Cluster 4 Digital, Industry and Space – Work Programme 2025

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Disclaimer

This is a preliminary paper for discussion in the Horizon Europe Programme Committee. The draft topics included in this paper may be modified, expanded or reduced.

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Destination 6: Digital and industrial technologies driving human-centric innovation

OTHER ACTIONS NOT SUBJECT TO CALLS FOR PROPOSALS

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

Manufacturing

Indicative budget for section: 110M€

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

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

- Enable an industrial ecosystem[1] to double the volume of remanufactured components compared to 2021, for the sector and products considered;
- Increase significantly the industrial and operational capability to implement remanufacturing technologies for retaining, upgrading or adapting the function of products and components;
- Double the capacity to remanufacture in the EU, leading to enhanced industrial resilience, competitiveness and strategic autonomy; and
- Support skills and education capabilities for remanufacturing.

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

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.

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;
- Repurposing of products; such repurposing can take place at the level of components or systems;

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[1] ecosystems acknowledged under the European Industrial Strategies

- Measurement, verification and inspection approaches assuring high quality, traceability and compliance with quality standards;
- Stringent data sourcing, interoperability and processing, coupled to <u>robust</u> AI technologies; (leveraging on existing ontologies and through the implementation of the FAIR data principles[2]); and
- International standards, building on existing standards or contributing to future standardisation.

Proposals should consider:

- The EU regulatory framework, notably the Ecodesign for Sustainable Product Regulation[3] and the EU waste/sectoral legislation[4];
- 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 extended lifetime 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 make a corresponding contribution to the standardisation of lifecycle performance metrics. With regard to 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 materials and recyclable components; increased adaptability and exchangeability of components [inclusion of this option tbd].

[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 the earlier 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, appropriate contributions from Social Sciences and Humanities (SSH) are indispensable. [In this context, the Societal Readiness concept may be addressed, to improve the consideration of innovations to relevant societal needs, through stakeholder engagement, thereby increasing

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[2]   Turning FAIR into reality: https://ec.europa.eu/info/sites/default/files/turning_fair_into_reality_1.pdf
[3]   https://ec.europa.eu/environment/publications/proposal-ecodesign-sustainable-products-regulation_en
[4] https://environment.ec.europa.eu/topics/waste-and-recycling/waste-law_en

the potential for societal uptake.] 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-CL4-2025-INDUSTRY-01-02: Physical and cognitive augmentation in advanced manufacturing (Made in Europe Partnership) (RIA)

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

- Empower workers at all levels of the in factories, both individuals and teams, through breakthrough augmentation technologies embodying the next stage in human-machine interactions;
- Enhance, due to these technologies, flexibility of workers, inclusiveness and their safety and well-being in the industrial environment, leading to more attractive jobs in the EU and retaining talents from new generations (e.g. Generation Z);
- Foster the Human-Centric aspect of the Industry 5.0 model, through insights and improved understanding into how technology affects the working environment and the organisation (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 are key to support and empower the workforce, leading to more high-quality jobs and prosperity beyond efficiency. Augmentation technologies 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 mechatronic and/or photonic solutions 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 safety;
- Develop innovative AI methodologies to control the behaviour of the developed systems, to support humans and to interact and communicate with them, improving efficiency, sharing of knowledge, inclusiveness and accessibility;
- During the development of the new solutions, assess the needs of managers and workers at the beginning of the design phase and involve them at all stages, including after the development of a prototype;
- 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 need to also take into account Social Sciences and Humanities (SSH) elements 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, taking into account age and gender aspects.

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).

To address the requirements above, appropriate contributions from Social Sciences and Humanities (SSH) are indispensable. Where appropriate social partners may be considered.

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

HORIZON-CL4-2025-INDUSTRY-01-03: GenAI4EU: robust and trustworthy advanced digital technologies for higher automation, flexibility and resource-efficiency in European industry (Made in Europe Partnership) (RIA)

TRLs: starting at 4 and achieving 6

Portfolio approach: To ensure a balanced portfolio covering all three approaches in the scope below, grants will be awarded to applications not only in order of ranking, but also to at least one project for each approach, provided that the applications attain all thresholds.

Expected outcome: The manufacturing industry should benefit from the following outcomes, through the adoption of robust and trustworthy digital technologies, in particular Generative AI:

- Increased productivity by high quality, flexible and resource-efficient manufacturing, 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.

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.

<u>Scope</u>: Advances in AI provide several breakthroughs and the manufacturing sector should strongly benefit from increased levels of automation made possible 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 also use of manufacturing data available in production lines.

Proposals should address **one of the following areas**:

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 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.*

Proposals should accomplish these objectives by **one of the three approaches** below:

> The development and integration of generative Artificial Intelligence applications specifically designed for manufacturing, providing measurable advantages in one of more of these key areas: manufacturing cost, 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 **area 1** or **area 2**);

OR

- 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 **area 3**);

OR

- 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 **area 4**).

Proposals should indicate which approach they are targeting. Proposals may combine two of the 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 Artificial Intelligence techniques is encouraged for all the approaches, even when it is not the primary target of the proposal.

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

Research must build on existing standards or contribute to standardisation.

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.

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

Construction

Indicative budget for section: 13M€

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

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;
- Improve health and safety of construction workers.

Scope: Construction works on the building site often involve a variety of complex operations apart from the actual assembly of building elements itself. 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; 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. 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 existing industry-wide practices, such as Digital Twins and Building Information Modelling tools;
- Address the traceability of construction products and other items delivered to the site, installed on site, and removed.
- Integrate circular economy approaches, such as management as well as reduction 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.

Energy-intensive Industries – Decarbonisation and Energy Efficiency

Indicative budget for section: 130M€

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

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-integrated process flows