the EGNSS service, minimise the risks for technology inclusion in the infrastructure, thanks to anticipated development and testing including in-orbit, protect better this infrastructure against modern threats (notably cyber, jamming/spoofing, natural hazards), and increase the strategic autonomy in key technologies. Overall, they will maintain the EU´s leadership position in the Global Navigation Satellite Systems.

- **Heading 6: Using Space on Earth related to services and data coming from satellites**

Over 10% of the European GDP is enabled by economical activities linked to the need of location through satellite navigation systems. Whilst the market uptake of EGNSS is already good in many areas, important priorities still remain, in particular 1) support the development of solutions that underpin EU priorities and policies, including the Green Deal, 2) support the public sector as a customer of Galileo, 3) foster the competitiveness of EU downstream industry and SMEs/start-ups and 4) leverage synergies with other space programmes and non-space technologies.

Downstream R&I activities for EGNSS applications are needed to support the uptake of the new services/differentiators (i.e. Galileo High Accuracy Service and Open Service Navigation Message Authentication, made available in 2022 for testing and initial services, Galileo Emergency Warning Service to be made available in 2025 and Galileo Public Regulated Services to be made available soon). Opportunities to be market leader lie a.o. in autonomous driving, unmanned vehicles (aerial, terrestrial and maritime), location-based services, critical infrastructures, emergency management and humanitarian aid, insurance and finance, urban development and cultural heritage.

Regarding Copernicus applications, the digital dimension must be reinforced, encouraging the collaboration of ICT players with Earth observation and space stakeholders. The uptake of applications using Copernicus data could be improved, including by public authorities, who are important potential customers. Also, while many applications are developed for the land sector, other areas are less active. Solutions for a more sustainable use of resources and preserving biodiversity should be reinforced, as well as for countering natural hazards and climate extreme events as well as climate change mitigation and adaptation.

- **Heading 7: Monitoring Space**

Orbital space infrastructure, the data, and the services they deliver have become indispensable for European societies and economies and in the daily lives of Europeans. However, due to an increasingly congested orbital space, the likelihood of a satellite being severely damaged or destroyed in a collision has raised dramatically. Such risk calls for action to preserve European interests by protecting its private and public investments in space in a sustainable manner.

Based on the EU Space Programme, capabilities of the Space Situational Awareness (SSA) component and Space Surveillance and Tracking (SST) services are being developed and consolidated through a Partnership of 15 Member States. The EU SST Partnership Agreement has officially entered into force on 11 November 2022. With this Partnership, EU SST builds on the good results achieved by the initial consortium of 5 Member States (Decision 541/2014) and targets continuity of activities and service provision, improvement of specialisation on expertise, and consideration of the duality and security dimension of SST.

Partnership’s Member States have joined forces and networked their national assets and competences with the objective to establish and improve the Union’s SST capacities to ensure the delivery of SST services to European institutions, public authorities, and public and private spacecraft operators and owners. Services are structured around three axes: Collision Avoidance, Fragmentation Analysis and Re-entry Analysis. EU SST service provision is the key operational capability for the EU’s future approach to Space Traffic Management (STM) which encompasses the means and the rules to access, conduct activities in, and return from outer space safely, sustainably, and securely.

EU SST relies on the European industry, including start-ups, to develop and improve national, public-owned capacities based on Partnership’s requirements. As a result, more than 80% of the funds delegated by the EU to the EU SST Partnership are sub-contracted to EU industry

through call for tenders or grants. This has triggered the spawning of a European industrial sector on SST activities that should contribute to the EU STM approach. On 15 February 2022, a Joint Communication on STM (JOIN/2022/4 final) has been adopted, calling for the enhancement of EU operational capabilities to support SST and STM activities (action 2). Within the framework of this STM Joint Communication, a European Industry Start-ups Forum on Space Traffic Management (EISF) has been created. The Forum aims at directly involving EU companies and other relevant stakeholders in the conception of future research and innovation activities in the SST/STM domain.

Further resilience and autonomy of the Union's SST capabilities will come by leveraging complementary contributions from European private capabilities and commercial initiatives. At the same time, EU industry shall adapt and benefit from new SST market opportunities appearing in a rapidly changing environment in and beyond Europe. To that end, research and development activities shall be oriented towards the strengthening of the competitiveness of the Union space industry, including start-ups, by increasing its capacity in designing, building, and operating its own SST systems.

Importantly, SSA also covers the domains of Space Weather (SW) and Near-Earth Objects (NEO). For those domains, activities are ongoing and no additional ones are needed under the 2025 WP.

- **Heading 8: Boosting space through non-dependence of the EU for key critical space technologies**

Ensuring non-dependence for critical space technologies is key, especially in the current geo-political context. The EC has undertaken several activities and deployed new tools (e.g. the EU Observatory of Critical Technologies) for assessing space technologies and identify those that are critical from a dependency point of view. Within this domain, a number of technological developments will be initiated with focus on priorities stemming from on-going and planned EU Space missions, including IRIS^2. Emphasis will be on reducing non-EU dependencies on critical space technologies across their whole supply chain from advanced materials to components, equipment, and sub-systems; providing unrestricted access to advanced space technologies relevant for EU space missions and programme components; developing or regaining capacity to operate independently in space by developing resilient space technologies supply chains, relying on EU supply chains and/or trustable and reliable supply chains not affected by non-EU export restrictions; enhancing competitiveness by developing products and capabilities reaching equivalent or superior performance level than those from outside the EU and compete at worldwide level; and opening new opportunities for manufacturers by reducing dependency on export restricted technologies.

- **Heading 9: Boosting Space through international cooperation**

International cooperation remains an important enabler as global challenges can best be addressed by global solutions. Opportunities lie especially in innovative technologies, in the exploitation of space-based data and in downstream applications.

- **Heading 10: Boosting Space through training and education activities**

Preparing the skilled workforce of tomorrow is essential to bridge the gap between supply and demand for talents in the European Space sector and inspire the next generation of space professionals.

- **Heading 11: Boosting Space through IOD/IOV opportunities**

IOD/IOV opportunities continue to be needed for experiments needing aggregation as well as for read-to-fly satellites. This includes the Flight Ticket Initiative to support competitiveness and innovation of the European Space sector.

- **Heading 12: Boosting Space through support to entrepreneurship**

Business development, acceleration and upscaling of start-ups is also much needed, which has given rise to the set-up of the CASSINI Space Entrepreneurship Initiative. CASSINI provides support to business and innovation-friendly ecosystems, including the strengthening business skills in the space market segments and digital services based on space data. CASSINI also aims at making start-ups and scale-ups investment-ready and able to secure venture capital funding and at leveraging synergies with the InvestEU programme and the EU Space Programme.

Limiting participation in certain actions to Member States (and certain associated countries to Horizon Europe)

The Space research part of the Horizon Europe Programme is by default open to the world, promoting international cooperation to drive scientific excellence.

However, an important aspect of this Destination consists in ensuring security and strengthening strategic autonomy across key technologies and value chains, taking advantage of the possibilities that space offers for the security of the Union and its Member States. This objective requires special rules in specific cases to set the requisite eligibility and participation conditions to ensure the protection of the integrity, security and resilience of the Union and its Member States. Hence, on an exceptional basis and duly justified, this work programme may foresee a limited participation to entities from selected countries. Such exceptional circumstances would relate to prevalent considerations to safeguard the Union’s strategic assets, interests, autonomy or security. Possibilities for such limitations are framed by Article 22(5). Out of 30 topics and actions, 14 remain fully open while 16 are proposed for limited participation.

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

HORIZON-CL4-2025-SPACE-01

HORIZON-EUSPA-2025-SPACE

Heading 1 - Accessing Space

For this Heading, a prize is included under "Prizes" in the section "Other Actions" of this work programme.

Proposals are invited against the following topic(s):

HORIZON-CL4-SPACE-2025-01-11: CSA on access to European spaceports

Call: SPACE 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 1.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 1.00 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: In order to achieve the expected outcomes, and safeguard the Union's strategic assets, interests, autonomy, or security, namely it is important to avoid a situation of technological dependency on a non-EU source, in a global context that requires the EU to take action to build on its strengths, and to carefully assess and address any strategic weaknesses, vulnerabilities and high-risk dependencies which put at risk the attainment of its ambitions, participation is limited to legal entities established in Member States, Norway, Iceland and the other Associated Countries provided that they have successfully passed their assessment. Proposals including entities established in countries outside the scope specified in the call/topic/action will be ineligible. For the duly justified and exceptional reasons listed in the paragraph above, in order to guarantee the protection of the strategic interests of the Union and its Member States, entities established in an eligible country listed above, but which are directly or indirectly controlled by a non-eligible country or by a non-eligible country entity, may not participate in the action unless it can be demonstrated, by means of guarantees approved by the eligible country of establishment, that their participation to the action would not negatively impact the Union's strategic, assets, interests, autonomy, or security. The guarantees shall in particular substantiate that, for the purpose of

	the action, measures are in place to ensure that: a) control over the applicant legal entity is not exercised in a manner that restrains or restricts its ability to carry out the action and to deliver results, that imposes restrictions concerning its infrastructure, facilities, assets, resources, intellectual property or know-how needed for the purpose of the action, or that undermines its capabilities and standards necessary to carry out the action; b) access by a non-eligible country or by a non-eligible country entity to sensitive information relating to the action is prevented; and the employees or other persons involved in the action have a national security clearance issued by an eligible country, where appropriate; c) ownership of the intellectual property arising from, and the results of, the action remain within the recipient during and after completion of the action, are not subject to control or restrictions by non-eligible countries or non-eligible country entity, and are not exported outside the eligible countries, nor is access to them from outside the eligible countries granted, without the approval of the eligible country in which the legal entity is established. If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
Procedure	The procedure is described in General Annex F. The following exceptions apply: The granting authority can fund a maximum of one project.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [124].

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

Expected Outcome: Common regulatory practices and guidelines will facilitate access to European spaceports and increase their attractiveness for European launch systems. The action is expected to contribute to the following outcomes:

- Awareness of stakeholders on practices and regulations;
- A comprehensive overview of technical challenges to be addressed in terms of guidelines and best practices;
- An assessment of the paths for the European spaceports regulations, guidelines and best practices to support safe and sustainable launch operations;
- An identification of the benefits for the European space market development, for European sovereignty as well as for international cooperation.
- Standards and guidelines should contribute to ease launcher agnostic use of spaceports.

Scope: This coordination and support action will contribute to the expected outcomes by:

- Assessing best practices, standards and guidelines for launch operations from European spaceports, taking into account experiences from worldwide existing spaceports.
- Proposing a set of common regulatory practices and guidelines for European Spaceports and evaluating their impact on the launch operations.
- Involving European stakeholders participating in the development of safety equipment with the aim to strengthen the spaceports interoperability with their technological solutions.

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content should be addressed only if relevant in relation to the objectives of the research effort.

HORIZON-CL4-SPACE-2025-01-12: Digital solutions for autonomy for space transportation systems, design and simulation tools - Digital enablers and building blocks

Call: SPACE 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 1.00 and 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 3.00 million.

Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: In order to achieve the expected outcomes, and safeguard the Union's strategic assets, interests, autonomy, or security, namely it is important to avoid a situation of technological dependency on a non-EU source, in a global context that requires the EU to take action to build on its strengths, and to carefully assess and address any strategic weaknesses, vulnerabilities and high-risk dependencies which put at risk the attainment of its ambitions, participation is limited to legal entities established in Member States, Norway, Iceland and the other Associated Countries provided that they have successfully passed their assessment. Proposals including entities established in countries outside the scope specified in the call/topic/action will be ineligible. For the duly justified and exceptional reasons listed in the paragraph above, in order to guarantee the protection of the strategic interests of the Union and its Member States, entities established in an eligible country listed above, but which are directly or indirectly controlled by a non-eligible country or by a non-eligible country entity, may not participate in the action unless it can be demonstrated, by means of guarantees approved by the eligible country of establishment, that their participation to the action would not negatively impact the Union's strategic, assets, interests, autonomy, or security. The guarantees shall in particular substantiate that, for the purpose of the action, measures are in place to ensure that: a) control over the applicant legal entity is not exercised in a manner that restrains or restricts its ability to carry out the action and to deliver results, that imposes restrictions concerning its infrastructure, facilities, assets, resources, intellectual property or know-how needed for the purpose of the action, or that undermines its capabilities and standards necessary to carry out the action; b) access by a non-eligible country or by a non-eligible country entity to sensitive information relating to the action is prevented; and the employees or other persons involved in the action have a national security clearance issued by an eligible country, where appropriate; c) ownership of the intellectual property arising from, and the results of, the action remain within the recipient during and after completion of the action, are not subject to control or restrictions by non-eligible countries or non-eligible country entity, and are not exported outside the eligible countries, nor is access to them from outside the eligible countries

	granted, without the approval of the eligible country in which the legal entity is established. If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
Technology Readiness Level	Activities are expected to achieve TRL 4-5 by the end of the project. The reference TRL definition is the ISO 16290:2013 applicable to the space sector. Activities may start at any TRL.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [125].

Expected Outcome: This topic supports the co-programmed European Partnership on Globally Competitive Space Systems ('Space Partnership'). It is part of cohesive activities in the domain of digital developments under the grand heading of "digitalisation for commercial space solutions". The topic addresses actions in the frame of the scope of the Space Partnership, considering synergies among the domains satellite communication (SatCom), Earth Observation (EO) and New Commercial Space Transportation Solutions.

Under the area of *Access to Space* related to New Space Transportation Solutions, this topic focusses on the Low to Mid TRL level building blocks for key technologies required to strengthen competitiveness in this domain. Areas for launch service improvement are e.g., health monitoring systems, enabling real time subsystem monitoring through all mission phases, high speed sensor networks for on board real-time data feeds, smart avionics, functional building blocks for autonomy, enhanced ground-board high-data rate communication and high-speed on-board computer, as well as Artificial Intelligence algorithms to process high volumes of data.

Projects are expected to contribute to one or several of the following outcomes:

- Improved space transportation systems and launcher sustainability, reduced costs and operational constraints as well as enhanced system monitoring and autonomy;

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

- Technology developments for New Space Transportation Solutions, including addressing software and digital tools;
- Models for mission, system design and optimisation, able to integrate life cycle analysis, engineering and environmental models for optimisation of development through manufacturing and mission implementation.

This will contribute to developing, deploying global space-based services applications and data and contribute to fostering the EU's space sector competitiveness, as stated in the expected impact of this destination.

Scope: To tackle the above-mentioned expected outcomes, the following R&I must be addressed:

- the maturation of eco-design software tools enhancing reconfigurability in orbit
- the maturation of disruptive/game changing technologies related to digitalisation

Proposals are expected to promote cooperation between different actors (industry, SMEs and research institutions) and consider opportunities to quickly turn technological innovation into commercial use in space.

Proposals under this topic should explore synergies and be complementary to already funded actions in the context of technology development at component level. In particular, it is expected that projects make use of existing European technologies and/or building blocks at component level contributing to European non-dependence and strengthen competitiveness, and this should be clearly presented in the proposal. Furthermore, proposed activities should be complementary to national activities and activities funded by the European Space Agency (ESA).

For information only, without this implying any additional requirements, this topic falls under the co-programmed European Space Partnership.

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content should be addressed only if relevant in relation to the objectives of the research effort.

HORIZON-CL4-SPACE-2025-01-13: Digital solutions for autonomy for space transportation systems, design and simulation tools – targeting demonstration

Call: SPACE 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 4.00 and 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and

	selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 7.00 million.
Type of Action	Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: In order to achieve the expected outcomes, and safeguard the Union's strategic assets, interests, autonomy, or security, namely it is important to avoid a situation of technological dependency on a non-EU source, in a global context that requires the EU to take action to build on its strengths, and to carefully assess and address any strategic weaknesses, vulnerabilities and high-risk dependencies which put at risk the attainment of its ambitions, participation is limited to legal entities established in Member States, Norway, Iceland and the other Associated Countries provided that they have successfully passed their assessment. Proposals including entities established in countries outside the scope specified in the call/topic/action will be ineligible. For the duly justified and exceptional reasons listed in the paragraph above, in order to guarantee the protection of the strategic interests of the Union and its Member States, entities established in an eligible country listed above, but which are directly or indirectly controlled by a non-eligible country or by a non-eligible country entity, may not participate in the action unless it can be demonstrated, by means of guarantees approved by the eligible country of establishment, that their participation to the action would not negatively impact the Union's strategic, assets, interests, autonomy, or security. The guarantees shall in particular substantiate that, for the purpose of the action, measures are in place to ensure that: a) control over the applicant legal entity is not exercised in a manner that restrains or restricts its ability to carry out the action and to deliver results, that imposes restrictions concerning its infrastructure, facilities, assets, resources, intellectual property or know-how needed for the purpose of the action, or that undermines its capabilities and standards necessary to carry out the action; b) access by a non-eligible country or by a non-eligible country entity to sensitive information relating to the action is prevented; and the employees or other persons involved in the action have a national security clearance issued by an eligible country, where appropriate; c) ownership of the intellectual property arising from, and the results of, the action remain within the recipient during and after completion of the

	action, are not subject to control or restrictions by non-eligible countries or non-eligible country entity, and are not exported outside the eligible countries, nor is access to them from outside the eligible countries granted, without the approval of the eligible country in which the legal entity is established. If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
Technology Readiness Level	Activities are expected to achieve TRL 7-8 by the end of the project. The reference TRL definition is the ISO 16290:2013 applicable to the space sector. Activities may start at any TRL.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [126].

Expected Outcome: This topic supports the co-programmed European Partnership on Globally Competitive Space Systems ('Space Partnership'). It is part of cohesive activities in the domain of digital developments under the grand heading of "digitalisation for commercial space solutions". The topic addresses actions in the frame of the scope of the Space Partnership, considering synergies among the domains satellite communication (SatCom), Earth Observation (EO) and New Commercial Space Transportation Solutions.

Under the area of *Access to Space* related to New Space Transportation Solutions, this topic focusses on the Mid to High TRL level developments of key technologies required to strengthen competitiveness in this domain.

Cost reduction, enhanced availability, and improved reliability must be reached by harnessing the advantages of reusability and modularity. Areas for launch service improvement are e.g., health monitoring systems, enabling real time subsystem monitoring through all mission phases, development of technologies and functional building blocks with a focus on digital solutions for autonomy, development of low cost/low mass sensors and efficient avionics. The

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

demand for readily accessible off-the-shelf modular solutions and products, caters to the needs of all launcher manufacturers.

Projects are expected to contribute to one or several of the following outcomes:

- The ability to identify and locate structural damage remotely (like cracks, corrosion, delamination or structural weakening) within the transportation systems before it leads to significant failure.
- The ability to provide autonomous thermo-mechanical monitoring enabling tracking changes in temperature, mechanical behaviour and loads experienced by the transportation systems, to predict and autonomous prevent failures.

This will contribute to developing, deploying global space-based services applications and data and contribute to fostering the EU's space sector competitiveness, as stated in the expected impact of this destination.

Scope: To tackle the above-mentioned expected outcomes, the following R&I must be addressed: R&I on advanced technologies and digital sensors for new space transportation, such as smart avionics with modularity and reusability drivers, health monitoring system and smart sensors, and structural health monitoring addressing thermo-mechanical monitoring and damage detection, ground and flight software for data management even by use of AI-algorithms.

The developments should aim at on-ground or in-orbit demonstration focusing on software and digital tools.

Proposals are expected to promote cooperation between different actors (industry, SMEs and research institutions) and consider opportunities to quickly turn technological innovation into commercial use in space via e.g., on-ground or in orbit demonstration.

Proposals under this topic should explore synergies and be complementary to already funded actions in the context of technology development at component level. In particular, it is expected that projects make use of existing European technologies and/or building blocks at component level contributing to European non-dependence and strengthen competitiveness, and this should be clearly presented in the proposal. Furthermore, proposed activities should be complementary to national activities and activities funded by the European Space Agency (ESA).

For information only, without this implying any additional requirements, this topic falls under the co-programmed European Space Partnership.

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content should be addressed only if relevant in relation to the objectives of the research effort.

Heading 2 - Acting in Space

Proposals are invited against the following topic(s):

HORIZON-CL4-SPACE-2025-01-21: ISOS Pilot Mission Detailed Design – Servicing component

Call: SPACE 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 7.00 and 9.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 18.00 million.
Type of Action	Research and Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: The page limit of the application is 60 pages.
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: In order to achieve the expected outcomes, and safeguard the Union's strategic assets, interests, autonomy, or security, namely avoiding a situation of technological dependency on a non-EU source, in a global context that requires the EU to build on its strenths and to carefully assess and address strategic weakenesses, vulnerabilities and high-risk dependencies, participation is limited to legal entities established in Member States and the following associated countries: Norway and Iceland. Proposals including entities established in countries outside the scope specified in the call/topic/action will be ineligible. For the duly justified and exceptional reasons listed in the paragraph above, in order to guarantee the protection of the strategic interests of the Union and its Member States, entities established in an eligible country listed above, but which are directly or indirectly controlled by a non-eligible country or by a non-eligible country entity, may not participate in the action unless it can be demonstrated, by means of guarantees approved by the eligible country of establishment, that their participation to the action would not negatively impact the Union's strategic, assets, interests, autonomy, or security. The guarantees shall in particular substantiate that, for the purpose of the

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	action, measures are in place to ensure that: a) control over the applicant legal entity is not exercised in a manner that restrains or restricts its ability to carry out the action and to deliver results, that imposes restrictions concerning its infrastructure, facilities, assets, resources, intellectual property or know-how needed for the purpose of the action, or that undermines its capabilities and standards necessary to carry out the action; b) access by a non-eligible country or by a non-eligible country entity to sensitive information relating to the action is prevented; and the employees or other persons involved in the action have a national security clearance issued by an eligible country, where appropriate; c) ownership of the intellectual property arising from, and the results of, the action remain within the recipient during and after completion of the action, are not subject to control or restrictions by non-eligible countries or non-eligible country entity, and are not exported outside the eligible countries, nor is access to them from outside the eligible countries granted, without the approval of the eligible country in which the legal entity is established. If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
Technology Readiness Level	Activities are expected to achieve TRL 6 by the end of the project. The reference TRL definition is the ISO 16290:2013 applicable to the space sector. Activities may start at any TRL.
Security Sensitive Topics	Some activities resulting from this topic may involve using classified background and/or producing of security sensitive results (EUCI and SEN). Please refer to the related provisions in section B Security — EU classified and sensitive information of the General Annexes.

Expected Outcome: The strategic objective of this topic is to develop capabilities to 'Act in Space' through demonstrating in space a pilot mission by 2030 related to ISOS. The envisaged pilot mission *EU ISOS>I* shall provide the necessary seed components for a future service infrastructure, available to the European in-space ecosystem (including the EU assets), driving the generation of a new in-space economy, providing enhanced in-orbit technology demonstration and maximising EU technology non-dependence.

This pilot mission will largely contribute to ensure EU's freedom of action in space, increase the resilience and protection of EU assets in space and foster the development of the new in-space economy. A pioneering and a novel mission concept which is unique compared to other initiatives among all space-faring nations is envisaged. The mission will build on previous

R&I with an operational mission concept, focusing on application and service demonstration, with a concrete view to commercial and governmental usage. The detailed mission concept will be derived in close coordination with EU Member States through a dedicated Advisory Group[127],

This topic addresses the finalisation of the detailed design of the **servicing component of the pilot mission *EU ISOS>I***. The servicing component will be based on previous and ongoing R&I developments and provide services such as inspection, upgrade, repair, life extension including refuelling, delivery and exchange of payload, reconfiguration, relocation, and removal of assets in space.

Projects are expected to contribute to the following outcomes:

- A sustainable, highly automated, flexible and economically viable space infrastructure, building on technologies and concepts for a circular economy in space, e.g. plug-and-play spacecraft functionality introducing recycling/re-use of spacecraft modules/functionalities;
- ISOS Pilot mission preparation up to detailed mission and system design for the servicing component;
- Elaboration of interfaces between the different components of the mission, together with the other mission components (i.e. HOST, logistics and satAPPS);
- Elaboration of clear use cases and relevant business models focussing on governmental and/or commercial needs;
- Contributing to the innovative design framework for a 'European construction kit for satellite systems and applications', following the AppStore approach and fostering system modularisation and flexibility.

This topic will contribute to, in the medium to long term, developing, deploying global space-based services and contribute to fostering the European space sector competitiveness, as stated in the expected impact of this destination.

Scope: To tackle the above expected outcomes, the following R&I actions must be addressed taking into account the provided technical annex[128]:

- R&I to complete detailed mission and system design [129] (including relevant key technology maturation) for the servicing component as part of the *EU ISOS>I* pilot

[127] The ISOS Pilot Mission Advisory Group will be composed of representatives of Member States and chaired by the Commission

[128] Technical annex is a guidance document for the Pilot Mission EU ISOS>I that is derived in close collaboration with the ISOS Pilot Mission Advisory Group, published on the EU funding and tenders portal (https:// …)

[129] Comparable with a mission design phase C according to ECSS-M-ST-10C

mission. More specifically, projects should finalise the detailed design for this component building on current or previous developments;

- Contribution to the overall ISOS pilot mission design in close cooperation with the other mission (including other servicing) components, the ISOS Pilot Mission Coordination and Support Action and the ISOS Pilot Mission Advisory Group;

- R&I on related service capabilities and applications including operational concepts for servicing individual or fleets of satellites based on the functionality of the *EU ISOS>I* system design. More specifically, possible use case for servicing a real EU asset is expected to be developed up to delivery of a concept of operations (CONOPS).

Projects must ensure full compliance to the ISOS detailed pilot mission concept including interoperability with the other mission components, in case a possibility for a standalone IOD for the proposed servicing component materialises earlier than the ISOS pilot mission.

Proposals are expected to promote cooperation between different actors (industry, SMEs and research institutions) and consider opportunities to quickly turn technological innovation into commercial use in space via e.g., on-ground or in-orbit demonstration.

Proposals should clearly present a concrete plan to ensure that required technologies reach the necessary TRL at the end of the project. Moreover, complementarities with previous and/or ongoing R&I for the proposed servicing component must be clearly described. More specifically, proposals should explore relevant and promising solutions derived in Horizon Europe, Horizon 2020, European Innovations Council (EIC) or other EU-funded relevant activities, in particular, the topics: Future Space Ecosystem (HORIZON-CL4-2021-SPACE-01-12/ 2022-SPACE-01-11/ 2023-SPACE-01-12). Finally, proposals are also expected to consider the use of existing European technologies and/or building blocks, including at component level, contributing to European non-dependence and strengthen competitiveness, and should seek to leverage synergies with national activities and activities funded by the European Space Agency (ESA).

Proposals are expected to consider and contribute to a balanced provision of Member States' and eligible Associated Countries' expertise and capabilities to the overall ISOS pilot mission, to support a successful introduction of the strategic capacity 'Act in Space' for the EU and its Member States.

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content should be addressed only if relevant in relation to the objectives of the research effort.

HORIZON-CL4-SPACE-2025-01-22: ISOS Pilot Mission Detailed Design – HOST component

Call: SPACE 2025

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 12.00 and 17.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 17.50 million.
Type of Action	Research and Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: The page limit of the application is 60 pages.
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: In order to achieve the expected outcomes, and safeguard the Union's strategic assets, interests, autonomy, or security, namely avoiding a situation of technological dependency on a non-EU source, in a global context that requires the EU to build on its strenths and to carefully assess and address strategic weakenesses, vulnerabilities and high-risk dependencies, participation is limited to legal entities established in Member States and the following associated countries: Norway and Iceland. Proposals including entities established in countries outside the scope specified in the call/topic/action will be ineligible. For the duly justified and exceptional reasons listed in the paragraph above, in order to guarantee the protection of the strategic interests of the Union and its Member States, entities established in an eligible country listed above, but which are directly or indirectly controlled by a non-eligible country or by a non-eligible country entity, may not participate in the action unless it can be demonstrated, by means of guarantees approved by the eligible country of establishment, that their participation to the action would not negatively impact the Union's strategic, assets, interests, autonomy, or security. The guarantees shall in particular substantiate that, for the purpose of the action, measures are in place to ensure that: a) control over the applicant legal entity is not exercised in a manner that restrains or restricts its ability to carry out the action and to deliver results, that imposes restrictions concerning its infrastructure, facilities, assets, resources, intellectual property or know-how needed for the purpose of the action, or that undermines its capabilities and standards necessary to carry out the action;

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	b) access by a non-eligible country or by a non-eligible country entity to sensitive information relating to the action is prevented; and the employees or other persons involved in the action have a national security clearance issued by an eligible country, where appropriate; c) ownership of the intellectual property arising from, and the results of, the action remain within the recipient during and after completion of the action, are not subject to control or restrictions by non-eligible countries or non-eligible country entity, and are not exported outside the eligible countries, nor is access to them from outside the eligible countries granted, without the approval of the eligible country in which the legal entity is established. If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
Technology Readiness Level	Activities are expected to achieve TRL 6 by the end of the project. The reference TRL definition is the ISO 16290:2013 applicable to the space sector. Activities may start at any TRL.
Procedure	The procedure is described in General Annex F. The following exceptions apply: The granting authority can fund a maximum of one project.
Security Sensitive Topics	Some activities resulting from this topic may involve using classified background and/or producing of security sensitive results (EUCI and SEN). Please refer to the related provisions in section B Security — EU classified and sensitive information of the General Annexes.

Expected Outcome: The strategic objective of this topic is to develop capabilities to 'Act in Space' through demonstrating in space a pilot mission by 2030 related to ISOS. The envisaged pilot mission *EU ISOS>I* shall provide the necessary seed components for a future service infrastructure, available to the European in-space ecosystem (including the EU assets), driving the generation of a new in-space economy, providing enhanced in-orbit technology demonstration and maximising EU technology non-dependence.

This pilot mission will largely contribute to ensure EU's freedom of action in space, increase the resilience and protection of EU assets in space and foster the development of the new in-space economy. A pioneering and a novel mission concept, which is unique compared to other initiatives among all space-faring nations is envisaged. The mission will build on previous R&I with an operational mission concept, focusing on application and service demonstration, with a concrete view to commercial and governmental usage. The detailed mission concept will be derived in close coordination with EU Member States through a dedicated Advisory Group[11],

This topic addresses the detailed design of the **platform component of the pilot mission *EU ISOS>I***, which will be named **Hub for Operational Services and in-orbit Testing (HOST)**. HOST shall be able to host multiple servicing components, IOD/V experiments and exchangeable, operational payloads for delivery, and shall be equipped with displaceable robotic manipulation and refuelling capability.

The project is expected to contribute to the following outcomes:

- A sustainable, highly automated, flexible and economically viable space infrastructure, building on technologies and concepts for a circular economy in space, e.g. plug-and-play spacecraft functionality introducing recycling/re-use of spacecraft modules/functionalities;
- ISOS Pilot mission preparation up to detailed mission and system design for the HOST component;
- Elaboration of interfaces between the different components of the mission, together with the other mission components (i.e. servicing, logistics and satAPPS);
- Maturation of enabling technologies and innovative system and operational concepts, contributing to the pilot mission;
- Elaboration of clear use cases and relevant business models focussing on governmental and/or commercial needs;
- Provision of enhanced opportunities for IOD/V by actively promoting experiment plug and play on the HOST;
- Contributing to the innovative design framework for a 'European construction kit for satellite systems and applications', following the AppStore approach and fostering system modularisation and flexibility.

This topic will contribute to, in the medium to long term, developing, deploying global space-based services and contribute to fostering the European space sector competitiveness, as stated in the expected impact of this destination.

Scope: To tackle the above expected outcomes, the following R&I actions must be addressed taking into account the provided technical annex[12]:

- R&I to complete ISOS Pilot mission detailed mission[13] and system design (including relevant key technology maturation) for the platform component (HOST). All relevant technologies shall reach the necessary TRL.
- R&I on key enabling technologies relevant for design of a scalable, modular, flexible platform component, equipped with displaceable robotic manipulation, SatApps

compatibility[130] and refuelling capability (for the HOST and the hosted servicing component), that can be extended and reconfigured to meet different demands (e.g., governmental and commercial, IOD/V and additional servicer hosting slots, robotic/manufacturing testbeds, logistic nodes, etc.).

- Contribution to the overall ISOS pilot mission design in close cooperation with other mission components, the ISOS Pilot Mission Coordination and Support Action and the ISOS Pilot Mission Advisory Group.

- R&I on related HOST functions and applications including related operational concepts supported by simulations, enhancing the overall ISOS>I system functionality.

Proposals are expected to promote cooperation between different actors (industry, SMEs and research institutions) and consider opportunities to quickly turn technological innovation into commercial use in space via e.g., on-ground or in-orbit demonstration.

Proposals should explore relevant and promising solutions derived in Horizon Europe, Horizon 2020, European Innovations Council (EIC) or other EU-funded relevant activities, in particular, the topics: Future Space Ecosystem (HORIZON-CL4-2021-SPACE-01-12/ 2022-SPACE-01-11/ 2023-SPACE-01-12). Finally, proposals are also expected to consider the use of existing European technologies and/or building blocks, including at component level, contributing to European non-dependence and strengthen competitiveness, and should seek to leverage synergies with national activities and activities funded by the European Space Agency (ESA).

Proposals are expected to consider and contribute to a balanced provision of Member States' and eligible Associated Countries' expertise and capabilities to the overall ISOS pilot mission, to support a successful introduction of the strategic capacity 'Act in Space' for the EU and its Member States.

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content should be addressed only if relevant in relation to the objectives of the research effort.

HORIZON-CL4-SPACE-2025-01-23: ISOS Pilot Mission Detailed Design – Logistics component

Call: SPACE 2025	
Specific conditions	
Expected EU contribution per	The Commission estimates that an EU contribution of between EUR 10.00 and 12.00 million would allow these outcomes to be addressed

[130] Ability to receive functional upgrades through satAPPS modules that will be connected to HOST via dedicated Universal Service Interfaces (USI)

project	appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 12.00 million.
Type of Action	Research and Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: The page limit of the application is 60 pages.
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: In order to achieve the expected outcomes, and safeguard the Union's strategic assets, interests, autonomy, or security, namely it is important to avoid a situation of technological dependency on a non-EU source, in a global context that requires the EU to take action to build on its strengths, and to carefully assess and address any strategic weaknesses, vulnerabilities and high-risk dependencies which put at risk the attainment of its ambitions, participation is limited to legal entities established in Member States, Norway, Iceland and the other Associated Countries provided that they have successfully passed their assessment. Proposals including entities established in countries outside the scope specified in the call/topic/action will be ineligible. For the duly justified and exceptional reasons listed in the paragraph above, in order to guarantee the protection of the strategic interests of the Union and its Member States, entities established in an eligible country listed above, but which are directly or indirectly controlled by a non-eligible country or by a non-eligible country entity, may not participate in the action unless it can be demonstrated, by means of guarantees approved by the eligible country of establishment, that their participation to the action would not negatively impact the Union's strategic, assets, interests, autonomy, or security. The guarantees shall in particular substantiate that, for the purpose of the action, measures are in place to ensure that: a) control over the applicant legal entity is not exercised in a manner that restrains or restricts its ability to carry out the action and to deliver results, that imposes restrictions concerning its infrastructure, facilities, assets, resources, intellectual property or know-how needed for the purpose of the action, or that undermines its capabilities and standards necessary to carry out the action; b) access by a non-eligible country or by a non-eligible country entity to sensitive information relating to the action is prevented; and the

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	employees or other persons involved in the action have a national security clearance issued by an eligible country, where appropriate; c) ownership of the intellectual property arising from, and the results of, the action remain within the recipient during and after completion of the action, are not subject to control or restrictions by non-eligible countries or non-eligible country entity, and are not exported outside the eligible countries, nor is access to them from outside the eligible countries granted, without the approval of the eligible country in which the legal entity is established. If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
Technology Readiness Level	Activities are expected to achieve TRL 6 by the end of the project. The reference TRL definition is the ISO 16290:2013 applicable to the space sector. Activities may start at any TRL.
Procedure	The procedure is described in General Annex F. The following exceptions apply: The granting authority can fund a maximum of one project.
Security Sensitive Topics	Some activities resulting from this topic may involve using classified background and/or producing of security sensitive results (EUCI and SEN). Please refer to the related provisions in section B Security — EU classified and sensitive information of the General Annexes.

Expected Outcome: The strategic objective of this topic is to develop capabilities to 'Act in Space' through demonstrating in space a pilot mission by 2030 related to ISOS. The envisaged pilot mission *EU ISOS>I* shall provide the necessary seed components for a future service infrastructure, available to the European in-space ecosystem (including the EU assets), driving the generation of a new in-space economy, providing enhanced in-orbit technology demonstration and maximising EU technology non-dependence.

This pilot mission will largely contribute to ensure EU's freedom of action in space, increase the resilience and protection of EU assets in space and foster the development of the new in-space economy. A pioneering and a novel mission concept, which is unique compared to other initiatives among all space-faring nations is envisaged. The mission will build on previous R&I with an operational mission concept, focusing on application and service demonstration, with a concrete view to commercial and governmental usage. The detailed mission concept will be derived in close coordination with EU Member States through a dedicated Advisory Group[11],

This topic addresses the detailed design of the **logistics component of the pilot mission *EU ISOS>I***. This component shall be able to logistics component that can transport cargo (e.g., exchangeable payload, experiments) and propellant taken from an upper stage to the platform component (HOST).

The project is expected to contribute to the following outcomes:

- A sustainable, highly automated, flexible and economically viable space infrastructure, building on technologies and concepts for a circular economy in space, e.g. plug-and-play spacecraft functionality introducing recycling/re-use of spacecraft modules/functionalities;
- ISOS Pilot mission preparation up to detailed mission and system design for the logistics component;
- Elaboration of interfaces between the different components of the mission, together with the other mission components (i.e. servicing, HOST and satAPPS);
- Maturation of enabling technologies and innovative system and operational concepts, contributing to the pilot mission;
- Elaboration of clear use cases and relevant business models focussing on governmental and/or commercial needs.

This topic will contribute to, in the medium to long term, developing, deploying global space-based services and contribute to fostering the European space sector competitiveness, as stated in the expected impact of this destination.

Scope: To tackle the above expected outcomes, the following R&I actions must be addressed taking into account the provided technical annex[12]:

- R&I to complete ISOS Pilot mission detailed mission and system design[13] (including relevant key technology maturation) for the logistics component. All relevant technologies shall reach the necessary TRL;
- R&I on key enabling technologies relevant for design of a logistics component that can transport cargo (e.g., exchangeable payload, experiments) and propellant taken from an upper stage to the platform component (HOST);
- R&I on docking interface for the logistic being docked to the HOST. The interface may also be used by the servicing component. Building on existing European designs is encouraged;
- R&I on solutions for propellant management and transfer from the logistic component to HOST;

- Contribution to the overall ISOS pilot mission design in close cooperation with other mission components, the ISOS Pilot Mission Coordination and Support Action and the ISOS Pilot Mission Advisory Group.

Proposals are expected to promote cooperation between different actors (industry, SMEs and research institutions) and consider opportunities to quickly turn technological innovation into commercial use in space.

Proposals should explore relevant and promising solutions derived in Horizon Europe, Horizon 2020, European Innovations Council (EIC) or other EU-funded relevant activities, in particular, the topics: Future Space Ecosystem (HORIZON-CL4-2021-SPACE-01-12/ 2022-SPACE-01-11/ 2023-SPACE-01-12). Finally, proposals are also expected to consider the use of existing European technologies and/or building blocks, including at component level, contributing to European non-dependence and strengthen competitiveness, and should seek to leverage synergies with national activities and activities funded by the European Space Agency (ESA).

Proposals are expected to consider and contribute to a balanced provision of Member States' and eligible Associated Countries' expertise and capabilities to the overall ISOS pilot mission, to support a successful introduction of the strategic capacity 'Act in Space' for the EU and its Member States.

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content should be addressed only if relevant in relation to the objectives of the research effort.

HORIZON-CL4-SPACE-2025-01-24: ISOS Pilot Mission Detailed Design – satAPPS component

Call: SPACE 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 2.00 and 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 5.00 million.
Type of Action	Research and Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: The page limit of the application is 60 pages.
Eligibility	The conditions are described in General Annex B. The following

conditions	exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
Technology Readiness Level	Activities are expected to achieve TRL 6 by the end of the project. The reference TRL definition is the ISO 16290:2013 applicable to the space sector. Activities may start at any TRL.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [131].

Expected Outcome: The strategic objective of this topic is to develop capabilities to 'Act in Space' through demonstrating in space a pilot mission by 2030 related to ISOS. The envisaged pilot mission *EU ISOS>I* shall provide the necessary seed components for a future service infrastructure, available to the European in-space ecosystem (including the EU assets), driving the generation of a new in-space economy, providing enhanced in-orbit technology demonstration and maximising EU technology non-dependence.

This pilot mission will largely contribute to ensure EU's freedom of action in space, increase the resilience and protection of EU assets in space and foster the development of the new in-space economy. A pioneering and a novel mission concept, which is unique compared to other initiatives among all space-faring nations is envisaged. The mission will build on previous R&I with an operational mission concept, focusing on application and service demonstration, with a concrete view to commercial and governmental usage. The detailed mission concept will be derived in close coordination with EU Member States through a dedicated Advisory Group[11],

This topic addresses the detailed design of the **satAPPS component of the pilot mission *EU ISOS>I***, that allows the creation of functional modules for satellite upgrade and the further development of a European construction kit for satellite systems and applications, following the AppStore approach and fostering system modularisation and flexibility.

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

The project is expected to contribute to the following outcomes:

- A sustainable, highly automated, flexible and economically viable space infrastructure, building on technologies and concepts for a circular economy in space, e.g. plug-and-play spacecraft functionality introducing recycling/re-use of spacecraft modules/functionalities;
- ISOS Pilot mission preparation up to detailed mission and system design for the satAPPS component;
- Elaboration of interfaces between the different components of the mission, together with the other mission components (i.e. servicing, HOST and logistics);
- Maturation of enabling technologies contributing to the pilot mission;
- Enhancing opportunities for IOD/V by actively promoting experiment plug and play on the HOST and prepared assets;
- Elaboration of clear use cases and relevant business models focussing on governmental and/or commercial needs.
- Contributing to the innovative design framework for a 'European construction kit for satellite systems and applications', following the AppStore approach and fostering system modularisation and flexibility.

This topic will contribute to, in the medium to long term, developing, deploying global space-based services and contribute to fostering the European space sector competitiveness, as stated in the expected impact of this destination.

Scope: To tackle the above expected outcomes, the following R&I actions must be addressed taking into account the provided technical annex[12]:

- R&I to complete ISOS Pilot mission detailed mission and system design[13] (including relevant key technology maturation) for the SatApps component. All relevant technologies shall reach the necessary TRL.
- R&I on technologies relevant for the design of SatApps components aiming at the establishment of a European construction kit for satellite systems and applications, consolidating an innovative, scalable and adaptive framework, following the AppStore approach and fostering development of compartmentalised functionalities (SatApp modules) for satellite systems independently from mission. More specifically, innovative SatApps should be developed at TRL 6 that will be used in the context of the *EU ISOS>I* pilot mission to demonstrate upgrade of components' functionalities and/or payload exchange.
- R&I on SatApps module specifically for hosting IOD/V experiments.

- Contribution to the overall ISOS pilot mission design in close cooperation with other mission components, the ISOS Pilot Mission Coordination and Support Action and the ISOS Pilot Mission Advisory Group.

Proposals are expected to promote cooperation between different actors (industry, SMEs and research institutions) and consider opportunities to quickly turn technological innovation into commercial use in space via e.g., on-ground or in-orbit demonstration.

Proposals should explore relevant and promising solutions derived in Horizon Europe, Horizon 2020, European Innovations Council (EIC) and other EU-funded relevant activities, in particular, the topics: Future Space Ecosystem (HORIZON-CL4-2021-SPACE-01-12/ 2022-SPACE-01-11/ 2023-SPACE-01-12). Furthermore, proposed activities should seek to leverage synergies with national activities and activities funded by the European Space Agency (ESA).

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content should be addressed only if relevant in relation to the objectives of the research effort.

Heading 3 - Using Space on Earth - Telecommunications

For a description of topics/actions related to the development of IRIS^2, please refer to "Indirectly managed actions by ESA" in the section "Other Actions" of this work programme.

Heading 3bis - Using Space on Earth – Telecommunications and Earth Observation

Proposals are invited against the following topic(s):

HORIZON-CL4-SPACE-2025-01-31: Digital enablers and building blocks for Earth Observation and Satellite telecommunication for Space solutions

Call: SPACE 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 1.00 and 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 6.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation

	and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
Technology Readiness Level	Activities are expected to achieve TRL 4-5 by the end of the project. The reference TRL definition is the ISO 16290:2013 applicable to the space sector. Activities may start at any TRL.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [132].

Expected Outcome: This topic supports the co-programmed European Partnership on Globally Competitive Space Systems ('Space Partnership'). This partnership topic is part of cohesive activities in the domain of digital developments under the grand heading of "digitalisation for commercial space solutions". It addresses actions in the frame of the scope of the co-programmed Partnership on Globally Competitive Space Systems ('Space Partnership'), considering synergies among the domains satellite communication (SatCom), Earth Observation (EO) and New Commercial Space Transportation Solutions.

Under the area of *Using Space on Earth* related to SatCom and EO, below this topic focus on the fast increment of the Low to Mid TRL level building blocks for key technologies required to strengthen competitiveness in these domains. Digitalisation is a major enabler for enhancing the value of an End-to-End EO and SatCom system. For example, processing applied to multi-sensor data can significantly enhance the resolution of the final data set, and digital optimisation of the data flow directly improves the End-to-End timeliness of an EO system (from request to delivery). Lastly, the enhancement of End-to-End data resilience and integrity calls for digital technologies on-board and, on the ground.

Projects are expected to contribute to one or several of the following outcomes:

- Enable the European Space Industry to maintain a significant share of the global connectivity market by increasing the performance of space satellite networks, new type of control, space and ground segments being fully integrated into the terrestrial networks;

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

- New commercial services and applications enabled by increased digitalisation of space solutions;

- Advanced Earth observation payloads, technologies and processing means (on ground and/or in space), for all types of observation missions.

This will contribute to developing, deploying global, more flexible and reactive space-based services applications, to contribute to fostering the EU's space sector competitiveness, as stated in the expected impact of this destination.

Scope: The areas of R&I, which needs to be addressed to tackle the above-mentioned expected outcomes are:

- R&I on End-to-End SatCom Mission capabilities (e.g., satellite network interconnectivity, seamless integration into the terrestrial networks, taking into account and contributing to ongoing standardisation efforts, increased reactivity), energy efficient connectivity and compatibility with 5G & 6G, (e.g., constellation and network software management system, optical communication), and satellites as network nodes in a distributed system (e.g., ubiquitous use of orbital resources, distributed computing, embracing both ground and space), flexible and modular testbed prototype with representative building blocks for complex SatCom typologies, data fusion;

- R&I on breakthrough harmonization enabling interoperability among multiple EO missions, breakthrough digitalized technology steps, such as AI algorithms, high performance cloud-based architectures, active and adaptive optics and/or higher power electronics (focal plane and RF back-ends and front-ends), mature (on-board and/or ground) digital techniques and technologies to support novel operational approaches, mature miniaturised instruments design - including their digitalized on-board processing electronics- fit for affordable EO constellations to address emerging markets;

- R&I on lower maturity building blocks and processes common to EO and SatCom systems, such as technologies and products improving system security and threats identification, resources usage optimization, tools to support the measure of key environmentally driven criteria through increased resource sharing, and maturation of high-performance processing payload H/W to support space network capabilities together with software functions to support reconfigurability, inter alia.

Proposals should address at least one of the areas outlined above.

Proposals are expected to promote cooperation between different actors (industry, SMEs and research institutions) and consider opportunities to quickly turn technological innovation into commercial use in space.

Proposals under this topic should explore synergies and be complementary to already funded actions in the context of technology development at component level, while still enabling new entrants and new approaches. In particular the topics: Critical Space Technologies for European non-dependence (HE H2020 SPACE-10-TEC-2018-2020, COMPET-1-2014-2015-

2016-2017, HORIZON-CL4-2021-SPACE-01-81/ 2023-SPACE-01-72/ 2024-SPACE-01-73), satellite communication technologies (H2020 COMPET-2-2016, COMPET-3-2017, SPACE-15-TEC-2018, SPACE-29-TEC-2020, HORIZON-CL4-2021-SPACE-01-11), Earth Observation end-to-end technologies (HORIZON-CL4-2022-SPACE-01-13, HORIZON-CL4-2023-SPACE-01-11). It is expected that projects make use of existing European technologies and/or building blocks, including at component level, contributing to European non-dependence and strengthen competitiveness, and this should be clearly presented in the proposal. Furthermore, proposed activities should be complementary to previously HE funded projects, national activities and activities funded by the European Space Agency (ESA).

For information only, without this implying any additional requirements, this topic falls under the co-programmed European Space Partnership.

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content should be addressed only if relevant in relation to the objectives of the research effort.

HORIZON-CL4-SPACE-2025-01-32: Preparing demonstration missions for collaborative Earth Observation and Satellite telecommunication for Space solutions

Call: SPACE 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 2.00 and 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 11.00 million.
Type of Action	Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
Technology Readiness Level	Activities are expected to achieve TRL 7-8 by the end of the project. The reference TRL definition is the ISO 16290:2013 applicable to the space sector. Activities may start at any TRL.
Legal and financial set-up of the Grant	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the

Agreements	Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [133].

Expected Outcome: This topic supports the co-programmed European Partnership on Globally Competitive Space Systems ('Space Partnership'). It is part of cohesive activities in the domain of digital developments under the grand heading of "digitalisation for commercial space solutions". The topic addresses actions in the frame of the scope of the Space Partnership, considering synergies among the domains satellite communication (SatCom), Earth Observation (EO) and New Commercial Space Transportation Solutions.

Under the area of *Using Space on Earth* related to SatCom and EO, below this topic focusses on the Mid to High TRL level developments of key technologies required to strengthen competitiveness in these domains. Digitalisation is a major enabler for enhancing the value of an End-to-End EO and SatCom system. For example, processing applied to multi-sensor data can significantly enhance the resolution of the final data set, and digital optimisation of the data flow directly improves the End-to-End timeliness of an EO system (from request to delivery). Lastly, the enhancement of End-to-End data resilience and integrity calls for digital technologies on-board and, on the ground.

Projects are expected to contribute to one or several of the following outcomes:

- Enable the European Space Industry to maintain a significant share of the global connectivity market by increasing the performance of space satellite networks, new type of control, space and ground segments being fully integrated into the terrestrial networks;
- New commercial services and applications enabled by an increased digitalisation of space solutions;
- Advanced Earth observation payloads, technologies and processing means (on ground and in space), as well as optimisation of data downlink for all types of observation missions.

This will contribute to developing, deploying global, more flexible and reactive space-based services applications, to contribute to fostering the EU's space sector competitiveness, as stated in the expected impact of this destination.

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

Scope: The areas of R&I, which needs to be addressed to tackle the above-mentioned expected outcomes are:

- R&I on End-to-End SatCom Mission capabilities (e.g., satellite network interconnectivity, seamless integration into the terrestrial networks, taking into account and contributing to ongoing standardisation efforts, increased reactivity), energy efficient connectivity and compatibility with 5G & 6G, (e.g., constellation and network software management system, optical communication), and satellites as network nodes in a distributed system (e.g., ubiquitous use of orbital resources, distributed computing, embracing both ground and space), flexible and modular testbed for complex satcom typologies to assess performances, compatibility of the different elements and operations concepts, data fusion;

- R&I on on-board processing to optimize EO missions' performance or timeliness (e.g., standardized software framework to host embedded edge-computing applications -AI, Machine Learning-, data/signal image processing, enhanced downlink and uplink capabilities), EO ground segment interfaces and data flow standardisation and adoption (e.g., development of use cases demonstrating the associated digital building-blocks, at least in ground relevant environment), smart multi-source EO intelligence information fusion (e.g., innovative intelligence information extraction and fusion), EO-related equipment and instruments digitalisation (e.g., miniaturization of equipment, enhancement of the European optical digital detectors supply);

- R&I on synergetic technologies, building blocks and processes with applicability across both EO and SatCom systems and missions, such as maturation of technologies and products improving system security and threats identification, resources usage optimization, tools to support the measure of key environmentally driven criteria through increased resource sharing, and maturation of high-performance processing payload H/W and payload data flexible downlink to support space network capabilities together with software functions to demonstrate mission flexibility.

Developments should aim at on-ground relevant environment or in-orbit demonstration focusing on software and digital tools (e.g. algorithms, functions), supporting open-HW alternatives (e.g. processors, electronics) such as RISC-V or similar from design to pre-operation phases.

Proposals may contribute to one or more of the above R&I areas, however the main area addressed should be clearly and unambiguously identified. To ensure a balanced portfolio covering the three areas described above, grants will be awarded to applications not only in order of ranking but at least also to one proposal that is the highest ranked within each area, provided that the applications attain all thresholds.

Proposals are expected to promote cooperation between different actors (industry, SMEs and research institutions) and consider opportunities to quickly turn technological innovation into commercial use in space via e.g., on-ground relevant environment or in orbit demonstration.

Proposals under this topic should explore synergies and be complementary to already funded actions in the context of technology development at component level, while still enabling new entrants and new approaches. In particular the topics: Critical Space Technologies for European non-dependence (HE H2020 SPACE-10-TEC-2018-2020, COMPET-1-2014-2015-2016-2017, HORIZON-CL4-2021-SPACE-01-81/ 2023-SPACE-01-72/ 2024-SPACE-01-73), satellite communication technologies and high speed data chain (H2020 COMPET-2-2016, COMPET-3-2017, SPACE-15-TEC-2018, SPACE-29-TEC-2020, HORIZON-CL4-2021-SPACE-01-11), Earth Observation end-to-end technologies (HORIZON-CL4-2022-SPACE-01-13, HORIZON-CL4-2023-SPACE-01-11). It is expected that projects make use of existing European technologies and/or building blocks, including at component level, contributing to European non-dependence and strengthen competitiveness, and this should be clearly presented in the proposal. Furthermore, proposed activities should be complementary to previously HE funded projects, national activities and activities funded by the European Space Agency (ESA).

For information only, without this implying any additional requirements, this topic falls under the co-programmed European Space Partnership.

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content should be addressed only if relevant in relation to the objectives of the research effort.

Heading 4 - Using Space on Earth – Earth Observation

Proposals are invited against the following topic(s):

HORIZON-CL4-SPACE-2025-01-41: Copernicus Climate Change Service (C3S) evolution: new and innovative processing and methods for future Sentinels and other satellites for reanalyses

Call: SPACE 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 10.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of

	Copernicus and/or Galileo/EGNOS (other data and services may additionally be used). The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Technology Readiness Level	Activities are expected to achieve TRL 5-6 by the end of the project. The reference TRL definition is the ISO 16290:2013 applicable to the space sector. Activities may start at any TRL.
Procedure	The procedure is described in General Annex F. The following exceptions apply: The granting authority can fund a maximum of one project.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [134].

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

- Innovative methods to prepare and pre-process observational input for Earth-system reanalysis datasets, including the Copernicus Sentinel missions, which will lead to an increase in the use of observations for Earth-system reanalysis;
- Enhanced sparse data assimilation and initialisation methods of climate sub-component (e.g., atmosphere, ocean, land, hydrology) in Copernicus products;
- More and better information about the climate record to be extracted from the available observations improving our overall monitoring of the climate and climate change;
- Expanded range of reanalyses products to include centennial reanalyses, and enhanced climate counterfactuals data sets to support data-driven predictions and the ongoing operationalisation of extreme event attribution.

Scope: The areas of R&I to address the above expected outcomes include:

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

- Improve the ability of Copernicus' models to assimilate new and other satellite observations (e.g. the Copernicus Sentinel Expansion and Next Generation missions, contributing missions, meteorological satellites, research satellites) that are sensitive to surface parameters and fluxes. It is also necessary to undertake research on information content of early satellite data and unlock their exploitation in reanalyses at global and regional scales;

- Exploit innovative methods (including AI/ML) for data rescue for in situ observations, in particular regarding past observing methods and environmental factors, and on error analysis, quality control and bias adjustment of the historical observation record. The aim is to make best possible use of early observations from various records of in situ and remote observations to improve physically consistent analysis of the atmosphere, the ocean, the land and the cryosphere;

- Improve the use of Sentinel and other data in all Copernicus reanalyses and their use across different services. Beyond processing and reprocessing activities, specific coordinated developments in terms of observation operators and observational error characteristics will be required across services;

- Explore innovative methods (e.g. AI/ML) to accelerate the production and updates of reanalyses, to capture reanalyses uncertainties efficiently, and to reduce overall computing energy/carbon footprint.

The C3S reanalyses represent a significant portion of the service data requests and are at the heart of the service product line and further exploitation (e.g. initialising climate predictions, evaluation of climate historical projections, climate intelligence, development of climate applications, AI/ML weather forecasts). The preparation of the future C3S coupled Earth system reanalyses is underway to significantly improve the consistency across earth system components and lengthen the timespan. Reanalyses play a key and vital role in climate monitoring and in the attribution of extreme events, but the development of the required counterfactual dataset is often ad-hoc and lacks operational implementation. An extension of the reanalyses back to the early 1900' would meet many requirements of users but such a task would be impossible without an adequate investment in data rescue and in the reprocessing of EO data.

Bringing together European expertise on a wide variety of observations, climate data records and global and regional reanalyses will be paramount, and this will require a very tight collaboration with the space agencies. Synergies with Destination Earth are encouraged. This will fully realise the progressive exploitation of Copernicus Sentinel data for the monitoring of a changing climate over Europe and worldwide. In addition, the proposal shall include some demonstrations of downstream applications that benefit from these improvements.

Additionally, the transfer of research results to operations should receive active attention during the project to strengthen the readiness for an operational deployment in the future. Appropriate involvement and/or interaction with the relevant Entrusted Entities of the Copernicus services, the conditions for making available, for re-using and exploiting the

results (including IPR) by the said entities must be addressed during the project implementation. Software should be open licensed.

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content should be addressed only if relevant in relation to the objectives of the research effort.

HORIZON-CL4-SPACE-2025-01-42: Copernicus Atmosphere Monitoring Service (CAMS) evolution: improved soil-vegetation-atmosphere modelling and data assimilation of atmospheric constituents

Call: SPACE 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 3.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used). The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Technology Readiness Level	Activities are expected to achieve TRL 5-6 by the end of the project. The reference TRL definition is the ISO 16290:2013 applicable to the space sector. Activities may start at any TRL.
Procedure	The procedure is described in General Annex F. The following exceptions apply: The granting authority can fund a maximum of one project.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for

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	Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [135].

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

- New parameterizations that can accurately simulate the biogenic fluxes of Volatile Organic Compounds (VOCs) and other atmospheric constituents to represent the corresponding processes in numerical models;
- Advanced modelling techniques, in particular within the canopy, to respond to the CAMS user needs for high-quality products, which are needed for the monitoring of environmental policies regarding eutrophication and acidification of soils and ecosystems as well as for regulatory reporting commitments;
- Advanced use of Earth observation (e.g. Sentinels) and modelling techniques for the soil-vegetation-atmosphere interface to determine emission and deposition of key atmospheric constituents, in particular for pollen of certain plants and trees.

Scope: The areas of R&I to address the above expected outcomes include:

- Advancing soil-vegetation-atmosphere surface/interface and evapo-transpiration numerical models and data assimilation techniques;
- Further development of surface models that can account accurately and dynamically for the sources and sinks of key trace gases and aerosols and are compatible with operational implementation in CAMS global and regional systems;
- Improvement of methodologies to estimate deposition fluxes and associated uncertainties;
- develop data assimilation approaches to deliver highly resolved deposition products, based on in-situ deposition networks and Earth Observation;
- Development of accurate pollen source models for additional species among the most allergenic ones in Europe (the current pollens in the CAMS portfolio are alder, birch, olive, grass, mugwort, and ragweed);
- Investigation of modelling of pollen at the global scale;

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

- Development of further use of satellite observations for improving calculation of dry deposition fluxes and emissions.

Eutrophication and acidifications of ecosystems remain among the most sensitive environmental issues which drive the revision of emission reduction strategies (UNECE Gothenburg Protocol, NEC Directive). Pollen and many atmospheric trace components such as VOCs represent major public health issues, affecting hundreds of millions of people globally and in Europe. Elaborated soil-vegetation-atmosphere surface/interface models and associated parameterization are needed to represent emissions, concentrations and deposition of such constituents. Enhanced numerical models, data assimilation and parameterization techniques are needed to characterize the fate of such constituents.

The main output of the project shall be tools and methodologies that can be readily transferred to the CAMS operational global and regional systems.

The proposal shall develop activities that will improve and expand the operational global and regional atmospheric composition analyses, forecasts, and reanalyses. In addition, the proposal shall include some demonstrations of downstream applications that benefit from these improvements. Synergies with Destination Earth are encouraged.

The transfer of research results to operations should receive active attention during the project to strengthen the readiness for an operational deployment in the future. Appropriate involvement and/or interaction with the relevant Entrusted Entities of the Copernicus services, the conditions for making available, for re-using and exploiting the results (including IPR) by the said entities must be addressed during the project implementation. Particular attention should be paid to the potential use and complementarities with the products already developed in the other Copernicus services. Strengthening Copernicus services collaboration could be foreseen. Software should be open licensed.

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content should be addressed only if relevant in relation to the objectives of the research effort.

HORIZON-CL4-SPACE-2025-01-43: Copernicus Anthropogenic CO_2 Emissions Monitoring & Verification Support (CO2MVS) capacity: new and innovative methods to estimate the impact of fires on vegetation and related carbon fluxes

Call: SPACE 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Indicative budget	The total indicative budget for the topic is EUR 3.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used). The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Technology Readiness Level	Activities are expected to achieve TRL 5-6 by the end of the project. The reference TRL definition is the ISO 16290:2013 applicable to the space sector. Activities may start at any TRL.
Procedure	The procedure is described in General Annex F. The following exceptions apply: The granting authority can fund a maximum of one project.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [136].

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

- Enable accounting for the interaction between droughts, fires and vegetation in the CO2MVS capacity;
- Improve the estimation of fire emissions in the Copernicus Atmosphere Monitoring Service (CAMS);
- Improve the fire risk forecasting in the Copernicus Emergency Management Service (CEMS);

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

- Improve the assimilation of Copernicus Land Monitoring Service (CLMS) products in vegetation fire impact and carbon fluxes assessments.

Scope: The areas of R&I to address the above expected outcomes include:

- Better understand and characterise the impact of wildfires on the carbon cycle and on anthropogenic emissions through land use change. This has been recognized especially in the climate community when developing process-based vegetation models for use in climate models. While a large variety of empirical or process-based vegetation models exist today, it is still unclear which type of model or degree of complexity is required to model fire adequately at regional to global scales. International collaborations, such as the Fire Model Intercomparison Project (FireMIP), have evaluated existing global fire models against benchmark data sets for present-day and historical conditions;

- Investigate the current state of fire modelling and specifically how the interaction between droughts, fires and vegetation can be accounted for in a global monitoring system, such as the CO2MVS. Because of the monitoring aspects of the CO2MVS, use should be made, where possible, of including observation-based data sets representing certain aspects of the fire-vegetation interaction;

- Investigate how a better understanding of the impact of fires on vegetation can improve the estimates of fire emissions of chemical species and aerosols, and subsequently air quality products in CAMS and the fire risk forecasting in CEMS.

Wildfires have become widespread during summer over many regions of the world, including Europe, and have major safety and larger societal impacts (air quality and health, aviation, weather, agriculture, etc). Wildfires and biomass burning are significant sources of CO2 and air pollutants in the atmosphere. Fires also change the vegetation and therefore affect the exchange of CO2 between the biosphere and the atmosphere. Current vegetation and fire models need to be improved to refine the quality of CAMS products (air quality, emissions), the Global Fire Assimilation System (GFAS) supporting CEMS and forcing data sets for climate projections supporting the IPCC. Innovative methodologies shall be investigated to include fire-vegetation interactions, also taking into account the impact of drought conditions in global monitoring systems such as the CO2MVS capacity, via the improvement of currently used process-based vegetation models or through empirical models. The use of relevant observation-based data sets (e.g. vegetation states, drought conditions, burnt areas) should be a key element of these methodologies. Current CLMS products should be considered, including options for potential improved specifications. The proposal shall include some demonstrations of downstream applications that benefit from these improvements.

The transfer of research results to operations should receive active attention during the project to strengthen the readiness for an operational deployment in the future. Appropriate involvement and/or interaction with, and/or coordination across the relevant Entrusted Entities of the Copernicus services, the conditions for making available, for re-using and exploiting

the results (including IPR) by the said entities must be addressed during the project implementation. Software should be open licensed.

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content should be addressed only if relevant in relation to the objectives of the research effort.

HORIZON-CL4-SPACE-2025-01-44: Copernicus Marine Environment Monitoring Service (CMEMS) evolution: new and innovative ocean data assimilation techniques

Call: SPACE 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 5.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used). The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Technology Readiness Level	Activities are expected to achieve TRL 5-6 by the end of the project. The reference TRL definition is the ISO 16290:2013 applicable to the space sector. Activities may start at any TRL.
Procedure	The procedure is described in General Annex F. The following exceptions apply: The granting authority can fund a maximum of one project.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the

	Research and Training Programme of the European Atomic Energy Community (2021-2025). [137].

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

- To advance ocean data assimilation techniques (physics and biogeochemistry) to get as realistic ocean state representation as possible, to improve ocean forecasts and to remain at the forefront at the international level;
- To get the most benefit from observations in reanalysis, analysis and forecasting systems;
- To strengthen data assimilation development exchanges between operational centres and to facilitate scientific community contributions.

Scope: The areas of R&I to address the above expected outcomes include:

- Coupled data assimilation (e.g. between ocean and biogeochemistry, ocean and sea-ice, ocean and waves and atmosphere) to control in a more consistent way the ocean state variables across ocean components or forcings and to get more benefits from observations;
- Development of multi-scale methods capable of assimilating high-resolution and high-frequency observations as well as of constraining larger scales;
- Development of methods to produce reliable estimation of analysis and forecast uncertainties;
- Use of Artificial Intelligence techniques in data assimilation schemes (e.g. use of emulators for ensemble generation, model error estimation, bias correction, separation of scale and model parameter estimation);
- Use of new types of observations (e.g. new Sentinel Expansion and Next Generation missions, new in-situ observations) or higher-resolution of existing data streams;
- Development of methods and tools to systematically assess the observing system impact in data assimilation systems (e.g. analysis and forecast sensitivity to observation);
- The development of software infrastructure that can accommodate different assimilation methods (including artificial intelligence techniques), and facilitate the sharing of

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

algorithms and optimization of computer codes (assimilation schemes) on high-performance computers;

- The development of validation and intercomparison protocols to estimate and quantify the benefits of improved assimilation methods and integration of new observations (e.g. data challenges, use of OSSEs).

The development of new types of observations from satellites and in-situ and the improvement of space/time sampling of existing observations require a step change in data assimilation techniques to fully benefit from these new sources of data. Current techniques are facing hard limits to progress and need new approaches to make the best use of observation and advances in modelling (e.g. resolution). Emerging coupling, multi-scale, ensemble and artificial intelligence techniques represent new opportunities for significant improvements in ocean data assimilation. The proposal shall include some demonstrations of downstream applications that benefit from these improvements.

The transfer of research results to operations should receive active attention during the project to strengthen the readiness for an operational deployment in the future. Appropriate involvement and/or interaction with the relevant Entrusted Entities of the Copernicus services, the conditions for making available, for re-using and exploiting the results (including IPR) by the said entities must be addressed during the project implementation. Software should be open licensed.

Potential contributions to the GEO Blue Planet initiative should also receive attention during the project, given that the CMEMS is and should remain an important player in this initiative.

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content should be addressed only if relevant in relation to the objectives of the research effort.

HORIZON-CL4-SPACE-2025-01-45: Supporting the AI/ML digital transition of Copernicus Services

Call: SPACE 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 12.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 12.00 million.
Type of Action	Research and Innovation Actions
Eligibility	The conditions are described in General Annex B. The following

conditions	exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used). The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Technology Readiness Level	Activities are expected to achieve TRL 5-6 by the end of the project. The reference TRL definition is the ISO 16290:2013 applicable to the space sector. Activities may start at any TRL.
Procedure	The procedure is described in General Annex F. The following exceptions apply: The granting authority can fund a maximum of one project.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [138].

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

- Integrated AI/ML strategy across Copernicus Services, value chains and workflows;
- Improved quality, timeliness, reliability and resilience of Copernicus data, products and applications;
- Improved time-to-solution and energy-to-solution of Copernicus operational workflows;
- Transformed user experience through enhanced interactivity and on-demand capabilities for Copernicus services;
- Exchange of knowledge and best practices on using AI/ML in the context of Copernicus;
- Enhanced AI-readiness of Copernicus data.

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

Scope: The areas of R&I to address the above expected outcomes include:

- AI-supported retrieval algorithms on both passive and active sensing for existing and upcoming Copernicus missions;
- Fast, reliable, consistent, and as much as possible sensor agnostic identification of clouds and shadows in optical sensing;
- Physics parameterization and parameter optimization to emulate poorly understood processes and increase the fidelity of numerical models;
- Fault and outlier detection in production and delivery workflows to ensure more robust services;
- Support to automated pre-processing and QA/QC of observations and data to reduce the risk of man-made errors and product deficiencies;
- Data fusion techniques towards added-value products;
- Data compression and mining methods to navigate big data efficiently, as the amount of data is becoming a limiting factor;
- Hybrid observation operator, ensemble data assimilation techniques, error calibration and uncertainty quantification towards improved (re-)analysis and forecast skill;
- Analysis-driven Earth system deep learning models to boost prediction skill and timeliness, including with Digital Twin Earth models. These methods have shown great promises when applied to reanalyses for example;
- Experimenting observation(-only)-driven forecasting to support time-critical service elements, circumventing analysis steps. These approaches could be particularly suited for observation-dense areas from which processes can be inferred from observations alone;
- Exploring the potential of large pre-trained foundation models and transfer learning at scale for Earth system modelling;
- Downscaling and super resolution applications building on Copernicus data to refine products in space and time;
- Adaptive workflow optimizations;
- Enhanced interactive interfaces enabling on-demand product and service generation;
- Chatbots that can guide the user across a wide range of information sources within and across Copernicus services for enhanced user support and experience.

Proposals are expected to address a significant portion – and possibly all - of the above areas.

During the last decade, artificial intelligence (AI), machine learning, big data volumes and computing capacities have developed at an unprecedented pace, and it is now evident that Copernicus needs to become even more proactive on the digital transition. AI and machine learning offer great opportunities across the Copernicus value chain and workflows to deeply transform its data, products, applications, services and user experience.

However, the scope and speed of developments also generate challenges, in particular regarding the necessary know-how that needs to be established, the software and hardware infrastructure that needs to be developed, and the integration of machine learning and conventional tools within production workflows. These challenges need to be addressed within a comparably short period of time to keep up with evolving user requirements and to leverage emerging AI/ML developments. The project is expected to foster game changer and disruptive approaches in particular towards next generation Earth system (re-)analysis and prediction systems, to promote integrated AI/ML strategies and intensive cooperation and knowledge transfer with and across Entrusted Entities to pave the way into the future of Copernicus. Given the QA/QC requirements on Copernicus products, explainable, trustworthy, open-source and responsible use of AI approaches are of particular interest, as AI mainly operates as a black box. In the context of recent EU policies, a robust framework is required to ensure the same stringent quality, reliability, and verifiability requirements of AI-generated products, as well as transparency and clearly labelled information to users.

The transfer of research results to operations should receive active attention during the project to strengthen the readiness for an operational deployment in the future. Appropriate involvement and/or interaction with the relevant Entrusted Entities of the Copernicus services and Destination Earth, the conditions for making available, for re-using and exploiting the results (including IPR) by the said entities must be addressed during the project implementation.

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content should be addressed only if relevant in relation to the objectives of the research effort.

HORIZON-CL4-SPACE-2025-01-46: Innovative Earth observation services in support of maritime litter detection and ship source pollution policies

Call: SPACE 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 5.00 million.

Type of Action	Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used). The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Technology Readiness Level	Activities are expected to achieve TRL 7-8 by the end of the project. The reference TRL definition is the ISO 16290:2013 applicable to the space sector. Activities may start at any TRL.
Procedure	The procedure is described in General Annex F. The following exceptions apply: The granting authority can fund a maximum of one project.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [139].

Expected Outcome:

- National maritime authorities and enforcement bodies will benefit from improved detection services to fulfil the requirements of the Ship Sourced Pollution Directive, ultimately resulting in a higher environmental protection of sea waters and preservation of marine ecosystems;
- Increased accuracy from the developed solutions will allow more efficient and quick responses to potential spill incidents.

Scope: The project should address the following points:

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

- Development and demonstration of space sensors, including the assessment of their operational boundaries and associated technical confidence levels, for the following use cases:
    - Estimation of oil spill volume and thickness, in conjunction with the identification of oil types using for instance oil spectral signatures;
    - Detection of oil spills in sea ice conditions;
    - Detection and identification of chemical products on the sea surface (MARPOL Annex II);
    - Detection and identification of sewage on the sea surface (MARPOL Annex IV);
    - Detection and identification of garbage on the sea surface (MARPOL Annex V);
    - Detection and identification of exhaust gas cleaning system residue, and monitoring of single-vessel methane emissions (MARPOL Annex VI);
    - Detection and Identification of the possible polluter using vessel unique spectral signature;
    - Elements of detection of other pollution emissions (MARPOL Annex VI) might prove useful and would be considered a plus;
- Design and improvement of use of artificial intelligence for the identification of spills, sewage and garbage on the sea surface and their characteristics to achieve a higher confidence level, to avoid as many false alerts as possible.

Context:

The MARPOL convention adopted at the IMO level regulates the release at sea of substances originating from ships, be it from the ship's operation or cargo operations. The Ship Source Pollution Directive adopted in 2005 seeks to strengthen the enforcement in the EU of the prohibition of release at sea of substances under Annex I and II of the MARPOL convention. Currently, high-resolution satellite imagery of the ocean surface is used to monitor and detect potential spill, notably through the CleanSeaNet service, offered by the European Maritime Safety Agency.

The revision of the Directive that will expand its scope to discharges in the water under all MARPOL annexes. Further research is needed to adapt the current monitoring systems to the accurate detection of the substances included under the revised scope of the SSPD as the technologies may not be available or accurate enough.

The objective of this topic is to support R&I activities developing advanced technological solutions, that will allow to enhance the service provided to Member States for the detection of potential spills and identification of potential polluters.

R&I activities should complement what is currently being done by EMSA, along CleanSeaNet and the Copernicus maritime surveillance service. Moreover, the Copernicus Security Services Strategic Research Agenda (CSS-SRA) provides, on a yearly basis, an overview of R&D activities, as well as proposed actions based on latest developments. Applicants are invited to consult the corresponding additional requirements and information based on the CSS-SRA 2024 exercise to develop their proposal.

The transfer of research results to operations should receive active attention during the project to strengthen the readiness for an operational deployment in the future. Appropriate involvement and/or interaction with EMSA, the conditions for making available, for re-using and exploiting the results (including IPR) by the said entities must be addressed during the project implementation.

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content should be addressed only if relevant in relation to the objectives of the research effort.

Heading 5 - Using Space on Earth – Satellite navigation

For a description of topics related to the development of Galileo and EGNOS, please refer to “Public Procurement” and to "Indirectly managed actions by ESA" in the section "Other Actions" of this work programme.

Heading 6 - Using Space on Earth – Services & Data coming from satellites, both Earth Observation and navigation

For a description of topics related to the development of applications for Galileo, EGNOS and Copernicus, please refer to "Indirectly managed actions by EUSPA" in the section "Other Actions" of this work programme.

Heading 7 - Monitoring Space

For a description of topics related to SSA-SST, please refer to “Identified beneficiaries” in the section “Other Actions” of this work programme.

Heading 8 – Boosting Space through non-dependence of the EU for key critical space technologies

Proposals are invited against the following topic(s):

HORIZON-CL4-SPACE-2025-01-71: HORIZON-CL4-YEAR-SPACE-XX-XX: Space Critical EEE Components and Related Technologies for EU non-dependence

Call: SPACE 2025
Specific conditions

Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR N/A million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Research and Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: The page limit of the application is 80 pages.
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: In order to achieve the expected outcomes, and safeguard the Union's strategic assets, interests, autonomy, or security, namely avoiding a situation of technological dependency on a non-EU source, in a global context that requires the EU to build on its strenths and to carefully assess and address strategic weakenesses, vulnerabilities and high-risk dependencies, participation is limited to legal entities established in Member States and the following associated countries: Norway and Iceland. Proposals including entities established in countries outside the scope specified in the call/topic/action will be ineligible. For the duly justified and exceptional reasons listed in the paragraph above, in order to guarantee the protection of the strategic interests of the Union and its Member States, entities established in an eligible country listed above, but which are directly or indirectly controlled by a non-eligible country or by a non-eligible country entity, may not participate in the action unless it can be demonstrated, by means of guarantees approved by the eligible country of establishment, that their participation to the action would not negatively impact the Union's strategic, assets, interests, autonomy, or security. The guarantees shall in particular substantiate that, for the purpose of the action, measures are in place to ensure that: a) control over the applicant legal entity is not exercised in a manner that restrains or restricts its ability to carry out the action and to deliver results, that imposes restrictions concerning its infrastructure, facilities, assets, resources, intellectual property or know-how needed for the purpose of the action, or that undermines its capabilities and standards necessary to carry out the action; b) access by a non-eligible country or by a non-eligible country entity to sensitive information relating to the action is prevented; and the

	employees or other persons involved in the action have a national security clearance issued by an eligible country, where appropriate; c) ownership of the intellectual property arising from, and the results of, the action remain within the recipient during and after completion of the action, are not subject to control or restrictions by non-eligible countries or non-eligible country entity, and are not exported outside the eligible countries, nor is access to them from outside the eligible countries granted, without the approval of the eligible country in which the legal entity is established. If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
Procedure	The procedure is described in General Annex F. The following exceptions apply: To ensure a balanced portfolio covering all the development areas described in the scope section, grants will be awarded to applications not only in order of ranking but at least also to one proposal that is the highest ranked within each development area, provided that the applications attain all thresholds
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries will be subject to the following additional exploitation obligations: • For a period of up to 5 years after the end of the project, access rights to the use of products and/or processes generated by the project shall be given to European entities, in compliance with the signed Grant Agreement and with no legal restrictions and limitations stemming from International Traffic in Arms Regulations (ITAR), EAR99 or equivalent instruments applicable in non-EU jurisdictions. Applicants must acknowledge and incorporate this obligation in the proposal and Annex I to the Grant Agreement. • For a period of up to 5 years after the end of the project, beneficiaries are obliged to inform the granting authority (i.e. DG-DEFIS) in case of transfer, sell of knowledge, IPs, manufacturing processes outside EU that would negatively affect the capability and knowledge in EU, developed through the awarded grant. In case, due to the transfer or sell, the knowledge,

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	IPs, manufacturing processes will not be longer available in EU, the relevant entity, part of the consortium, is obliged to refund the granting authority of the financial contribution received as part of the awarded grant. Applicants must acknowledge and incorporate this obligation in the proposal and Annex I to the Grant Agreement.

Expected Outcome: Projects are expected to contribute to the following outcomes:

- Reinforcing EU strategic autonomy by reducing non-EU dependencies on critical space EEE components and related technologies across their entire supply chain;
- Providing unrestricted access to critical space EEE components and related technologies relevant for EU space missions;
- Developing or regaining capacity to operate independently in space by developing resilient space EEE components and related technologies supply chains, relying on EU supply chains and/or trustable and reliable supply chains not affected by non-EU export restrictions;
- Enhancing competitiveness by developing products and capabilities reaching equivalent or superior performance level than those from outside the EU and compete at worldwide level;
- Opening new opportunities for manufacturers by reducing dependency on non-EU export restricted technologies.

Scope: Unrestricted access to state-of-art space EEE components and related technologies is a pre-requisite for the EU space industry responding to EU space missions. However, especially for some families of components, the available solutions in EU do not meet the current high-performance space requirements. Currently, alternative products sourced from outside EU, are either affected by non-EU export control, that limits its use, or present challenges in terms of trustable supply chains for the implementation of EU space missions with a security dimension.

Within the frame of this topic, it is expected to finance and implement development projects aiming at maturing critical space EEE components with the final goal of lowering the dependency from outside EU. This will be done by establishing a long-term sustainable supply chain for supporting EU strategic autonomy in the space sector. The selection of the supply chains shall reflect the EU objective of strategic autonomy. Therefore, the supply chain shall preferably be built fully based in EU and when this can only be achieved partially (i.e. because of lack of current EU capabilities for unrestricted advanced semiconductor processes or advanced materials that cannot be developed within the project), services procured from outside EU shall take place under the condition that the overall supply chain will remain trustable and not affected by non-EU export control. The latest scenario is subject to the approval of the granting authority.

Below, the list of space EEE components and related technologies relevant for this Call. It has been identified based on needs related to strategic institutional programs, inputs from relevant space agencies, industry, EU institutional stakeholders and the EU Observatory of Critical Technologies.

- A [Target final TRL] [Budget XXX]
- B [Target final TRL] [Budget XXX]
- C [Target final TRL] [Budget XXX]
- D [Target final TRL] [Budget XXX]
- E [Target final TRL] [Budget XXX]

Context information and technical requirements are provided in the Technical Requirements Guidance document published on the Funding & Tenders Portal outlining all relevant information for each of the above-mentioned development lines.

A proposal should address only one technology area, which must be clearly identified.

Space is a low volume market affected by a dynamic industrial landscape compared to the terrestrial market therefore, technological spin in and/or bilateral collaborations should be enhanced between European non-space and space industries. Furthermore, proposed activities should be complementary to national activities and European space agencies. Complementary activities should be clearly identified, described and the proposal should report how the complementarity is ensured.

To achieve the non-dependence objective, applicants must include a dedicated proposal's paragraph covering:

- The description of the technology and/or technology processes and high-level breakdown of the space EEE component supply chain to be used. Applicants should demonstrate that the supply chain and final product are free of any legal export restrictions or limitations, such as those established in the International Traffic in Arms Regulations (ITAR) or equivalent instruments applicable in other non-EU jurisdictions. Applicants shall also report, in a dedicated subsection, if and which part of the supply chain is affected by non-EU export controls such as the Export Administration regulation (EAR) i.e. EAR99.
- The description of the suitable technology development process that has been identified and set up within the consortium for avoiding export restrictions of non-EU states and assess vulnerabilities of the supply chain.

Proposal covering space EEE components and related technology developments that are targeting a final TRL equal or higher than 5, shall include a list of applicable standards that are considered relevant for implementing a formal space evaluation and/or qualification.

The proposal must include specific tasks as part of the work plan and related dedicated confidential deliverables to be provided within 6 months from the project kick-off, with the objective of:

1. Analysing and describing, in detail, the full supply chain, each entity and its role in the supply chain, level of criticality and, if relevant, identify dependencies from outside EU;

2. Describing the industrial technical roadmap and a business plan for commercialization with accurate understanding of applications needs, space mission insertion, including time to market indication, of the developed product.

Unless otherwise agreed with the granting authority, beneficiaries must ensure that none of the entities that participate as affiliated entities, associated partners or subcontractors are established in countries which are not eligible countries or target countries set out in the call conditions.

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content should be addressed only if relevant in relation to the objectives of the research effort.

HORIZON-CL4-SPACE-2025-01-72: HORIZON-CL4-YEAR-SPACE-XX-XX: Space Critical Equipment and Related Technologies for EU non-dependence

Call: SPACE 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR N/A million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Research and Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: The page limit of the application is 80 pages.
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: In order to achieve the expected outcomes, and safeguard the Union's strategic assets, interests, autonomy, or security, namely avoiding a situation of technological dependency on a non-EU source, in a global context that requires the EU to build on its strenths and to carefully assess and address strategic weakenesses, vulnerabilities and high-risk

	dependencies, participation is limited to legal entities established in Member States and the following associated countries: Norway and Iceland. Proposals including entities established in countries outside the scope specified in the call/topic/action will be ineligible. For the duly justified and exceptional reasons listed in the paragraph above, in order to guarantee the protection of the strategic interests of the Union and its Member States, entities established in an eligible country listed above, but which are directly or indirectly controlled by a non-eligible country or by a non-eligible country entity, may not participate in the action unless it can be demonstrated, by means of guarantees approved by the eligible country of establishment, that their participation to the action would not negatively impact the Union's strategic, assets, interests, autonomy, or security. The guarantees shall in particular substantiate that, for the purpose of the action, measures are in place to ensure that: a) control over the applicant legal entity is not exercised in a manner that restrains or restricts its ability to carry out the action and to deliver results, that imposes restrictions concerning its infrastructure, facilities, assets, resources, intellectual property or know-how needed for the purpose of the action, or that undermines its capabilities and standards necessary to carry out the action; b) access by a non-eligible country or by a non-eligible country entity to sensitive information relating to the action is prevented; and the employees or other persons involved in the action have a national security clearance issued by an eligible country, where appropriate; c) ownership of the intellectual property arising from, and the results of, the action remain within the recipient during and after completion of the action, are not subject to control or restrictions by non-eligible countries or non-eligible country entity, and are not exported outside the eligible countries, nor is access to them from outside the eligible countries granted, without the approval of the eligible country in which the legal entity is established. If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
Procedure	The procedure is described in General Annex F. The following exceptions apply: To ensure a balanced portfolio covering all the development areas described in the scope section, grants will be awarded to applications

	not only in order of ranking but at least also to one proposal that is the highest ranked within each development area, provided that the applications attain all thresholds
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries will be subject to the following additional exploitation obligations: • For a period of up to 5 years after the end of the project, access rights to the use of products and/or processes generated by the project shall be given to European entities, in compliance with the signed Grant Agreement and with no legal restrictions and limitations stemming from International Traffic in Arms Regulations (ITAR), EAR99 or equivalent instruments applicable in non-EU jurisdictions. Applicants must acknowledge and incorporate this obligation in the proposal and Annex I to the Grant Agreement. • For a period of up to 5 years after the end of the project, beneficiaries are obliged to inform the granting authority (i.e. DG-DEFIS) in case of transfer, sell of knowledge, IPs, manufacturing processes outside EU that would negatively affect the capability and knowledge in EU, developed through the awarded grant. In case, due to the transfer or sell, the knowledge, IPs, manufacturing processes will not be longer available in EU, the relevant entity, part of the consortium, is obliged to refund the granting authority of the financial contribution received as part of the awarded grant. Applicants must acknowledge and incorporate this obligation in the proposal and Annex I to the Grant Agreement.

Expected Outcome: Projects are expected to contribute to the following outcomes:

- Reinforcing EU strategic autonomy by reducing non-EU dependencies on critical space equipment and related technologies across their entire supply chain;
- Providing unrestricted access to critical space equipment and related technologies relevant for EU space missions;
- Developing or regaining capacity to operate independently in space by developing resilient critical space equipment and related technologies supply chains, relying on EU supply chains and/or trustable and reliable supply chains not affected by non-EU export restrictions;

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- Enhancing competitiveness by developing products and capabilities reaching equivalent or superior performance level than those from outside the EU and compete at worldwide level;

- Opening new opportunities for manufacturers by reducing dependency on non-EU export restricted technologies.

Scope: Unrestricted access to state-of-art space equipment and related technologies is a pre-requisite for the EU space industry responding to EU space missions. However, especially for some families of equipment, the available solutions in EU do not meet the current high-performance space requirements and alternative products, sourced from outside EU, are either affected by non-EU export control with extra territorial applicability, that limit the access, re-export or raise challenges in terms of trustable supply chains for the implementation of EU space missions with a security dimension.

Within the frame of this topic it is expected to finance and implement development projects aiming at maturing critical space equipment with the final goal of lowering the dependency from outside EU, establish a long-term sustainable supply chain and support EU strategic autonomy in the space sector. Therefore, the supply chain shall preferably be built fully based in EU and when this can only be achieved partially (i.e. because of lack of current EU capabilities that cannot be developed within the project), services procured from outside EU shall take place under the condition that the overall supply chain will remain trustable and not affected by non-EU export control. The latest scenario is subject to the approval of the granting authority.

Below, the list of space equipment and related technologies relevant for this Call. It has been identified based on needs related to strategic institutional programs, inputs from relevant space agencies, industry, EU institutional stakeholders and the EU Observatory of Critical Technologies :

- A [Target final TRL] [Budget XXX]

- B [Target final TRL] [Budget XXX]

- C [Target final TRL] [Budget XXX]

- …

Context information and technical requirements are provided in the Technical Requirements Guidance document published on the Funding & Tenders Portal outlining all relevant information for each of the above-mentioned development lines.

A proposal should address only one technology area, which must be clearly identified.

Space is a low volume market affected by a dynamic industrial landscape compared to the terrestrial market therefore, technological spin in and/or bilateral collaborations should be enhanced between European non-space and space industries. Furthermore, proposed activities

should be complementary to national activities and European space agencies. Complementary activities should be clearly identified, described and the proposal should report how the complementarity is ensured.

To achieve the non-dependence objective, applicants must include a dedicated proposal's paragraph covering:

- The description of the technology and high-level breakdown of the space equipment supply chain to be used. Applicants should demonstrate that the supply chain and final product are free of any legal export restrictions or limitations, such as those established in the International Traffic in Arms Regulations (ITAR) or equivalent instruments applicable in other non-EU jurisdictions. Applicants shall also report, in a dedicated subsection, if and which part of the supply chain is affected by non-EU export controls such as the Export Administration regulation (EAR).

- The description of the suitable technology development process that has been identified and set up within the consortium for avoiding export restrictions of non-EU states and assess vulnerabilities of the supply chain.

Proposal covering space equipment and related technology developments that are targeting a final TRL equal or higher than 5, shall include a list of applicable standards that are considered relevant for implementing a formal space evaluation and/or qualification.

The proposal must include specific tasks as part of the work plan and related dedicated confidential deliverables to be provided within 6 months from the project kick-off, with the objective of:

1. Analysing and describing, **in detail,** the full supply chain, each entity and its role in the supply chain, level of criticality and, if relevant, identify dependencies from outside EU;

2. Describe the industrial technical roadmap and a business plan for commercialization with accurate understanding of applications needs, space mission insertion, including time to market indication, of the developed product.

Unless otherwise agreed with the granting authority, beneficiaries must ensure that none of the entities that participate as affiliated entities, associated partners or subcontractors are established in countries which are not eligible countries or target countries set out in the call conditions.

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content should be addressed only if relevant in relation to the objectives of the research effort.

Heading 9 – Boosting Space through international cooperation

Proposals are invited against the following topic(s):

HORIZON-CL4-SPACE-2025-01-81: EU-Japan cooperation on the exploitation of Quantum Space Gravimetry data

Call: SPACE 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 0.45 and 0.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 0.50 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: In order to achieve the expected outcome of the action, the consortium must include at least one entity from Japan. If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
Technology Readiness Level	Activities are expected to achieve TRL 3 by the end of the project. The reference TRL definition is the ISO 16290:2013 applicable to the space sector. Activities may start at any TRL.
Procedure	The procedure is described in General Annex F. The following exceptions apply: The granting authority can fund a maximum of one project.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [140].

[140] This decision is available on the Funding and Tenders Portal, in the reference documents section for Horizon Europe, under 'Simplified costs decisions' or through this link:

Expected Outcome: Projects are expected to contribute to the following outcomes:

- Support the EU space policy and the EU green deal by preparing the grounds for an innovative Quantum Space Gravimetry (QSG) mission.
- Foster EU-Japan cooperation in the field of quantum sensing from space.
- Allow scientists from EU and Japan to prepare for the exploitation of QSG mission data.

Scope: The development of quantum sensing technology brings several promises and expectations, in terms of sensor performances and stability. However, in order to best exploit quantum sensors, it is critical to prepare the scientific community to use the data generated by such sensors, develop new or tailor existing processing algorithms, and initiate and develop new applications based on this enhanced data.

The objective of this call is to prepare the grounds for the exploitation of Quantum Space Gravimetry mission data and foster the cooperation between the EU and Japan scientific communities on the topic. Effective QSG data exploitation requires research and dissemination activities to demonstrate the benefits of space-borne gravity field data and involve the relevant user institutions at early stage. To achieve this objective, one proposal will be selected. The proposal will identify Earth science fields relying on space gravity data exploitation and of mutual EU-Japan interest and will propose innovative algorithmic solutions highlighting the benefits of quantum space gravimetry. The proposal will discuss the expected QSG mission performance.

Horizon Europe will fund EU scientists only. Japan scientists will fund their own activities, expected to be at the same level as the EU contribution.

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content should be addressed only if relevant in relation to the objectives of the research effort.

Heading 10 – Boosting Space through training and education activities

For a description of topics related to training and education activities please refer to “Public Procurement” in the section “Other Actions” of this work programme.

Heading 11 – Boosting Space through IOD/IOV opportunities

For a description of topics related to the IOD & IOV opportunities, please refer to please refer to "Indirectly managed actions by ESA" in the section "Other Actions" of this work programme.

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https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/ls-decision_he_en.pdf

Heading 12 – Boosting Space through support to entrepreneurship

For a description of topics related to Cassini Entrepreneurship, please refer to "Public Procurement" in the section "Other Actions" of this work programme

Destination 6: Digital and industrial technologies driving human-centric innovation

Virtual Worlds

Proposals are invited against the following topic(s):

HORIZON-CL4-2025-03-HUMAN-14: Core technologies for virtual worlds (RIA) (Virtual Worlds and Photonics Partnerships)

Call: DIGITAL - CNECT	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 5.00 and 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 43.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to start at TRL 3-4 and achieve TRL 6 by the end of the project – see General Annex B.
Procedure	The procedure is described in General Annex F. The following exceptions apply: To ensure a balanced portfolio covering the two ares described, grants will be awarded to applications not only in order of ranking but at least also to two proposals that are the highest ranked within each of the two areas described, provided that the applications attain all thresholds.

Expected Outcome: Proposals are expected to contribute to developing core technologies for Virtual Worlds, with a focus on better, more realistic and more performant interaction and immersion, at application and components levels. The following outcomes are expected:

A. Better and more realistic immersion through multimodal interaction.

- Improve the multimodal immersion experience combining eXtended Reality with advanced and innovative technologies

B. Innovative photonics technologies for projection, sensing and perception in virtual worlds.

- Improve the performance of microdisplays or sensing devices serving Virtual Worlds by using innovative Optics and Photonics technologies.

Proposals are expected to address at least one of the expected outcomes, either type A) or B). The type must be clearly identified within the proposal, Special attention will be given to proposals including transdisciplinary research (encompassing Type A) and B)) in order to deliver and enhance uptake of suitable, accurate, ethical and safe solutions.

At least two proposals in each of the areas defined below will be selected. Proposals should clearly identify the area they are addressing.

Proposed applications should aim at increasing awareness, acceptance and adoption of virtual worlds applications across sectors.

Scope: Virtual worlds will impact the way people live, work, create and share content, the way public administrations interact with citizens as well as the way businesses operate, innovate, produce and interact with customers.

Multimodal interaction and immersion are key dimensions of Virtual Worlds and will be supported by innovative optics and photonics technologies to achieve the full potential of Virtual Worlds core technologies.

A broader adoption of Virtual Worlds will need better and more realistic immersion and interaction, mixing modalities, sensors and actuators for an ever-improved user experience: touch, smell, haptics, etc will be better stimulated, bringing users closer to real-world sensations, serving Virtual Worlds.

Many challenges remain to be addressed to realize optics and photonics technical solutions that offer high-performance, excellent visual quality, high-quality user experience, and sustainable services and devices, for head-mounted displays (HMD), autostereoscopic displays or sensing devices.

Coupled with display and sensing technologies, algorithms and metrics should be considered to exploit the underlying light (transportation) models given the utilized modality and address e.g. scene representation, content generation, compression, transmission, content reconstruction, content-to-display adaptation, or rendering. Moreover, the quality of integration, both from a user and technological perspective, will be essential for a broad adoption of Virtual Worlds.

The type A) proposals under this topic should develop and demonstrate novel applications for Virtual Worlds that combine several modalities and aim to provide seamless and more realistic immersive interactions. Proposals should investigate novel scientific approaches or push the limit of existing ones to improve the synchronization and integration of the different modalities.

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Proposals should focus on an enhanced use of multimodal technologies, integrating at least two modalities within an extended reality application. Modalities include haptics and force-feedback, vision, touch, smell, speech, etc.

The type B) proposals should address the development and integration of advanced innovative and high-performance Optics and Photonics technologies for display and sensing devices serving Virtual Worlds.

- For displays further improve current high-end microdisplays regarding power consumption (<1 mW), device efficiency, resolution (8K and beyond, pixel densities > 10kppi), high dynamic range (HDR), colour gamut, contrast and refresh rate holding the promise for truly immersive experiences;

- For sensing devices improve accuracy in diverse lighting conditions and with different eye physiologies

Special attention should be given to the design and fabrication of suited waveguide optics, holographic elements, diffractive optics, reflective light guides, freeform optics, or meta-surfaces with optimal optical properties and behaviour; to support the required field of view (FoV), to be lightweight and safe for the user, and provide excellent colour uniformity and high brightness efficiency; to satisfy the use case requirements for both professional use and mass adoption, i.e., be scalable to large volumes and cost-effective; to integrate targeted systems seamlessly into mixed-reality devices without increasing bulk or reducing comfort.

For proposals type A) and B), the quality of integration, both from a user and technological perspective, will be essential for a broad adoption of Virtual Worlds. The proposals should include a focus on human perception and experience, from subjective, objective, and functional perspectives , and take into account EU values such as inclusivity, privacy, security and safety of users and their personal data, as well as diversity. Solutions should guarantee the privacy and rights of individuals and companies and ensure secure and trustworthy interactions to deliver and enhance uptake of suitable, accurate, ethical and safe solutions.

The Consortium should pay attention to developing solutions that are reliable, robust and interoperable. Proposals should leverage existing open standards and technologies in the domain of eXtended Reality., while contributing to ongoing standarsisation work. Applications should be tested and anchored in real world environments and aimed at least one application domain.

We consider that proposals with an overall duration of typically 36 months and a budget of EURO 5-6 M€ would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other durations.

This topic is implemented through a joint effort from the co-programmed European Partnership for Virtual Worlds and the Photonics Partnership.

HORIZON-CL4-2025-03-HUMAN-15: GenAI4EU: Generative AI for Virtual Worlds: Advanced technologies for better performance and hyper personalised and immersive experience (IA) (AI/Data/Robotics & Virtual Worlds Partnerships)

Call: DIGITAL - CNECT	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 4.00 and 5.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 20.00 million.
Type of Action	Innovation Actions
Technology Readiness Level	Activities are expected to start at TRL 4-5 and achieve TRL 6-7 by the end of the project – see General Annex B.

Expected Outcome: Projects are expecting to contribute to the following outcomes:

- Realistic, creative and innovative characters, user-tailored artefacts, and Virtual Worlds for a better immersion and significantly improved user experience.
- Smart digital assistants and 3D chatbots for a safe and inclusive navigation

Scope: Generative AI, at the edge and integrated in devices, will bring better performance, a more personalised and a more immersive experience for an inclusive and wider adoption of Virtual Worlds. Small and frugal AI models would enable faster inference contributing to lower latency while improving security and privacy by processing data closer to the user, preserving EU Values. Smart digital assistants will accompany users throughout their journey within Virtual Worlds, bringing new innovative communication modalities, advancing collaborative intelligence and decision-making AI capabilities.

The following type of innovation actions proposals are expected:

Generative AI – Realistic and innovative Virtual Worlds for a better immersion:

Proposals should use Generative AI to build on the users' expectations to create either safe and inclusive virtual spaces, realistic environments, or creative and beyond reality ones. They should develop dynamic Storytelling and scenarios to enable creative content that is personalised leading to unique experiences for the users or shared with other users. They should also use AI to enable generation of personalised avatars aiming to provide seamless and more realistic immersive interaction.

Generative AI – Smart digital assistance for a safe and inclusive navigation in Virtual Worlds:

Proposals should develop smart digital assistants and 3D chatbots (AI-enhanced communicating 3D avatars), to for example, enhance training and education, remove language barriers or language disorders through instant translation, including sign languages, offer sentiment analysis and behavioural decision support systems, enable users to adapt to various interlocutors from various cultures, languages and backgrounds, contributing to navigate in inclusive and safe Virtual Worlds, while offering users new adapted learning modalities. When relevant, proposals can capitalise on latest developments in generative AI, to bring step change in explainable collaborative intelligence and decision-making capabilities by dedicated specific research.

We consider that proposals with an overall duration of typically 36 months and a budget of minimum 4M EUR would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other durations.

This topic is implemented as a joint effort between the co-programmed European Partnership for Virtual Worlds and AI/Data/Robotics Partnership (ADRA).

HORIZON-CL4-2025-03-HUMAN-16: Drive the evolution of the internet towards open and interoperable Web 4.0 and Virtual Worlds : building blocks in priority areas (RIA) (Virtual Worlds Partnership)

Call: DIGITAL - CNECT	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 14.50 million.
Type of Action	Research and Innovation Actions
Procedure	The procedure is described in General Annex F. The following exceptions apply: To ensure a balanced portfolio covering all the areas described in the scope, grants will be awarded to applications not only in order of ranking but at least also to one application that is the highest ranked within each area, provided that the applications attain all thresholds.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties. The support to third parties can only be provided in the form of grants. The maximum amount to be granted to each third party is EUR 150 000.

	This is justified by the possibility for a third party to participate in several calls during the full duration of the pilot. A maximum of 15% of the total requested EU contribution may be allocated to financial support to third parties, selected through open calls.

Expected Outcome:

- An early demonstration of the future Web 4.0 architectural framework (including protocols and standards) made up of key open source internet building blocks in priority areas: identity, software supply chain, open hardware, decentralised solutions & virtual worlds.
- The emergence of open and interoperable Web 4.0 and Virtual Worlds supported by EU based internet ecosystems centred on EU values and regulatory framework with high socio-economic impact, through the application of digital commons technologies and other open-source solutions and open standards in several use cases.
- Supporting the transition from today's internet towards Web 4.0 where end-users have access to a more personalised and interactive experience through more collaborative, decentralised and user-centred approaches. Special attention will have to be given to security, scalability, and accessibility issues.
- New business opportunities and the emergence of new business and sustainability models based on Open Source.

Scope: The aim of this topic is to advance the evolution of the internet towards open and interoperable Web 4.0 enabling Virtual Worlds, ensuring seamless user experience navigating across platforms by increasing the take up of digital commons technologies and other Open Source solutions in Europe. The action will thus leverage the strong and active community of European open-source innovators that can contribute to relevant digital commons to deliver on key features of virtual worlds.

This topic will support early demonstrations for Web 4.0 and its architectural framework, through the use of key building blocks where there is sufficient level of maturity and critical mass of commons contributors (such as in the context of the Next Generation Internet initiative).

The envisaged Web 4.0 shall be powered by open and decentralised technologies enabling interoperability between platforms and networks and freedom of choice for the users. It should be developed through open source / digital commons and tackle security, scalability and sustainability at the core of the technological developments.

Applicants should define the mechanisms for contributing to and aligning with the strategic roadmap for research and innovation and the architectural Framework as it becomes available

from the specific separate support action HORIZON-CL4-2025-03-HUMAN-17: Specific support for the Virtual Worlds Partnership and the Web 4.0 initiative (CSA).

Applicants should devise appropriate mechanisms for cooperating with the other projects under this action to ensure that they work in a coherent way towards the vision of an open, interoperable Web 4.0

At least one proposal in each of the area defined below will be selected. Proposals should clearly identify the area they are addressing.

Area 1: Identity management

Proposals will support and facilitate the deployment and adoption of the EU Digital Identity Wallet with the testing, community development and packaging of open-source solutions for the issuance and verification of electronic attestations and the provision of eIDAS trust services. The aim is to deliver a diversity of open-source digital solutions and services in accordance with the European digital rights and principles, empowering citizens with the freedom of choice from many secure digital identity solutions that are aligned with the EU regulations. Additionally, to foster and support enterprises to harness the benefits of the EUDI wallet and the eIDAS trust services. Examples may include the implementation of EUDI wallets for open-source operating systems, like Linux (for enterprise servers), cloud-based wallets, laptop-based wallets, open-source OS for mobile devices. Furthermore, technical solutions and services for secure and anonymous digital payments and money transfers between people, solutions for the implementation for attestation issuers and verifiers and the eIDAS trust services with a focus on the development of open-source stacks for issuers and relying parties (for issuing and verifying electronic attestations), especially as/for cloud services. When relevant, proposals may address the validation of physical documents, either IDs or other types of identity-related documents, such as breeder documents.

Area 2: Software Supply Chain security

Trusted frameworks are essential to keep the software supply chain secure, as demonstrated by the recent attack on XZ Utils. The aim is to strengthen the security of the software supply chain by leveraging related NGI building blocks and package solutions for example for traceability of code, collaborative trust models among contributors and users, detection of anomalous behaviour, construction of software bill of material. Use cases include developers and users of codes, DevSecOps team, corporate IT, open-source projects, industry and/or parties that need to be compliant with the Cyber Resilience Act.

Area 3: Open Hardware

Open Hardware is key for supporting trust and sovereignty as it allows users to inspect, modify, and implement freely the designs. The aim is to support the uptake of open hardware chips and tools through prototyping, productization and integration in real life cases. Proposals can address several re-usable tools and components such as controllers, processors, or network chips. Use cases include consumer devices for immersive virtual worlds, industry applications, consumer devices, smart cities.

Area 4: Alternative solutions to centralised platforms

As EU legislation places obligations on platforms, particularly focusing on gatekeepers, it is important to prioritize nurturing and enriching credible alternatives. Proposals in this area could cover integrating, testing and operation of open-source decentralised solutions offering credible alternatives to users supporting the emergence of Web 4.0 and Virtual Worlds experience. Examples include instant messaging, application stores, or productivity groupware that should showcase virtual worlds interoperability, trust, resilience, and scalability. The focus should be made on decentralised and federated solutions based on interoperability requirements and on open standards to ensure to not only meet regulatory demands but also foster a more open, diverse, resilient, and competitive digital ecosystem.

Area 5: Web 4.0 demonstration for Virtual Worlds

Web 4.0 technologies enabling interoperability and transferability across platforms are crucial to ensure various players to contribute to virtual worlds as opposed to a mono-provider environment. This area will make use of existing open-source building blocks for ensuring trust, interoperation, interconnection, transaction (including tokens), and resource access in Virtual Worlds applications and services. Proposals will aim at integrating the various building blocks, with a special focus on interoperability and will demonstrate seamless interactions (for example when browsing and searching across multiple providers) in one or two selected scenarios.

For all areas, proposals shall innovate beyond the state-of-the-art and could include development, integration, testing, deployment, uptake, and operations activities.

Proposals should encourage, when relevant, open access to data, standardisation activities, as well as an IPR regime and sustainability model ensuring lasting impact and reusability of results.

The Commission considers that proposals with an overall duration of typically 24 to 36 months would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other durations.

HORIZON-CL4-2025-03-HUMAN-17: Specific support for the Virtual Worlds Partnership and the Web 4.0 initiative (CSA) (Virtual Worlds Partnership)

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

Type of Action	Coordination and Support Actions

Expected Outcome: The launch of a new European Partnership will help develop and promote a thriving industrial and end-user ecosystem in the EU, covering all the aspects of the virtual worlds value chain. It will also actively engage with people and society at large and provide access to a broader range of resources, including funding, expertise and technology.

This CSA should be prepared, managed and coordinated by the key stakeholders in this field. Proposal results are expected to contribute to the following outcomes:

1. The delivery of a Strategic Research, Innovation and Deployment Agenda (SRIDA) for Virtual Worlds in Europe, for useful, open, interoperable, inclusive, sustainable and trustworthy virtual worlds systems and applications, ensuring Virtual worlds reflect EU values and principles.

2. The delivery of a Strategic Research and Innovation agenda (SRIA) for Web 4.0 in Europe leading to an inclusive, trustworthy, interoperable, and human-centric Web 4.0 leveraging open-source commons building blocks enabling new social and sustainability models that respect European values.

3. Established and running European Virtual Worlds Partnership supporting the European Virtual Worlds and Web 4.0 community.

4. A strong and competitive ecosystem, with European companies playing a leading role in the adoption and acceptance, and in the development and deployment of Virtual Worlds technologies.

5. Reinforced links among initiatives in virtual worlds in Horizon Europe, Digital Europe Programme, and other programmes.

6. Widespread educational and outreach programmes

7. Increased adoption of virtual worlds that are open, interdisciplinary, safe and respect ethical values and European legal framework, including regarding privacy, security in all Member States and Associated Countries

8. Standardisation methods for virtual worlds technologies and in support of the Commission regulatory framework.

Scope: The selected proposal should provide specific support for the coming European Virtual Worlds Partnership.

The selected proposal will:

- Support to the Virtual Worlds Partnership to develop a strong and inclusive network by strengthening the links and promoting collaboration among academia, industry, public actors and end-users, including the major industrial European sectors and all relevant stakeholders, to guarantee strong coordinated efforts toward trustworthy and human-

centric virtual worlds for the economy and society. The network will also include national representatives, to link to national programmes and to foster synergies and coordination between the various European, national, public and private initiatives. Such coordination of efforts in research, innovation and expertise will be important for Europe's leadership in virtual worlds. The objective is to support the community in defining and implementing the Virtual Worlds strategy for research, innovation, and deployment, and support the Partnership in its coordination and support of the community in non-R&D tasks as well.

- Support the development and implementation of a Strategic Research, Innovation and Deployment Agenda for Virtual Worlds (SRIDA)

- Support the development of a Strategic Research and Innovation agenda (SRIA) for Web 4.0 in Europe and propose an implementation agenda of a European Web 4.0 strategy for research and innovation by defining the trajectories to drive the evolution of the internet towards Web 4.0. This should include the architectural framework (including standards and protocols) and principles, identifying its main building blocks. The implementation strategy should also identify the technology areas where Web 4.0 and Virtual Worlds can benefit from joint developments, reuse of technologies or exchanges.

- Support the emergence of a thriving European ecosystem for Web 4.0 where developers, research teams, industry and startups can boost technological capabilities, accelerate uptake of innovative solutions, and foster a supportive business environment. This community shall be involved in the definition of the architectural framework, its main building blocks and the implementation roadmap.

- Proposals are encouraged to build on, or seek collaboration with, existing projects and develop[D(1)] synergies with other relevant European, national or regional initiatives and funding programmes relevant for Web 4.0 and Virtual Worlds in Horizon Europe, Digital Europe Programme (such as the Common European Data spaces or the Digital Twins) and other programmes (European Innovation Council, Digital Innovation Hubs, European Digital Innovation Hubs, European Digital Infrastructure Consortia, the VR/AR Industrial Coalition, etc). Such synergies should be developed through efficient mechanisms (e.g. joint task forces), organisation of joint events gathering projects, etc.

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In particular links are encouraged with:
- HORIZON-CL4-2023-HUMAN-01-21: Next Generation eXtended Reality (RIA)
- HORIZON-CL4-2023-HUMAN-01-22: eXtended Reality for Industry 5.0 (IA)
- HORIZON-CL4-2023-HUMAN-01-23: Supporting the emergence of an open human-centric Metaverse (CSA)"

In view of sharing knowledge and developing synergies, proposals are also encouraged to coordinate and establish links with relevant initiatives in this Work Programme,

especially:
- HORIZON-CL4-2025-03-DATA-11: Open Europe Stack: development of technological commons/open-source 3C building blocks (RIA)
- HORIZON-CL4-2025-03-DATA-08: Large-scale pilots for supply end-to-end infrastructures integrating device, network computing and communication capabilities for Telco Edge Cloud deployments, as a basis for Connected Collaborative Computing Networks (3C networks) (RIA)
- HORIZON-CL4-2025-03-HUMAN-14: Core technologies for virtual worlds (RIA) (Virtual Worlds and Photonics Partnerships)
- HORIZON-CL4-2025-03-HUMAN-15: GenAI4EU: Generative AI for Virtual Worlds: Advanced technologies for better performance and hyper personalised and immersive experience (IA) (AI/Data/Robotics & Virtual Worlds Partnerships)
- HORIZON-CL4-2025-03-HUMAN-16: Drive the evolution of the internet towards open and interoperable Web 4.0 and Virtual Worlds: building blocks in priority areas (RIA) (Virtual Worlds Partnership)

- Closely collaborate and build synergies with other relevant European Partnerships (such as Data, AI and Robotics; Photonics, the European Blockchain Partnerships); Next Generation Internet (NGI) initiative, the European Flagships (such as Graphene), the EU supported digital twins initiatives (such as Destination Earth).

- Support and encourage the adoption of Virtual Worlds in all Member States and Associated Countries, with particular emphasis on geographical aspect and across the value chain.

- Develop and implement outreach programmes aiming at better understanding and awareness of Virtual Worlds including acceptability and trustworthiness, informing about potentialities of Virtual Worlds but also ensuring that public expectations are realistic to avoid backlash in the adoption. Such activities should target in particular the business community, with a particular focus on SMEs, as well as public administrators, citizens and civil society at large.

- Identify ethical, legal, societal and economical aspects of virtual worlds and actions on how to tackle possible issues.

- Support to standardisation in view of boosting virtual worlds industry, creating, and guaranteeing trustworthy and ethical Virtual Worlds, by bringing stakeholders together and, when needed, organise European representation in existing or new standardisation working groups in support of the Commission regulatory framework

This topic implements the co-programmed European Partnership on Virtual Worlds and the initiative on Web 4.0.

All proposals are expected to allocate tasks to cohesion activities with the Partnership on Virtual Worlds and funded actions related to this partnership.

AI-GenAI / Data / Robotics

Proposals are invited against the following topic(s):

HORIZON-CL4-2025-03-HUMAN-18: GenAI4EU central Hub (CSA) (AI/Data/Robotics Partnership)

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

Expected Outcome:

- Creation of the GenAI4EU HUB: developing a strong and visible GenAI4EU community, supporting the uptake of European GenAI solutions across strategic application sectors and the HE Clusters, through collaboration and knowledge exchange.
- This CSA will also support and collaborate with the European Commission's AI Office in its function to promote an innovative ecosystem of trustworthy AI, to reap the societal and economic benefits.

Scope: This horizontal Coordination and Support Action for GenAI4EU will develop a strong and visible European GenAI ecosystem of developers and users, aiming to strengthen the coordination, impact and visibility of the GenAI4EU initiative[141] across diverse sectors. This CSA should be prepared, managed and coordinated by the key stakeholders in this field, in particular those active in developing local GenAI communities, tech transfer, attracting investment, and making the European GenAI stakeholders visible.

Serving as a hub for collaboration, this project seeks to streamline efforts in developing high-impact GenAI-based applications while fostering cooperation among various GenAI stakeholders, from startups, academia and large user industries, including large IT suppliers and integrators.

It will support all the Horizon Europe Pillar 2 clusters, in addressing their policy needs through the implementation of the GenAI4EU initiative, in particular in supporting

[141] https://digital-strategy.ec.europa.eu/en/library/communication-boosting-startups-and-innovation-trustworthy-artificial-intelligence

mechanisms to pool efficiently and make sufficient data of high quality available (in particular from the European Data Spaces, but exploiting other sources of data as appropriate), and facilitate collaboration with the AI Factories.

The proposed project will involve close collaboration and coordination among the projects implementing GenAI4EU, developing a strong community. It will also help them to maximise their impact and increase their visibility.

It will foster the uptake in all strategic application sectors, namely the ones addressed in the GenAI4EU initiative, including the 14 industrial ecosystems[142], in stimulating collaborations between the European developers and users.

The selected proposal will foster collaboration between the AI Factories, the Data Spaces (as well as other data providers) and the SIMPL infrastructure, in establishing mechanisms to make data available in the AI factories, in particular for the training, and possibly fine-tuning of large GenAI models, while respecting IP or privacy/GDPR of the entities/industries providing their data. This should build on relevant initiatives, such as data intermediation services, with a view of using a trusted third party to ensure no exchanges between industry competitors for instance, while defining mechanisms to access (and if needed pooling of) critical amount of data, required for the training of very large models. This will require mobilisation of industries owning large sets of data, defining with them such mechanisms acceptable to all, and implementing them through secure infrastructures, protocols, interoperability mechanisms, within the various projects implementing GenAI4EU in the various clusters.

The proposal will also support Common European Data Spaces to coordinate standard setting approaches for further data sharing and data interoperability among them or with the AI Factories.

The selected proposal will also ensure collaboration between the GenAI4EU projects, and the relevant the AI Factories, for the computing resources, and the data spaces. Moreover, a few specific working groups among stakeholders should be established in key European industrial / application sectors (such as in Robotics / Manufacturing, Automotive, energy, pharmaceuticals, etc.). Their aim will be to bring together key stakeholders of the sector (incl. startups / SMEs and large companies) and foster discussions among them for stimulating their cooperation in developing GenAI models relevant for their sector, but also on how to address access to existing large data sets, incl. their interoperability and use for GenAI models and/or any other elements necessary for enabling an effective development and further grow of the sector's GenAI ecosystem.

[142] The 14 strategic industrial ecosystems identified in the European Industrial strategy (Strategy - European Commission (europa.eu)) are: construction, digital industries, health, agri-food, renewables, energy intensive industries, transport and automotive, electronics, textile, aerospace and defence, cultural and creative culture industries, tourism, proximity and social economy, and retail

The proposal will also ensure connection with the AI on Demand platform providing support for fine-tuning pre-trained models and developing innovative downstream applications, the GenAI4EU Skills, and relevant activities implemented under the EU's Digital Europe Programme, Horizon Europe Programme as well as national activities. The selected proposal is also expected to build on or seek collaboration with existing and upcoming projects and develop synergies with other relevant European, national or regional initiatives, funding programmes and platforms.

The CSA is expected to constantly monitor the way the EU GenAI ecosystem, including the AI factories, is developing. More broadly, the selected proposal will act as a global observatory for GenAI conducting a comprehensive landscape analysis of gen AI, including data on market, research, funding, patent and more broadly the state of the advancement of GenAI in the EU and worldwide. This includes an inventory of use cases, capabilities, evaluation tools and methods to assess generative AI models. The selected proposal is expected to widely disseminate this analysis at least twice a year to the stakeholders, including the EU, the Member States and Associated Countries.

It will also assess the uptake of GenAI by large European industry (including technology suppliers and user industry), and mobilise them to engage in GenAI4EU initiatives and drive the future strategy for the development and uptake of GenAI solution "made in Europe" in all strategic industries.

By identifying prioritized sectors and sharing best practices, the project aims to bridge existing gaps, connect stakeholders and foster innovation uptake.

Furthermore, the selected proposal will assess potential areas that require further R&D, including coordination with national initiatives, to ensure comprehensive coverage and collaboration. It will actively engage in networking and community animation to foster knowledge exchange and collaboration among stakeholders.

This topic implements the co-programmed European Partnership on AI, data and robotics (ADRA) and all proposals are expected to allocate tasks to cohesion activities with ADRA and the funded actions related to this partnership under the call CSA HORIZON-CL4-2021-HUMAN-01-02. This initiative will capitalise on these existing initiatives, complement them and ensure integration within the existing ecosystem developed by ADRA.

Standardisation and Knowledge Valorisation

Proposals are invited against the following topic(s):

HORIZON-CL4-INDUSTRY-2025-01-HUMAN-61: Standardisation landscape analyses tool (CSA)

Call: INDUSTRY 2025
Specific conditions

Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 1.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 1.00 million.
Type of Action	Coordination and Support Actions
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [143].

Expected Outcome:

- Provide an information tool on the standardisation landscape accessible for all actors of the R&I ecosystem which includes a search instrument for standardisation deliverables at national, European and international level;
- Improve valorisation mechanisms for ensuring the market relevance and scalability of R&I results.

Scope: Standards play a pivotal strategic role, serving as the silent foundation of our Single Market, ensuring a high-level of safety, functionality and inter-operability for EU products. They guarantee adherence to policy and legal objectives. At the same time, standards can facilitate access to global markets when they are state-of-the-art and developed within international organisations. This underscores the significant role of standards on the EU policy agenda, including initiatives such as the European Green Deal, Digital Decade, New Industrial Strategy for Europe, the Commission's EU standardisation strategy[144], and the Communication European Economic Security Strategy[145]. Future Commission actions – whether it is the implementation of legal frameworks, like the AI and Data Act or the roll-out of the Commission Recommendation on critical technology areas for the EU's economic security – will depend on standards.

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

144 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022DC0031

145 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023JC0020&qid=1687525961309

To support the valorisation of research and innovation results, it is essential to ensure that investments in R&I fully leverage the substantial benefits of standardisation for policy and legal objectives. In line with the Commission Recommendation on a Code of Practice on standardisation[146], structured information on the existing standardisation landscape should be accessible for R&I actors. This is crucial as available information is fragmented, standardisation processes are often uncoordinated, and financial impacts are insufficiently understood.

Furthermore, the diverse array of standard development organisations contributes to a varied landscape, each with distinct procedures, priorities, and stakeholders. This decentralised approach often results in duplicated efforts, and difficulties in navigating the plethora of available standards. Moreover, the absence of a centralised database or repository makes it challenging for researchers to access relevant standards efficiently, hindering their ability to incorporate standardisation into their research and innovation endeavours effectively.

The overarching objective of the action is to develop a landscape analyses tool supporting all actors in the R&I ecosystem in identifying relevant existing standards. This will enable R&I actors to consider the existing standards landscape as a key state-of-the-art input when planning their R&I project activities, thereby avoiding reinventing the wheel. The tool to be developed shall include mechanisms to keep the standards up-to-date automatically as far as possible. In addition, state of the art standards give new impetus for technological developments and help R&I actors comply with existing regulatory frameworks. Efforts should be made to develop standards that align with international and European standards, as well as with industrial and commerce consortia, to reduce the number of standards and have a broader acceptance.

In order to develop such a comprehensive open-source information tool effectively benefitting a variety of R&I actors, the project should be carried out by experts representing different stakeholders covering industry, academia and standard development organisations.

HORIZON-CL4-INDUSTRY-2025-01-HUMAN-62: Artificial Intelligence for knowledge valorisation (CSA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 2.00 million.

[146] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023H0498&qid=1678171117168

Type of Action	Coordination and Support Actions
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [147].

Expected Outcome: Proposals are expected to contribute to the following outcomes:

- Swiftly valorise research results by market, society or policy making, powered by AI;
- Tackle the innovation paradox in Europe, by supporting R&I actors to valorise their research through relevant AI tools;
- Use AI to deliver valorisation roadmaps, business plans, partnerships and guide market uptake strategies in at least 100 use cases of research-based innovative solutions addressing societal challenges.

Scope: Artificial intelligence and machine learning present enormous opportunities to use scientific knowledge and research results faster and more effectively to create value, develop new products and services and address the needs of our societies. Despite leading in many fields of scientific research, Europe falls short in innovation and valorisation performance (what is known as "the innovation paradox"). Harnessing the power of AI to guide the efforts of researchers and innovators to bring results to the market, make their research more responsive to the needs of society and provide knowledge to inform public policies, can significantly contribute to addressing the innovation paradox. From results scouting to patent drafting, the role of AI to support knowledge valorisation presents ever-growing possibilities.

One of the main reasons hampering valorisation of the knowledge generated by R&I actors in Europe is that researchers and innovators are not always aware of the valorisation opportunities of their research results and may struggle to adopt a concrete plan on how to generate value from their research.

This topic aims to support R&I actors to use AI to support the uptake of research results by market and society. This entails the identification of appropriate existing tools and instruments and the testing of AI -powered valorisation plans in at least 100 cases.

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

The action will provide an AI -powered valorisation toolbox, which will take into account EU policy and regulations on AI-ethics and can be used by researchers and innovators to identify the opportunities for valorisation as well as for guiding them towards market and societal uptake. This may include using AI for assessing feasibility under conditions, investigating legal frameworks that may be relevant to the uptake of the solutions, providing guidance on supporting instruments and funding mechanisms, supporting matching with investors, providing knowledge on the sector, investigating institutional and cultural aspects, citizens and consumer preferences. The use of AI may also focus on the efficient use of intellectual assets to raise awareness and guide R&I actors for the smart management of intellectual assets.

The action will also support multistakeholder collaboration for valorisation, by identifying and promoting dynamic stakeholder interaction opportunities to optimise outreach and engagement, e.g. by engaging SMEs, social enterprises, NGOs and local communities. Drawing of the testing of at least 100 cases of AI- powered valorisation from research results to the market, the action will also develop a knowledge base for insights and best practices, principles and guidance to ensure a responsible use of AI for knowledge valorisation benefiting society.

HORIZON-CL4-INDUSTRY-2025-01-HUMAN-63: Value creation pilots for scaling up innovative solutions (CSA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 2.00 million.
Type of Action	Coordination and Support Actions
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the

	Research and Training Programme of the European Atomic Energy Community (2021-2025). [148].

Expected Outcome: Proposals are expected to contribute to the following outcomes:

- Increase innovation capacity by drawing on transdisciplinary research and cross-sectoral collaboration to generate economic and societal value;
- Promote the twin transitions, by testing and preparing for scale up at least 10 valorisation pilots, combining research results in a transdisciplinary mode, building multistakeholder collaborations, promoting industry- academia co-creation and engaging with citizens for swifter and human-centric valorisation;
- Enabling more value creation to be retained in Europe, by testing research-based solutions with high potential for scale up.

Scope: Knowledge valorisation is crucial for boosting the Union's industrial competitiveness internationally, strengthening its resilience and fostering its open strategic autonomy. Effective knowledge valorisation enables the Union to create and retain economic and societal value by turning research results to new innovative solutions, benefiting society and creating prosperity for all.

The aim of this topic is to strengthen EU capacity to respond to complex and urgent challenges through research and innovation, increase industrial and economic competitiveness and make transdisciplinary research deliver for society. This entails testing the effectiveness of at least 10 transdisciplinary valorisation pilots to "be ready" for scale up across Europe.

The trans-disciplinary and cross-sectoral scale-up pilots will use mature results from research and innovation while simultaneously unlocking untapped value-creation opportunities and promoting collaboration of many different stakeholders from the early stages. In the preparatory to the potential scale-up phase, the pilots will also provide new insights to the possibilities and challenges of transdisciplinary approaches to address complex challenges and to the skills, resources and tools needed. Within the scope of the topic are also targeted trainings for cross-disciplinary projects with scale-up potential, as well as other methodological tools and guidelines. This may also include best practices in harnessing the power of cross-disciplinary and cross-sectoral collaboration to enhance capacity, drive innovation, and unlock new opportunities for value creation across industry, academia, and the public sector.

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

HORIZON-CL4-INDUSTRY-2025-01-HUMAN-64: Pilot initiatives on Technology Infrastructures (CSA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 2.00 million.
Type of Action	Coordination and Support Actions
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [149].

Expected Outcome:

- Provide evidence and understanding of the European landscape of Technology Infrastructures and their services in selected pilot areas [to be updated following the work of the Expert Group on Technology Infrastructures];
- Develop a sound understanding of the specific needs of industrial users for Technology Infrastructures;
- Improve availability of Technology Infrastructures facilities and services for enterprises across the EU, in particular SMEs and start-ups, with increased opportunities for testing, up-scaling and deployment of new technologies;
- Make Technology Infrastructures in Europe stronger and more resilient with improved, strategic service offer, better adapted to user needs;

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

- Strengthening the innovation and technology development capacity of the European industry;

- Validate a European approach to Technology Infrastructures, including a target scenario and a "masterplan" with specific actions at EU and national levels needed to strengthen the provision of infrastructure services in the pilot areas;

Scope: The proposed actions should develop a comprehensive understanding of the landscape of Technology Infrastructures in pilot areas identified as strategic for Europe's competitiveness and strategic autonomy through the Commission Expert Group on Technology Infrastructures.[1] The activities should in particular carry out a detailed mapping of the available Technology Infrastructures in Europe in the selected pilot areas and analysis of main types of services offered. Proposals should also develop a detailed understanding of user needs for Technology Infrastructures in relevant industrial ecosystems as well as identify the potential gaps in Technology Infrastructures services or mismatch between supply and demand, both in terms of the types of facilities and services offered and their availability across the entire EU. This analysis should consider both the current state of play and a forward-looking perspective. Finally, the actions should identify measures needed to improve infrastructures service provision to industry, facilitate access to these services and their visibility as well as identify potential investment priorities in the strategic pilot areas.

To successfully implement the actions, proposals should involve all relevant stakeholders including in particular industrial partners, including SMEs, organisations hosting Technology Infrastructures and other infrastructures offering relevant services for industry, technology, market and legal experts as needed.

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

NB: Further context and definitions will be provided through reports and the work of the Commission Expert Group, and will be made available online in due time.

HORIZON-CL4-INDUSTRY-2025-01-HUMAN-65: Network of Industry 5.0 system innovation hubs (IA)

Call: INDUSTRY 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 2.00 million.

Type of Action	Coordination and Support Actions
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [150].

Expected Outcome: Proposals are expected to contribute to the following outcomes:

- Increased investments in human-centricity, sustainability and resilience by companies;
- Demonstrated incentives for systemic transformation towards Industry 5.0 and for adopting organisational and business models needed for the competitiveness of EU industries and their adaptation to the twin transition and beyond;
- Develop enabling conditions, processes and tools for systemic transformation and upgrading of organisational capability for complex Industry 5.0 environments in the participating learning organisations and ecosystems; and
- Increased organisational learning capacities, organisational agility, and capability of industries for rapid adaptation to change in uncertain and complexity-driven value chains and environments, contributing to the Industry 5.0 goals of human-centricity, sustainability and resilience.

Scope: Industry 5.0 is a transformative vision for industry as a key driver in the current economic, sustainability and societal transitions.[151] It aims beyond efficiency and productivity as the sole goals, and reinforces the role and the contribution of industry to society and competitiveness.

Proposals should elaborate on initiating a pilot network of Industry 5.0 system innovation hubs that would mobilise different players in at least two proposed industrial ecosystems to transform their organisations, ways of work, production and consumption processes or value

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

[151] European Commission, Directorate-General for Research and Innovation, Renda, A., Schwaag Serger, S., Tataj, D. et al., Industry 5.0, a transformative vision for Europe – Governing systemic transformations towards a sustainable industry, Publications Office of the European Union, 2021, https://data.europa.eu/doi/10.2777/17322

chains in order to contribute to Industry 5.0 goals. Synergies with the results and tools of the "Community of Practice on Industry 5.0"[152] should be ensured.

The proposal should include details on processes to identify a concrete transformational challenge for each of the chosen industrial ecosystems, and the area of the challenge. Once identified, the transformational challenge should be guiding the process to catalyse industrial transformation processes, experimentation and adoption of new ways of working towards Industry 5.0 goals, considering long-term competitiveness, socio-ecological and geopolitical changes, and the need to empower humans, and increase resilience and sustainability.

For each of the identified transformational challenge at industrial ecosystem level, the system innovation hubs should engage at least four to five participating stakeholders from relevant local / regional / national or EU industrial communities and ecosystems in transdisciplinary research and innovation activities, including in:

- Identifying the niche innovations, technologies, design practices, work processes and / or organisational models that could support the industrial ecosystem players achieve the transformational challenge towards Industry 5.0.

- Identifying systemic innovation incentives and enablers towards Industry 5.0 paradigm change and competitiveness, which are currently hampering the adoption of the identified innovations at scale. Proposals should involve appropriate expertise in Social Sciences and Humanities (SSH), in particular in systems thinking, transformative innovation policy or systems dynamics, to achieve a better understanding of the key incentives and enablers that are needed for Industry 5.0.

- Where relevant, identify needs and / or prototype digital toolsfor agile information flow, rapid conversion and orchestration of information that can support decision-making towards the identified transformational challenge.

- Prototype new transformation journeys and learning ecosystems for industrial ecosystem / value chain players to increase learning capacities of organisations, by both upgrading organisational practices, supporting the adoption of new technologies, but also working towards leadership enablement and new mindsets based on Industry 5.0 paradigm. The tools and learning pathways should be inspired by complexity theory including systems thinking and systems mapping, as well as, where relevant, biomimicry approaches and open systems theory, and aim to achieve the human-centric, sustainable and resilient goals in Industry5.0.

- Develop sandboxes or participatory processes for prototyping the identified new incentives schemes or enabling policies together with government, environment, education or community players in partnership with industry and / or social players, which would support the achievement of the identified transformational challenge, and increase the potential for sustainable and competitive system transformation.

152

- Document the results and benefits of the system innovation hub pilots and of its developed tools and processes to inform and advise policy-makers in view of their potential upscaling.

The project should build on or seek collaboration with existing projects developing Industry 5.0 solutions, in order to build on the lessons learned from the respective projects and include references in its dissemination activities. It should also develop synergies with other relevant European, national or regional initiatives, funding programmes and platforms such as EIT Manufacturing, EIC Climate-KIC, European Digital Innovation Hubs, or the European Cluster Collaboration Platform.

Proposals submitted under this topic should include an exploitation strategy.

International Cooperation

Proposals are invited against the following topic(s):

HORIZON-CL4-2025-03-HUMAN-19: International cooperation in semiconductors (CSA)

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

Expected Outcome:

- Evidence-based advice to the Commission and the Member States on joint actions with leading semiconductor countries (including Japan, South Korea (TBC), Taiwan, Singapore, USA, Canada, and India) in support of EU policies.
- Support to the Commission to define and implement measures aiming at strengthening the position of Europe's industry in the global semiconductor value chain.
- Factual elements (e.g. analyses of state-of-the-art, emerging technologies…) that help the Commission in assessing potential areas of cooperation.

Scope: Within the context of semiconductor and semiconductor-based photonics (e.g. silicon photonics), the CSA will support the Commission and the Member States in the following activities:

- Preparation of a regional mapping of leading semiconductor countries outside of the EU regarding industrial strengths and gaps and their expected evolution;
- Identification of emerging opportunities (e.g. technologies, approaches) for cooperation with other regions;
- Definition of research areas in which international cooperation would result in tangible benefits for Europe;
- Analysis of risks to the EU's technological advancements, technological competitiveness, and access to leading-edge technology vis-à-vis international cooperation countries;
- Promotion and contribution to standardisation activities;
- Organisation of joint events contributing to the above outcomes;
- Promotion of mobility of researchers in specific topics (in cooperation with other support schemes);
- Preparation of a comparative analysis of modalities for cooperation and their applicability.

The Commission will actively engage with Member States via the European Semiconductor Board ensuring that their interests and views are taken into account. This CSA should be prepared, managed and coordinated by the key stakeholders in this field.

Links with topics in other WPs:

This topic builds on the results under the following topics:

- HORIZON-CL4-2022-DIGITAL-EMERGING-01-38: International cooperation in semiconductors (CSA)

Chips Joint Undertaking's HORIZON-Chips-2024-3-RIA: Joint call with Korea on Heterogeneous integration and neuromorphic computing technologies for future semiconductor components and systems

HORIZON-CL4-2025-04-HUMAN-08: GenAI for Africa

Call: DIGITAL - HADEA	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 1.00 and 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Indicative budget	The total indicative budget for the topic is EUR 5.00 million.
Type of Action	Research and Innovation Actions
Technology Readiness Level	Activities are expected to start at TRL 4 and achieve TRL 6 by the end of the project – see General Annex B.

Expected Outcome:

- African societies would benefit from innovative solutions on GenAI applied to key areas:

- Provide local technological companies with the technological capacity to develop targeted solutions to unlock the full potential of GenAI Digital in key areas with the primary focus on rural communities in Africa and women, being an underrepresented group but with a key role in the foundation of these societies.

Scope: Generative AI (GenAI) holds the potential of creating in Africa a rich ecosystem of transformative solutions and practical applications addressing the specific societal challenges and opportunities most of the countries are facing.

The proposals should address one or more of the following topics:

- Agriculture optimisation: GenAI can analyse satellite imagery and sensor data to monitor state of crops, soil conditions, and weather patterns, enabling farmers to boost crop yields and enhance food security through sophisticated predictive analytics and efficient resource management like water and pesticides. This is crucial to mitigate climate change and poor irrigation infrastructures in some areas of Africa.

- Healthcare: GenAI can diagnose diseases from medical images and patient data, enhancing healthcare in remote areas; forecast disease outbreaks and aid in preventive planning, and with the help of chatbots and virtual assistants can offer medical advice and connect patients with doctors, expanding telemedicine services, making healthcare more accessible to remote populations.

- Infrastructure and urban planning: GenAI optimises energy usage, integrates renewables, and ensures efficient distribution, while managing water (including groundwater but also rainfall use) and waste (e.g. plastic reduction and reuse) effectively for sustainability, and enhancing safety with real-time incident detection. It also provides support for reconstruction following natural or human-made disasters. This is vital for some African communities with scarce natural resources like water and facing high temperatures by using Digital Twins on urban and rural areas. All these technological solutions depend strongly on the existence and quality of connectivity infrastructure, as a key enabler for unlocking the Digital and Green Transition.

- Digital Skills and learning: Generative AI can personalize learning paths, create multilingual educational content, and offer on-demand virtual tutoring, benefiting rural

communities with low resources and fully relying on mobile phones to access online services. Additionally, adaptive learning platforms can use data analytics to tailor teaching, while engineers craft queries to help AI models understand local languages and nuances to set up conversational chatbots for local communities.

The proposals will approach these objectives by:

- Developing and integrating generative Artificial Intelligence models and algorithms specifically adapted for one or several of the abovementioned key areas.
- Involving and supporting start-ups in Africa to create innovative solutions to uniquely African challenges in those areas based on GenAI. Co-creation and living lab methodologies should be explored to boost social uptake of proposed solutions. Living labs are ecosystems of experimentation and open innovation, with a systematic approach to co-creation among their users, whether they are researchers, businesses, civil society or public administrations. These open innovation spaces will enable researchers and local actors from the public and private sectors work together using digital technologies to co-create knowledge and solutions that respond to their societal needs, while improving territorial cohesion.
- The approved projects should take into account the AI Act and GDPR as the main legal frameworks to ensure data protection of the data used within third countries.

Links with topics in other WPs:

Where relevant proposals are encouraged to build on, or seek collaboration with, existing projects and develop synergies with other relevant European initiatives. In particular links are encouraged with the projects funded under international cooperation on AI for public good, in the areas of health, digital twin for reconstruction, emergency response and electric grid optimisation, Destination Earth, Copernicus.

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Other actions not subject to calls for proposals

Public procurements

1. Research security and intellectual assets management (study)

Expected outcome: A set of practical recommendations addressed to (i) organisations for the development of a strategy to identify, assess and mitigate potential research security risks linked to intellectual assets developed in international collaborations; and (ii) innovators, researchers and their teams, so that they have concrete guidance and tools supporting them in the management of intellectual assets when research security may be involved.

Scope:

Global developments and the evolving geo-political context increasingly influence the way intellectual assets, including intellectual property, are valorised and managed. In this context, risks related to undesirable transfer of knowledge, malign influence and ethical or integrity violations require rethinking the strategies for using and sharing intellectual assets and adequately balancing openness and protection.

The crucial role of intellectual assets management in research security has been recently recognised at the EU and international levels, for instance in the context of the European Economic Security Strategy [153] and Multilateral Dialogue on Principles and Values for Research and Innovation [154]. The need to support universities and research performing organisations in the management of the intellectual assets in the context of international collaborations is also stressed by the recent proposal for a Council Recommendations on enhancing research security. [155]

However, only limited national initiatives have been established so far to define what are the risks for research security entailed in the management of intellectual assets and what are the potential means to address them [156]. To this point, no harmonised set of principles and concrete recommendations have been developed at the EU level.

This study would fill this gap and provide recommendations helping R&I actors to identify the risks and the mitigation measures.

In particular, the study goals are:

153 Strategic Autonomy and European Economic and Research Security - European Commission (europa.eu)

154 3b27e6ed-3d55-45f6-8ddc-98210bf90784_en (europa.eu)

155 eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=COM:2024:26:FIN

156 Some national governments have issued guidelines on IP management for research security and provide practical support (e.g., Secure Innovation Company Guidance | NPSA in the UK, Contact Point for Knowledge Security in the Netherlands and Counter-foreign interference guidance for the academic sector in the Czech Republic).

- Identifying the risks for intellectual assets management (e.g. with respect to licensing of patents related to critical technologies or sharing of data and know-how) from the research security perspective in the European R&I landscape;
- Analysing existing research security practices and measures in Member States and their implication for intellectual assets management;
- Identifying gaps and challenges for research security in relation to intellectual assets management at the national and European levels;
- Providing principles and concrete guidance addressed to all R&I ecosystem actors for the management of intellectual assets from the research security perspective.

The study is **targeted** to organisations, innovators, researchers and their teams.

The **duration** of the study is one year.

The **geographical scope** of the study will cover European countries. Inspiration could also be drawn from countries outside of Europe, such as the US, where similar guidelines and recommendations where developed.

Form of Funding: Procurement

Type of Action: Public procurement

Form of Funding: Procurement

Type of Action: Public procurement

Indicative budget: EUR 0.20 million from the 2025 budget

2. Heading 5 of Space - Using Space on Earth – Satellite navigation - EGNSS Evolution Mission and Service-related R&D activities

The objective is to study potential new user needs, as well as the resulting enhancement of services, and determine whether and how the EGNSS programmes Galileo and EGNOS shall evolve to answer these new user needs. This includes the preparation of contributions and technical analysis supporting the EU position in multilateral and bilateral working groups and meetings. The upstream R&D actions in this area will cover the assessment of new mission concepts and of services improvements and of new services or capacities to be introduced based on the user needs, developing the service concept including with international partners when relevant, assessing costs to the programme versus benefits to users and defining the roadmap of activities until an operational service could be provided.

Some procurement actions under this section will affect the essential security interests of the Union, and will therefore require restricted participation that will be established in the tender specifications on a case-by-case basis.

Form of Funding: Procurement

Type of Action: Public procurement

Indicative budget: EUR 2.00 million from the 2025 budget

3. Heading 10 of Space - Boosting Space through training and education activities

The objective is to conduct public procurement activities for the implementation of training and education actions in support of upskilling and reskilling efforts pursued by the European Space Policy, European R&I research agendas related to Horizon Europe.

Support will be given to the successful tenderer for the implementation of the following actions, already developed in a pilot phase in the years 2024 – 2025:

- CASSINI Job Placement Scheme: targeting university students and young graduates, to give them an opportunity to gain hands-on experience through internships in space companies. This action aims to connect academia with industry, in particular new space companies, by providing students and young graduates with practical experience on top of the theoretical knowledge acquired at university. This will help students access the job market. At the same time, it will help industry identify and train prospective future staff. The action shall build on the pilot edition developed in the frame of the STARS*EU project featuring the Space Career Launchpad platform and a voucher scheme for paid internships.

- CASSINI Space camp: targeting students aged 14-18. It is aimed to spark the interest of teenagers to pursue a vocation in space, with a particular focus on New Space. This action will build on a pilot activity to be developed throughout 2024 and 2025. Following the model of Cassini Hackathons, it foresees the involvement of local organisers that will implement each space camp locally in the local language where the space camp takes place. The added value in relying on local organisers is their connection with the local ecosystem and local stakeholders (e.g. schools, universities, companies, museums, planetarium, observatory, etc.) that would facilitate the promotion of the programme as well as the rolling out of the various activities.

Form of Funding: Procurement

Type of Action: Public procurement

Indicative budget: EUR 5.00 million from the 2025 budget

4. Heading 12 of Space – Boosting Space through support to entrepreneurship – 2025 CASSINI activities

Business development, acceleration and upscaling of start-ups will be fostered across all space areas under the CASSINI Space Entrepreneurship Initiative. CASSINI will provide support to business and innovation-friendly ecosystems, including the strengthening of business skills in the space market segments and digital services based on space data. The objective is to make start-ups and scale-ups investment-ready and able to secure venture capital funding. Synergies

with the InvestEU programme and the Space programme will be established. The following two actions will be funded:

- CASSINI innovation support.
- CASSINI Business Accelerator.

Form of Funding: Indirectly managed actions

Type of Action: Indirectly managed action

Indicative budget: EUR 8.50 million from the 2025 budget

5. International Cooperation

5.1. AI for Public Good 1: Innovative cancer imaging services AI-based for breast and prostate diagnosis

As part of the cooperation with the US on AI for Public Good, in the area of health innovative services are to be implemented for cancer imaging detection relying on AI algorithms that later can be offered to hospitals and clinical centers in need of advanced technologies.

Technical teams on both sides will train, enhance and optimise existing AI models and algorithms for breast and prostate cancer diagnosis using images. The training will utilise generative AI and machine learning as appropriate based both on synthetic and real data from clinical sources from the US and EU, as well as learn from the experience of the initiatives launched under the European Cancer Imaging Initiative, including EUCAIM..The set of innovative services to be procured through domain experts by the EC for phases II (development), III (testing)

- Train, enhance and optimise existing AI models and algorithms for breast and prostate cancer diagnosis using images. The training will utilise generative AI and machine learning as appropriate based both on synthetic and real data from clinical sources from the US and EU. The AI Act and GDPR legislation will be used as common frameworks to ensure data protection of the data used within third countries. When required, privacy-preserving technologies will be exploited to guarantee data is kept private.
- Sources of, mainly magnetic resonance, data images will be identified and organised according to ethical and privacy requirements and equipped with efficient and secure access mechanisms. Image acquisition and reconstruction and domain adaptation will be explored as potential sources to apply the AI models and algorithms to low and middle-income countries.
- Required level of enhanced accuracy of models will be identified and validated, prior to their testing in real trials. Trials will be undertaken for each use case (breast and prostate cancer) in countries in need, through clinical centres, e.g. in Kenya and South Africa (tbc) and in trials in locations in Asia (US proposal).

- Following the trials, the experts will plan and initiative the steps towards regulatory approval of the algorithms, for use in real life scenarios.
- The enhanced AI models and guidelines to their use in diagnosis will be delivered as open access to EU and US researchers, as well as to stakeholders from other world regions (in particular to low-to-middle income countries).
- The teams should also assess the potential to provide the AI models and their diagnosis guidelines and training possibly using virtual and remote learning, as a service to countries in need through e.g. hosting in high computing facilities.
- Synergies with ongoing activities and projects already running under the scope of Cancer Mission and Digital Europe Programme will be sought.

Form of Funding: Procurement

Type of Action: Public procurement

Indicative timetable: Second quarter of 2025

Indicative budget: EUR 2.40 million from the 2025 budget

5.2. AI for Public Good 2: Innovative services AI-based for emergency response and crisis management

As part of the cooperation with the US on AI for Public Good in the area of emergency response, innovative solutions and services are to be implemented to face natural disasters such as wildfires and flooding. This will be done through a combination of advanced technologies including AI, geographic information systems, and real-time data analytics empowering emergency responders to anticipate, optimize, and track resource allocation, coordinate response efforts more effectively. The goal is to implement a multihazard **open, modular, accessible, multi-hazard platform** that harnesses the potential of artificial intelligence (AI) to significantly enhance emergency response capabilities during natural disasters, supporting them with accurate data. The ecosystem will leverage existing global, national and regional systems like the Global Wildfire Information System (GWIS) and National Emergency Response Information System [NERIS], and link. with/draw from EU initiatives providing relevant data, such as Copernicus or Destination Earth.

The set of innovative service to be procured by the EC for phases II (development), III (testing)

- Development of the platform and integrating the existing Global Wildfire Information System (GWIS) that already covers the entire planet. Potentially integration of other US-based systems (Calfire, Missoula science lab...). Synergies with EU initiatives providing relevant data, such as Copernicus or Destination Earth, should be sought.
- Host the platform in cloud-based servers.

- Deployment in several countries in Latin America (mainly Central America, the Carabeen and Colombia) and others suggested with the US.
- Support for the EU (DG ECHO) to use the platform as part of the Union Civil Protection Mechanism (UCPM).
- Assess the potential to provide the platform as a service, hosted in high computing facilities in order offer emergency response capabilities to countries in need at broader scale. Prepare the scaling-up and hosting.
- Design and develop of the multihazard platform for disaster 2: floods.

Form of Funding: Procurement

Type of Action: Public procurement

Indicative timetable: Second quarter of 2025

Indicative budget: EUR 2.00 million from the 2025 budget

5.3. AI for Public Good 3: Innovative services AI-based for urban

As part of the cooperation with the US on AI for Public Good, in the area of reconstructive innovative services are to be implemented to support urban reconstruction planning relying on AI algorithms.

The set of innovative services to be procured by the EC for phases II (development), III (testing) are:

- Technical research teams from EU and the US will identify data sources and create a dataset containing 3D virtual replicas of buildings in cities all over the world (excluding replicas from the EU and the US which are already under development).
- The teams will organise the data and make it accessible according to security, ethical, privacy etc. requirements as agreed upon by all stakeholders including end-users and develop and train supporting AI algorithms for trustworthy, transparent and cost-efficient reconstruction projects.
- The virtual replicas and the AI algorithms will be integrated into a Geographical Information System (GIS) platform for a complete offering of digital twin and AI-algorithm-based reconstruction services.
- The teams should also assess the potential to provide the GIS platform, hosted in high computing facilities in order offer the services to countries in need at broader scale.
- Design and develop the production version of a Digital Twin for reconstruction based on pilots conducted in Phase I.
- Deploy the solutions in several counties in need, like Ukraine.

The teams should also assess the potential to provide the platform, hosted in high computing facilities in order offer the services to countries in need at broader scale.

Form of Funding: Procurement

Type of Action: Public procurement

Indicative timetable: Second quarter of 2025

Indicative budget: EUR 2.00 million from the 2025 budget

5.4. AI for Public Good 4: Innovative services AI-based for electric grid optimisation

As part of the cooperation with the US on AI for Public Good in the area of electric optimization, innovative solutions and services are to be implementing enabling dynamically the integration of renewable energy sources to meet increasingly fluctuating demands. The solutions will rely on AI to enhance energy efficiency and promote optimal usage, contributing to a greener society.

The set of innovative services to be procured through domain experts by the EU for phases II (development), III (testing) are:

- Finish design and development of edge-oriented AI-based flexibility tools. It will be done combining different modeling activities already available and present scenarios of flexibility over the long-term, providing an assessment tool.
- Running laboratory simulations for verification of the proposed mechanism of data exchanges and complex systems simulation.
- Concept testing and validation of tools both in the lab and in the field, prior to testing in EU locations (e.g. Rome, Denmark, Portugal).
- Deployment in third countries in need e.g. Peru (Lima).

The teams should also assess the potential to provide the platform, hosted in high computing facilities in order offer the services to countries in need at broader scale.

Form of Funding: Procurement

Type of Action: Public procurement

Indicative timetable: Second quarter of 2025

Indicative budget: EUR 3.00 million from the 2025 budget

Grants to identified beneficiaries

Proposals are invited against the following topic(s):

1. Quantum Internet Framework Partnerships Agreement– launching the second Specific Grant Agreement (SGA)

Expected outcome:

Proposals submitted under the SGA2 for the FPA on "Building the Quantum Internet" are expected to achieve the following outcomes, building on the progress made by the SGA1 and demonstrating concrete steps (in terms of improved functionality, distance and accessibility) towards the realisation of a quantum internet:

1. The realization of quantum communication technology that is scalable, secure, reliable, and ready for manufacturing.

2. The achievement of entanglement distribution over distances reaching or exceeding 500 km, incorporating quantum repeaters and demonstrating feasibility for global quantum internet infrastructure over a real-world communication network.

3. Prototype (lab condition) of a long-distance quantum communication fibre network using quantum repeaters capable of connecting metropolitan area networks over hundreds of kilometres and demonstrate interoperability of various approaches and scalability of the architecture.

4. The integration of advanced quantum network applications (e.g., secret key sharing, distributed quantum computation, blind quantum computation) into classical network infrastructure (i.e. orchestration platform) over a quantum network including quantum repeaters.

5. Platform-independent software and network stack demonstration that can operate on a quantum communication network involving at least two quantum computing nodes with quantum memories, ensuring the network's resistance to known forms of cyber-attacks.

Scope:

The Second Specific Grant Agreement (SGA2) under the FPA for building the Quantum Internet should focus on making significant steps towards the practical realization of a quantum internet:

• Develop the foundational technologies and network architectures needed to establish a quantum internet that interconnects quantum computers, simulators, and sensors through quantum networks.

• Propel the innovation and deployment of quantum repeaters capable of operating across extensive real-world networks.

• Encourage collaboration across disciplines and sectors to address the technological, computational, and societal aspects of building the quantum internet.

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• Contribute to the development of international standards and ensure interoperability across different quantum technologies, facilitating the secure and efficient exchange of quantum information, while promoting, where possible, sustainable practices.

• Highlight the project's contribution to economic growth, technological sovereignty, and strategic advantages in global quantum technology leadership.

• Engage with potential end users of the technological developments and enable advanced use cases of a quantum internet.

Proposals should demonstrate synergies with actions already carried out under HORIZON-CL4-2021-DIGITAL-EMERGING-02-19: Framework Partnership Agreements in Quantum Communications.

Proposals should also contribute to spreading excellence across Europe, for example, through the involvement of EU Widening Countries.

Technology Readiness Level: Activities are expected to start at TRL 4-5 and achieve TRL 6-7 by the end of the project – see General Annex B.

Eligibility conditions - Participation limited to legal entities established in MS only, or in specified ACs or other 3rd countries in addition to MS: Specific Art22.5 condition to be defined

Form of Funding: Grants not subject to calls for proposals

Type of Action: Specific grant agreement awarded without call for proposals in relation to a Framework Partnership Agreement

Indicative budget: EUR 32.50 million from the 2025 budget

2. Heading 7 of Space - Monitoring Space

Proposals are invited against the following topic(s):

HORIZON-CL4-SPACE-2025-01-61: Consolidate European commercial SST capabilities on sensors

Call: SPACE 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 15.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 15.00 million.

Type of Action	Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: The page limit of the application is 50 pages.
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: In order to achieve the expected outcomes, and safeguard the Union's strategic assets, interests, autonomy, or security, namely avoiding a situation of technological dependency on a non-EU source, in a global context that requires the EU to build on its strenths and to carefully assess and address strategic weakenesses, vulnerabilities and high-risk dependencies, participation is limited to legal entities established in Member States only. Proposals including entities established in countries outside the scope specified in the call/topic/action will be ineligible. For the duly justified and exceptional reasons listed in the paragraph above, in order to guarantee the protection of the strategic interests of the Union and its Member States, entities established in an eligible country listed above, but which are directly or indirectly controlled by a non-eligible country or by a non-eligible country entity, may not participate in the action unless it can be demonstrated, by means of guarantees approved by the eligible country of establishment, that their participation to the action would not negatively impact the Union's strategic, assets, interests, autonomy, or security. The guarantees shall in particular substantiate that, for the purpose of the action, measures are in place to ensure that: a) control over the applicant legal entity is not exercised in a manner that restrains or restricts its ability to carry out the action and to deliver results, that imposes restrictions concerning its infrastructure, facilities, assets, resources, intellectual property or know-how needed for the purpose of the action, or that undermines its capabilities and standards necessary to carry out the action; b) access by a non-eligible country or by a non-eligible country entity to sensitive information relating to the action is prevented; and the employees or other persons involved in the action have a national security clearance issued by an eligible country, where appropriate; c) ownership of the intellectual property arising from, and the results of, the action remain within the recipient during and after completion of the action, are not subject to control or restrictions by non-eligible countries or non-eligible country entity, and are not exported outside

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	the eligible countries, nor is access to them from outside the eligible countries granted, without the approval of the eligible country in which the legal entity is established. If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
Technology Readiness Level	Third parties' activities are expected to start at least TRL 2 and reach at least TRL 5 by the end of the project – The reference TRL definition is the ISO 16290:2013 applicable to the space sector.
Procedure	The procedure is described in General Annex F. The following exceptions apply: The granting authority can fund a maximum of one project.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: The beneficiary may provide financial support to third parties for a total amount up to EUR 14,5 million. In derogation to article 204 EU Financial Regulation (2018/1046), the maximum amount to be granted to each third party can exceed EUR 60,000. This derogation is justified by the fact that the foreseen actions carried out by third parties will target breakthrough techniques and technologies to disruptively improve SST sensors performance and/or operations. A given action can be implemented by one third party or a by consortium of entities. The maximum amount to be granted to <u>each</u> action implemented by a third party or by a consortium is expected to be in the range of EUR 4 million. In line with IA funding rates, third parties will be asked to co-finance 30% of the total amount of each action. Financial supports to third parties are expected to start no later than 6 months after the start date of the grant.

<u>Expected Outcome</u>: Projects developed under this topic are expected to contribute to the following outcomes:

- To reinforce European strategic autonomy and resilience in space surveillance and tracking capabilities (sensors and associated data processing) by leveraging innovation and competitiveness of the European industry and start-ups

- To develop and/or improve existing commercially available assets and SST-related technologies fostering competition and market development, allowing the European SST industry and start-ups to be competitive on global markets.

- To complement, as defined by EUSST Partnership's architecture studies, existing Member States patrimonial SST capacities with European privately-owned ones, assuring interoperability and adopting global standards.

- To improve European SST operational capabilities by supporting the extension of space-tracking infrastructure located outside continental Europe.

- To prepare EU industry to capture new SST markets in the domains by proposing competitive, cutting-edge sensors.

Scope: The following sensors and data processing R&I activities shall be addressed to tackle the above expected outcomes:

- Novel, cost-effective sensor concepts and technologies capable of detecting, tracking and surveying objects in order to improve the state-of-the-art performance according to the target orbit regime (e.g. less than 10 cm in LEO, 50 cm in MEO/GEO). Note: Priority will be given to projects focusing on LEO detection even though preeminent proposals in other orbit regimes will be considered.

- Autonomous sensor concepts to increase operational robustness, to reduce response times, to reduce operation costs, amongst others.

- Tools, techniques, and technologies necessary to significantly improve the efficiency of future or existing commercial sensor's network by streamlining the scheduling and tasking of its own sensors.

- State-of-the-art technologies and concepts improving sensors' tracking and surveillance performances (measurements quality (noise; bias; measurements rates ...), tracks accuracy (track noise; track duration...), sensors' field of view…

- Cost-effective tracking and/or surveillance sensor concepts expanding orbital coverage of Member States patrimonial SST capacities and/or meeting commercial market needs. Note: surveillance sensors should be understood as those conceived to perform surveillance monitoring as opposed to tracking sensors operating in surveillance mode.

- Any promising technology for precise tracking and data processing.

Proposals are expected to promote cooperation between different actors (industry, SMEs and research institutions) and consider opportunities to quickly turn technological innovation into commercial use in the space sector.

Proposals under this topic should explore synergies and be complementary to already funded actions in the context of technology development at component level. In particular, it is expected that projects make use of existing European technologies and/or building blocks at

component level contributing to European non-dependence and strengthen competitiveness. Furthermore, proposed activities should be complementary to national activities and activities funded by the European Space Agency (ESA).

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content should be addressed only if relevant in relation to the objectives of the research effort.

HORIZON-CL4-SPACE-2025-01-62: Consolidate European commercial SST capabilities on Services

Call: SPACE 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 4.00 million.
Type of Action	Research and Innovation Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: The page limit of the application is 50 pages.
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: In order to achieve the expected outcomes, and safeguard the Union's strategic assets, interests, autonomy, or security, namely avoiding a situation of technological dependency on a non-EU source, in a global context that requires the EU to build on its strenths and to carefully assess and address strategic weakenesses, vulnerabilities and high-risk dependencies, participation is limited to legal entities established in Member States only. Proposals including entities established in countries outside the scope specified in the call/topic/action will be ineligible. For the duly justified and exceptional reasons listed in the paragraph above, in order to guarantee the protection of the strategic interests of the Union and its Member States, entities established in an eligible country listed above, but which are directly or indirectly controlled by a non-eligible country or by a non-eligible country entity, may not participate in the action unless it can be demonstrated, by means of guarantees approved by the eligible country of establishment, that their

	participation to the action would not negatively impact the Union's strategic, assets, interests, autonomy, or security. The guarantees shall in particular substantiate that, for the purpose of the action, measures are in place to ensure that: a) control over the applicant legal entity is not exercised in a manner that restrains or restricts its ability to carry out the action and to deliver results, that imposes restrictions concerning its infrastructure, facilities, assets, resources, intellectual property or know-how needed for the purpose of the action, or that undermines its capabilities and standards necessary to carry out the action; b) access by a non-eligible country or by a non-eligible country entity to sensitive information relating to the action is prevented; and the employees or other persons involved in the action have a national security clearance issued by an eligible country, where appropriate; c) ownership of the intellectual property arising from, and the results of, the action remain within the recipient during and after completion of the action, are not subject to control or restrictions by non-eligible countries or non-eligible country entity, and are not exported outside the eligible countries, nor is access to them from outside the eligible countries granted, without the approval of the eligible country in which the legal entity is established. If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
Technology Readiness Level	Third parties' activities are expected to start at least TRL 2 and reach at least TRL 6 by the end of the project – The reference TRL definition is the ISO 16290:2013 applicable to the space sector.
Procedure	The procedure is described in General Annex F. The following exceptions apply: The granting authority can fund a maximum of one project.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: The beneficiary may provide financial support to third parties up to a total amount of EUR 3,8 million. In derogation to article 204 EU Financial Regulation (2018/1046), the maximum amount to be granted to each third party can exceed EUR 60,000. This derogation is justified by the fact that foreseen actions

	carried out by third parties target competitive added-value SST services proposed worldwide by the EU industry to capture new SST markets. A given action can be implemented by one third party or a by consortium of entities. The maximum amount to be granted to each action implemented by a third party or by a consortium is expected to be in the range of EUR 600,000. Financial supports to third parties are expected to start no later than 6 months after the start date of the grant.

Expected Outcome: Projects developed under this topic are expected to contribute to the following outcomes:

- To prepare EU industry and start-ups to capture new SST markets by proposing innovative and competitive services.
- To reinforce European strategic autonomy and resilience in the SST domain by leveraging commercial services while enhancing EU SST operational effectiveness.
- To foster competition and market development in SST-related commercial services considering the needs of relevant actors such as, but not limited to, satellites Owners and Operators, insurances companies, regulators…
- To demonstrate and foster the development of an ecosystem of lucrative, advanced, and tailor-made commercial services, which may rely on, or be provided on top of, the basic public services delivered by EU SST.

Scope: The R&I areas which shall be addressed to tackle the above-mentioned expected outcomes are:

- Cost-effective techniques and technologies to develop future SST commercial services or to substantially improve existing ones, additional or complementary to the ones currently delivered by EU SST.
- Development or improvement of algorithms for added value services (with respect to EU SST public services), for instance: measurements correlation, initial Orbit determination, orbit determination, covariance estimation, objects characterisation, secure exchanges between Owners/Operators (for example taking advantage of, but not limited to, technologies such as AI or blockchain).
- Development of evaluation methods of collision probability applied, but not limited to manoeuvrable or non-manoeuvrable objects, including satellite constellations.
- Improvement of algorithms for data fusion for a more efficient use of data and information from the same object coming from different sensors.

- Expansion or improvement of EU industry proprietary space objects catalogue (targeting in priority debris below 10 cm in LEO and below 50 cm in GEO).
- Development or improvement of new objects propagation models for efficient propagation of the orbital population (e.g. cloud propagation models to propagate the debris cloud generated after a collision or fragmentation ...).

Proposals are expected to promote cooperation between different actors (industry, SMEs and research institutions) and consider opportunities to quickly turn technological innovation into commercial use in space.

Proposals under this topic should explore synergies and be complementary to already funded actions in the context of technology development at component level. In particular, it is expected that projects make use of existing European technologies and/or building blocks at component level contributing to European non-dependence and strengthen competitiveness. Furthermore, proposed activities should be complementary to national activities and activities funded by the European Space Agency (ESA).

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content should be addressed only if relevant in relation to the objectives of the research effort.

3. Heading 2 of Space - Acting in Space

Proposals are invited against the following topic(s):

HORIZON-CL4-SPACE-2025-01-25: HORIZON-CL4-SPACE-2025-01-25: ISOS Pilot Mission – Coordination and Support

Call: SPACE 2025	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 2.00 and 2.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 2.50 million.
Type of Action	Coordination and Support Actions
Admissibility conditions	The conditions are described in General Annex A. The following exceptions apply: The page limit of the application is 60 pages.
Eligibility	The conditions are described in General Annex B. The following

conditions	exceptions apply: In order to achieve the expected outcomes, and safeguard the Union's strategic assets, interests, autonomy, or security, namely avoiding a situation of technological dependency on a non-EU source, in a global context that requires the EU to build on its strenths and to carefully assess and address strategic weakenesses, vulnerabilities and high-risk dependencies, participation is limited to legal entities established in Member States and the following associated countries: Norway and Iceland. Proposals including entities established in countries outside the scope specified in the call/topic/action will be ineligible. For the duly justified and exceptional reasons listed in the paragraph above, in order to guarantee the protection of the strategic interests of the Union and its Member States, entities established in an eligible country listed above, but which are directly or indirectly controlled by a non-eligible country or by a non-eligible country entity, may not participate in the action unless it can be demonstrated, by means of guarantees approved by the eligible country of establishment, that their participation to the action would not negatively impact the Union's strategic, assets, interests, autonomy, or security. The guarantees shall in particular substantiate that, for the purpose of the action, measures are in place to ensure that: a) control over the applicant legal entity is not exercised in a manner that restrains or restricts its ability to carry out the action and to deliver results, that imposes restrictions concerning its infrastructure, facilities, assets, resources, intellectual property or know-how needed for the purpose of the action, or that undermines its capabilities and standards necessary to carry out the action; b) access by a non-eligible country or by a non-eligible country entity to sensitive information relating to the action is prevented; and the employees or other persons involved in the action have a national security clearance issued by an eligible country, where appropriate; c) ownership of the intellectual property arising from, and the results of, the action remain within the recipient during and after completion of the action, are not subject to control or restrictions by non-eligible countries or non-eligible country entity, and are not exported outside the eligible countries, nor is access to them from outside the eligible countries granted, without the approval of the eligible country in which the legal entity is established. If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of

	Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
Procedure	The procedure is described in General Annex F. The following exceptions apply: The granting authority can fund a maximum of one project.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [157].
Security Sensitive Topics	Some activities resulting from this topic may involve using classified background and/or producing of security sensitive results (EUCI and SEN). Please refer to the related provisions in section B Security — EU classified and sensitive information of the General Annexes.

Expected Outcome: The strategic objective of this topic is to support the development of capabilities to 'Act in Space' through demonstrating in space a pilot mission by 2030 related to In-Space Operations and Services (ISOS). The envisaged pilot mission *EU ISOS>I* shall provide the necessary seed components for a service infrastructure, available to the European in-space ecosystem (including the EU assets), driving the generation of a new in-space economy, providing enhanced in-orbit technology demonstration and maximising EU technology non-dependence.

This pilot mission will largely contribute to ensure EU's freedom of action in space, increase the resilience and protection of EU assets in space and foster the development of the new in-space economy. A pioneering, novel and scalable mission concept, which is unique compared to other initiatives among all space-faring nations is envisaged. The mission will build on previous R&I with an operational mission concept, focusing on application and service demonstration, with a concrete view to commercial and governmental usage. The detailed mission concept will be derived in close coordination with EU Member States through a dedicated Advisory Group[11],

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

This Coordination and Support Action addresses the coordination of the development R&I actions for the **implementation of the pilot mission *EU ISOS>I*** and the support toward its evolution towards a flagship for commercial and governmental services.

The project is expected to contribute to the following outcomes, in close coordination with the European Commission services and the ISOS Pilot Mission Advisory Group:

- Creating and promoting an inclusive, transparent and scalable EU ISOS ecosystem that allows on-boarding of Member States' or commercial actors' initiatives putting the EU at the centre of a new in-space economy offering global in-space services;
- Elaboration of the ISOS Pilot mission detailed architecture, based on the high-level mission requirements provided in the technical annex[12];
- Coordination of the implementation of the four components identified in topics HORIZON-CL4-SPACE-2025-01-21/22/23/24, in particular with regards to the determination of interfaces among the mission components, identification of dependencies, exchange of requirements and performance indicators;
- Support to the elaboration of key standards for future institutional and commercial ISOS missions together with the projects implementing the four mission components and relevant stakeholders.

This topic will contribute to, in the medium to long term, developing, deploying global space-based services and contribute to fostering the European space sector competitiveness, as stated in the expected impact of this destination.

Scope: To tackle the above expected outcomes, the following R&I actions must be addressed taking into account the provided technical annex[12]:

- Overall coordination of ISOS pilot mission preparation up to detailed design[13] and elaboration of a detailed system architecture that is modular and scalable, in close cooperation with all mission components and the ISOS Pilot Mission Advisory Group, building on the high-level mission requirements;
- Ensure compatibility between mission components (for instance interfaces among components and exchange of requirements and performance indicators);
- Elaboration of an effective conflict resolution regime;
- Dissemination and Communication activities on the EU ISOS>I pilot mission;
- Derive an in-space services product tree – functional specification of the EU ISOS>I;
- Community consultation and elaboration of a Pilot Mission and Future Space Ecosystem Plug-in Specification which should allow third-party on-boarding the ISOS pilot mission ecosystem, at system and technology level;

- Prepare a proposal for the implementation, deployment, funding and system governance scheme for the EU ISOS>I pilot mission under the next MFF;
- Proposal for a pilot mission evolution plan towards a flagship for commercial and governmental services (seed point for future flagship development and deployment plan, to be considered as future component of the EU Space Programme). The project should propose at least three use cases for the servicing of EU Space Programme assets through the delivery of a concept of operations (CONOPS);
- Contribution to standardisation, regulatory and legal framework actions including stakeholder consultation;
- System risk management plan: Identification of global risks, incl. technical, operational, managerial, legal, IP, and related to external interferences, and elaboration of possible mitigation actions.

The proposal is expected to consider and contribute to a balanced provision of Member States' expertise and capabilities to the overall ISOS pilot mission, to support a successful introduction of the strategic capacity 'Act in Space' for the EU and its Member States.

Pre-identified beneficiaries: The coordinators and other beneficiaries as necessary of the awarded proposals from topics HORIZON-CL4-SPACE-2025-01-21, 22, 23, 24.

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content should be addressed only if relevant in relation to the objectives of the research effort.

Prizes

1. Heading 1 of Space – Accessing Space - Horizon Prize for EU launch service

Description:

The challenge is to develop an innovative, cost-effective and commercially viable solution to launch satellites of the EU space programmes.

The solution shall reinforce the EU autonomous access to space and enhance European technological non-dependence.

The objective is to support the development of competitive EU launch services able to deliver satellites into at least Low-Earth Orbit (LEO) before the end of 2028. The service will have to be compatible with specific requirements stemming from EU launch service need.

Candidates must define solutions that complement existing means in the short term and have potential for development in the longer term.

The awarding of the prize is expected to leverage private investment capital to the winning contestant.

The specific rules of the contest will be published in 2025 by the European Commission, which will directly launch and manage the contest and award the prize.

Expected results: The prize will be awarded to a maximum of three launch service providers able to best demonstrate their capacity to meeting the criteria of the contest.

Essential award criteria:

The prize will be awarded, after closure of the contest, to the contestant(s) who demonstrate(s) a solution that best meets the following cumulative criteria:

- Excellence
- Impact
- Service sustainability

Eligibility criteria

Some procurement actions under this section will affect the essential security interests of the Union, and will therefore require restricted participation that will be established in the tender specifications on a case-by-case basis.

The reward (budget): The indicative budget for the prize is EUR 10 million from the 2025 budget, to be awarded a maximum of three winning contestant(s).

Indicative timetable of contest(s):

Stages	Date and time or indicative period
Opening of the contest	Q1/Q2 2025
Deadline for submission of application	Q4 2025
Award of the prize	Q1 2026

Form of Funding: Prizes

Type of Action: Inducement Prize

Indicative budget: EUR 10.00 million from the 2025 budget

Other budget implementation instruments

1. Project monitoring and use of individual experts (space)

This action will support the use of appointed independent experts by HaDEA for the monitoring of running space actions (grant agreement, grant decision, public procurement actions and financial instruments) funded under Horizon Europe and previous Framework

Programmes for Research and Innovation and where appropriate include ethics checks as well as compliance checks regarding the Gender Equality Plan eligibility criterion.

Form of Funding: Other budget implementation instruments

Type of Action: Expert contract action

Indicative budget: EUR 0.50 million from the 2024 budget

Indirectly managed actions

Indirectly managed actions delegated to ESA

1. ESA.1 - Heading 5 of Space - Using Space on Earth – Satellite navigation - EGNSS Evolution: Technology and infrastructure-related R&D activities

Actions under this area will address upstream R&D activities. They will cover the maturing of the existing technologies and the development of new and emerging technologies (e.g. LEOPNT), the engineering activities for the further evolution of Galileo and EGNOS existing systems, technical studies for the assessment of exploratory system concepts and/or responding to new mission needs and a changing environment, the development and maintenance of state-of-art system tools and technical test-beds, the implementation of actions agreed at Programme level to reduce the dependence of the supply chain on non-EU markets, the definition, design, development and implementation of experimental satellite demonstrator, and others.

These activities will be implemented by ESA under the Contribution Agreement between the Commission and ESA. The procurement actions under this section will affect the essential security interests of the Union, and will therefore require restricted participation that will be established in the tender specifications. In such case, participation should in principle be open only to entities established in the EU Member States. Participation of entities established in Horizon Europe associated countries or in third countries will be decided on a case-by-case basis with the approval of the annual work plan submitted to Commission under the Financial Framework Partnership Agreement (FFPA).

Please note that the indicative budget of € 18 million being lower than usual does not mean that EGNSS Upstream would be deprioritized. The indicative budget for EGNSS Upstream for 2025-2027 is approximately EUR 150 million.

Form of Funding: Indirectly managed actions

Type of Action: Indirectly managed action

Indicative budget: EUR 18.00 million from the 2025 budget

2. ESA.2 - Heading 3 of Space - Using Space on Earth – Telecommunications - IRIS2 Space infrastructure: Development and Validation

The Commission has adopted a proposal for a Union Programme for Secure Connectivity. The future IRIS² system – Infrastructure for Resilience, Interconnectivity and Security by Satellites – should upon the GOVSATCOM component of the EU Space Programme, which should also take advantage of additional national and European capacities and develop further the European Quantum Communication Infrastructure (EuroQCI) initiative. This action should therefore enable and support the development and validation actions for the construction of the initial space and ground infrastructure required for the provision of governmental services.

These activities are due to be entrusted to ESA under a Contribution Agreement between the Commission and ESA. In particular, ESA will perform the following tasks: infrastructure development and validation activities as required to achieve full validation activities (including performances) of IRIS^2, that will be implemented by the future Concessionaire.

IRIS² implementation will include system architecture tasks, engineering and design of non-recurring items, development, manufacturing, security and technology non-dependency aspects and all necessary qualification and tests of space and ground segments. It will also include all the new developments that are needed to achieve the programme's objectives, as well as all the early validations deemed as necessary for an early elimination of the technical risks (e.g., interface and functional testing between blocks).

However, the detailed perimeter of activities for the Entrusted Tasks industrial activities will be based on the selected contractors' final proposal.

The procurement actions under this section will affect the essential security interests of the Union, and will therefore require restricted participation that will be established on a case-by-case basis in the tender specifications. In such case, participation should in principle be open only to entities established in the EU Member States. Participation of entities established in Horizon Europe associated countries or in third countries will be decided on a case-by-case basis.

Form of Funding: Indirectly managed actions

Type of Action: Indirectly managed action

Indicative budget: EUR 50.50 million from the 2025 budget

3. ESA.3 - Heading 11 of Space - Boosting Space through IOD/IOV opportunities - In Orbit Demonstration/Validation (IOD/IOV) service

To ensure EU non-dependence and competitiveness in technologies, there is a clear need for a regular, sustainable, cost-effective and responsive In Orbit Demonstration/Validation (IOD/IOV) service in the EU. Space flight heritage in real conditions and environment is

often required to de-risk new technologies, products, concepts, architectures, services and operations techniques be that for unique or recurrent, institutional or commercial missions.

Intended results of the action is to provide a service for regular aggregation (if needed), launch and operations in orbit for IOD/IOV experiments; the objective is to have at least one opportunity every year during the Horizon Europe implementation period. This will contribute to reduce the time to market or operational use of new technologies, products, concepts, architectures, and operations techniques.

The IOD/IOV activities intend to provide a regular and cost-effective service and solution for common flight ticket actions (management, spacecraft design including reuse of existing solutions, assembly, integration and tests, launch and operations) based on EU solutions both for the spacecraft (i.e. platform, experiments aggregation, operations in orbit including preparation and associated Ground Segment) and for the launch services.

The scope of the activities may include mission design, integration and implementation, for all the necessary tasks to prepare, provide and operate spacecraft(s), together with the related ground segment, which accommodates the selected IOD/IOV experiments as well as the associated launch services.

For the aggregation and operations, the activities include:

- System studies, at ground and space level, including the compatibility with the available launchers;
- Input to the launch mission analysis performed by the launch service provider;
- Selection, assembly, integration and testing of the spacecraft(s) and related ground segment;
- Management of interfaces with and between the different IOD/IOV experiments, between the spacecraft and the launcher and between the spacecraft and the ground segment;
- Preparation of the spacecraft(s) for the flight;
- In-orbit testing and operations including data provision.

Concerning launch aspects, IOD/IOV activities should support the European launcher exploitation policy, therefore relying as far as possible on EU manufactured launcher solutions launched from the EU territory. The actions will include the provision of flight opportunities with EU manufactured launchers which encompass the mission analysis, the verification of interfaces between the spacecraft and the launcher, the preparation of launch campaign and the flight up to the injection of the spacecraft(s) on the required orbit(s).

Form of Funding: Indirectly managed actions

Type of Action: Indirectly managed action

Indicative budget: EUR 8.00 million from the 2025 budget

Indirectly managed actions delegated to EUSPA

1. EUSPA.1 - Tender eval, project monitoring and audits

This action will support the use of appointed independent experts by EUSPA for the monitoring of running projects, tender evaluation and audits where appropriate.

Legal entities:

European Union Agency for the Space Programme (EUSPA), Janovského 438/2 170 00 Prague 7 – Holesovice Czech Republic

Form of Funding: Indirectly managed actions

Type of Action: Indirectly managed action

Indicative budget: EUR 0.50 million from the 2025 budget

2. EUSPA.2 - Heading 6 of Space - Using Space on Earth – Services & Data coming from satellites, both Earth Observation and navigation

We need to make the best use of EGNSS and Copernicus capacities for EU citizens, companies and society. Research and innovation will foster the development of EGNSS and Copernicus downstream applications and promote their adoption in the EU and worldwide. A call for proposals under this area will address downstream R&D activities to be launched by the European Union Space Programme Agency (EUSPA) in accordance with the specification included in Appendix below.

Form of Funding: Indirectly managed actions

Type of Action: Indirectly managed action

Indicative budget: EUR 15.00 million from the 2025 budget

Appendix to action EUSPA.2

Call - STRATEGIC AUTONOMY IN DEVELOPING, DEPLOYING AND USING GLOBAL SPACE-BASED INFRASTRUCTURE, SERVICES, APPLICATIONS AND DATA 2023 - APPLICATIONS

HORIZON-EUSPA-2025-SPACE

Proposals are invited against the following topic(s):

HORIZON-EUSPA-SPACE-2025-01-51: Space Data Economy

Specific conditions

Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 1.50 and 2.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Innovation Actions
Eligibility conditions	If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used).
Technology Readiness Level	Activities are expected to achieve TRL 7-9 by the end of the project. The reference TRL definition is the ISO 16290:2013 applicable to the space sector. Activities may start at any TRL.
Procedure	To ensure a balanced portfolio covering all the areas described in the scope section, grants will be awarded to applications not only in order of ranking but at least also to one proposal that is the highest ranked within each priority area, provided that the applications attain all thresholds.
Legal and financial set-up of the Grant Agreements	Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [158].

Expected Outcome: This topic aims at supporting activities that are enabling or contributing to overcoming sectorial demand fragmentation and support scale up of the space data[159] use, increasing the wider uptake and mass adoption of the EU space data in selected priority areas that are strategic for Europe. To that end, proposals under this topic should aim to deliver results that are directed, tailored towards and contributing to some or all of the following expected outcomes:

- Foster the development and prepare for the commercialisation of innovative space-based solutions that supports an informed decision making of relevant stakeholders (e.g.

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

[159] Space data relates to data and services provided by the EU Space programme components.

energy operators, city and regional authorities, financial institutes, insurance companies, corporates, food/industrial manufacturing etc.);

- Leverage EGNSS-based and Copernicus-based capabilities to modernize and increase the efficiency and resilience of energy infrastructure and/or urban environment, and/or support the use of green financing schemes addressing environmental challenges as well as implementing climate resilient practices in the downstream sector;

- Analyse and support the consolidation of the sectorial demand for solutions based on EGNSS and Copernicus services and data, possibly also exploring the synergies with EU secure satellite communications, addressing the challenges identified in priority areas and leveraging the relevant regulatory environment.

Scope: Europe has made a considerable investment in its space infrastructure, resulting in two pivotal outcomes: first, a strategic autonomy of the continent, and second, a surge in economic growth driven by space-enabled applications. Additionally, Europe boasts a thriving sector offering space data, services and products, which continues to show steady growth.

The market for space data and services is fragmented, both on the side of supply and demand. A fragmented and underdeveloped demand from both public and private users does not allow for scaling up, hindering the realization of the full potential of the EU Space infrastructure.

Space data can be used in almost all industry verticals in the EU and worldwide. While some sectors are already using space data to high extent, providing benefits to the citizens, economy and environment; other sectors are only marginally testing the ground. The demand creation is progressing, however, in order to foster the space data economy, it is needed to scale up and accelerate the market uptake and mass adoption of space data, in the context of the applicable legal framework.

In order to achieve this, the proposals should focus on the development of innovative solutions, tailored to the specific needs of downstream industries and verticals and addressing inherent sectorial demand fragmentation issues. There is also an untapped potential of using space data to bolster green and digital transitions, presenting an opportunity to create innovative solutions in these domains.

Moreover, the projects should leverage the existing relevant sectorial regulations and policies, by exploring how the proposed solutions using space data and services can support these regulations.

Projects supporting the integration of EU Space data and services into vertical market segments shall focus on selected priority areas:

- **Energy** (renewable energy, energy efficiency, energy infrastructure) In the face of energy supply shortages and climate change, the demand for renewable energy is rapidly increasing. Driving this demand is the fact that renewables are reducing greenhouse gas emissions and transitioning the world towards a sustainable future. Moreover, energy

efficiency initiatives aim to optimize energy consumption across various sectors, from manufacturing to residential spaces, fostering a more sustainable and responsible approach to energy use. To expedite this transition, space data and services enable energy stakeholders to make informed decisions about the deployment and management of renewable energy infrastructure and to gain insights into energy consumption patterns across diverse sectors and geographic regions. Examples of downstream innovation in this context is the use of GNSS and EO technologies to enhance energy infrastructure resilience and efficiency in smart grids by adapting to real-time demand changes or to facilitate the monitoring and management of electricity distribution networks.

- **Climate adaptation and Environmental footprint reduction**: The implementation of effective Climate adaptation measures can foster climate resilience and reduce vulnerability to climate change, in communities, ecosystems and infrastructure. GNSS and EO technologies provide accurate and up to date data for assessing climate risks, prioritizing adaptation measures and allocate resources effectively to reduce environmental footprint, enabling a deeper understanding of climate change impacts and informing effective mitigation strategies. This includes the development of innovative downstream applications to prepare and respond effectively, improving disasters preparedness through early warning systems for extreme events, strengthening biodiversity and ecosystems services, promote afforestation and reforestation, manage water resources and water allocation more efficiently, implement climate resilient agriculture practices. Moreover, space-based solutions play a crucial role to reduce resource consumption, environmental impact, pollution and ecological degradation, fostering industry sustainability practices. Proposals should address one or more of the aforementioned areas, leverage digital tools based on innovative technologies such as AI/Big Data/Quantum/Blockchain etc., explore synergies with Satcom, as well as ensure the involvement of private sector as end users for the proposed solution commercial exploitation.

- **Green financing and insurance**: Green financing involves the allocation of funds to support environmentally sustainable projects. Concurrently, green insurance offers coverage for risks tied to sustainability, climate change, and eco-friendly activities. These insurance products incentivize responsible practices, providing protection against environmental challenges. Both green financing and insurance contribute to fostering sustainability by directing financial resources and risk management strategies toward initiatives that promote positive environmental and social outcomes. Space technologies can play a pivotal role by providing accurate data to ensure transparency, accountability and risk management for the assessment and monitoring of environmental projects funded by green financing.

- **Liveable cities of the future**: The share of the world's population living in cities is constantly increasing. Currently governments have the goal to move cities towards a better liveable future. Tomorrow cities can drive and take advantage of innovation and new downstream space technologies as they are the biggest digital platform. Solutions should develop space-based applications and technologies with focus on commercial

exploitation for the modernisation of cities. Examples of areas to be analysed are smart waste and waste water managements, drinking water management, green constructions, urban green, urban mobility and public transports, urban logistics, health and well-being, public safety, sustainable tourism, as well as the monitoring of urbanisation patterns (e.g. land coverage, urban sprawl, heat islands), assessing the interdependencies of cities with their regional areas, improving disasters preparedness and preventive/proactive urban planning, supporting investment in more climate resilient infrastructures etc. In parallel with modernisation of liveable cities another important objective is to preserve the past and valorise the cultural heritage trough monitoring sites mitigating the effects of mass tourism, climate change, subsidence and pollution. Synergies with satellite communications can also be explored. Proposals will have to ensure the involvement of cities' authorities as either end users or regulatory authorities supporting the uptake of the proposed innovative solutions.

Each proposal should address only one of the four areas outlined above, which must be clearly identified.

The proposals under this topic shall present a business plan.

Proposals are expected to promote cooperation between different actors (industry, SMEs and research institutions, city authorities, and where relevant, Copernicus Entrusted Entities) and consider opportunities to quickly turn technological innovation into commercial use in space.

When applicable and upon request of the contracting authority, the beneficiaries may be asked to interact with the EU Space Programme, through the most relevant expert group(s) configuration(s), with the purpose of giving feedback about the EU Space Programme.

Proposals under this topic should explore synergies and be complementary to already funded actions in the context of technology development at component level. In particular, it is expected that projects make use of existing European technologies and/or building blocks at component level contributing to European non-dependence and strengthen competitiveness. Furthermore, proposed activities should be complementary to national activities and activities funded by the European Space Agency (ESA) and if applicable Destination Earth.

Proposals addressing Galileo PRS (Public Regulated Service) related applications are not in the scope of this action.

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content should be addressed only if relevant in relation to the objectives of the research effort.

HORIZON-CL4-EUSPA-2025-01-52: Innovative space-based applications enhancing capabilities for a resilient Europe

Specific conditions	
Expected EU	The Commission estimates that an EU contribution of between EUR

contribution per project	1.50 and 1.80 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 5.00 million.
Type of Action	Innovation Actions
Eligibility conditions	If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used). The following additional eligibility criteria apply:This topic requires the active involvement, as beneficiaries, of at least two crisis or security practitioner[160] organisations or agencies, from at least two different EU Member States or Associated Countries. For participants with practitioner status, applicants must fill in the table "Information about security practitioners" in the application form with all the requested information, following the template provided in the submission IT tool.
Technology Readiness Level	Activities are expected to achieve TRL 7-9 by the end of the project. The reference TRL definition is the ISO 16290:2013 applicable to the space sector. Activities may start at any TRL.
Procedure	To ensure a balanced portfolio covering all the areas described in the scope section, grants will be awarded to applications not only in order of ranking but at least also to one proposal that is the highest ranked within each priority area, provided that the applications attain all thresholds.
Legal and financial set-up of the Grant Agreements	Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [161].

[160] Crisis or security practitioners has the meaning of organisations or agencies actively engaged in crisis or security operations, involved in e.g., law enforcement, customs, environmental crime management, smuggling and trafficking fighting and counter-terrorism, border and maritime surveillance, critical infrastructure operators, public safety, fundamental rights, disaster first/second responders, civil protection authorities, humanitarian aid etc.

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

Expected Outcome: Projects' results are expected to contribute to some or all of the following outcomes:

- Foster the development and validation of integrated synergistic space technologies that support the operational work of crisis and security practitioners (e.g. law enforcement, customs, first/second responders, critical infrastructure operators, border or coast guards, civil protection authorities etc);

- Improve, operationalize and mainstream EGNSS-based and possibly Earth observation-based services that enhance the resiliency and security (including cybersecurity) of the EU, reinforcing their acceptance, adoption and usage of the developed solution(s) among practitioners. Synergies with secure satellite communications can also be explored;

- Improve the wide uptake and penetration of EU Space Programme data and services, and in particular EGNSS differentiators (OSNMA - Open Service Navigation Message Authentication, HAS - High Accuracy Service, RLS - Return Link Service, EWSS – Emergency Warning Satellite Service etc.), in the everyday operations and tasks of crisis and security practitioners, increasing their awareness and ability to operate efficiently and with safety;

- Identify new, and analyse existing, capability gaps of security practitioners, that space technologies can bridge, demonstrating on the field innovative solutions based on EGNSS and possibly other EU Space Programme components such as Copernicus;

- Create new space-based commercial opportunities for innovative businesses serving practitioner organisations.

Scope: Proposals should be built on the exploitation of the distinguishing features of Galileo and EGNOS seeking to enhance the way practitioners prepare for and manage crises and security operations. Proposals should develop applications and technologies that focus on commercial exploitation in one or more of the following priority areas:

- Development of EGNSS-based spoofing-proof downstream solutions to support the digital transformation of security practitioners in security-critical operations (e.g. Law Enforcement Agencies, Custom Authorities, Border and Coast Guards, etc) in various applications, including: environmental crimes management, prevention of smuggling and trafficking, counter-terrorism, border and maritime surveillance, migration management, fugitive search, public safety and fundamental rights, illegal poaching, customs operations and Electronic Freight Transport Information, dangerous goods transportation, usage of robots and/or automated Galileo-enabled platforms for surveillance, etc.;

- Development of EGNSS-based downstream solutions to support the resiliency and functioning of critical infrastructures in EU (e.g. digital infrastructure, drinking water supply and distribution, water waste management, healthcare, e-government, etc.);

- Development of EGNSS-based downstream solutions to support crisis management operations: drone-supported operations, improved and safer asset management systems, AR/VR for first responders, novel EGNSS smartphone-sized or wearable technologies, UneXploded Ordnance (UXO) risk assessment and clearance for humanitarian operations, etc.

Proposals shall also address cybersecurity threats in the description of the solution(s).

Proposals should, when relevant, integrate other data sources/services from other EU Space Programme components, in particular Copernicus and/or GOVSATCOM. Where appropriate, the beneficiaries are encouraged to interact with the relevant Entrusted Entities managing the Copernicus Emergency Management Service and/or the Copernicus Security Service.

The action focuses on the development of close to market EGNSS downstream applications through the realisation of large-scale demonstration and implementation projects, with the participation of relevant crisis and/or security practitioners.

Developed applications should have a clearly defined commercial potential and should respond to user needs. The solution(s) developed is/are expected to achieve TRL 7-9 by the end of the project.

Proposals should deliver new innovative applications, identifying and addressing existing gaps, leveraging the existing relevant sectorial regulations and policies and exploring how the solutions implemented using space data and services can address these regulations and be commercialised. Proposals shall also highlight the expected impact and define a clear market uptake strategy, presenting a credible post-project pathway to operations. The developed solutions may integrate other non-space technologies like IoT, big data, artificial intelligence, drones, 5G, augmented/mixed reality etc.

For proposals under this topic:

- A Business Plan and evidence of user engagement (i.e. crises and security practitioners, as mentioned in the eligibility conditions) is compulsory and should be provided as part of the proposal, to demonstrate the user need and sustainability of the project, and opportunities for wide adoption in Europe according to standards and operational needs;

- Participation of industry, in particular SMEs and midcaps, is encouraged;

- Participation of, or outreach to, entities based in countries without a space tradition is encouraged;

- Involvement of post-graduate researchers (engineers, scientists, and others) is also allowed, for example through professional work experience or through fellowships/scholarships when applicable.

Proposals addressing Galileo PRS (Public Regulated Service) related applications are not in the scope of this action.

Proposals shall seek to leverage and/or create synergies with relevant projects and activities funded under Horizon Europe Cluster 3: Civil security for society, reinforcing the cross-fertilization of research and innovation in this domain.

In this topic, the integration of the gender dimension (sex and gender analysis) in research and innovation content should be addressed only if relevant in relation to the objectives of the research effort.

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Budget[162]

	Budget line(s)	2024 Budget (EUR million)	2025 Budget (EUR million)
Calls			
HORIZON-CL4-INDUSTRY-2025-01			550.00
	from 01.020240		*550.00*
HORIZON-CL4-2025-SPACE-01		2.50	153.00[163]
	from 01.020240	*2.50*	*153.00*
HORIZON-CL4-2025-03			302.60
	from 01.020240		*302.60*
HORIZON-CL4-2025-04			217.00
	from 01.020240		*217.00*
Contribution from this part to call HORIZON-MISS-2025-05 under Part 12 of the work programme			19.46
	from 01.020240		*19.46*
Contribution from this part to call HORIZON-MISS-2025-04 under Part 12 of the work programme			20.27
	from 01.020240		*20.27*
Contribution from this part to call HORIZON-MISS-2025-06 under Part 12 of the work programme			1.94
	from 01.020240		*1.94*

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162 The budget figures given in this table are rounded to two decimal places.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for 2025.

163 To which EUR 5.00 million from the 'Climate, Energy and Mobility' budget will be added making a total of EUR 139.00 million for this call.

Contribution from this part to call HORIZON-MISS-2025-01 under Part 12 of the work programme			21.63
	from 01.020240		*21.63*
Contribution from this part to call HORIZON-MISS-2025-03 under Part 12 of the work programme			19.58
	from 01.020240		*19.58*
Other actions			
Public procurement			16.60
	from 01.020240		*16.60*
Indirectly managed action			100.50
	from 01.020240		*100.50*
Specific grant agreement			32.50
	from 01.020240		*32.50*
Prize			10.00
	from 01.020240		*10.00*
Expert contract action		0.50	
	from 01.020240	*0.50*	
Contribution from this part to Public procurement under Part 12 of the work programme			2.06
	from 01.020240		*2.06*
Contribution from this part to Indirectly managed action under Part 12 of the work programme			2.83
	from 01.020240		*2.83*
Contribution from this part to Expert contract action under Part 12 of the work programme			0.25
	from 01.020240		*0.25*

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Estimated total budget	3.00	1470.22

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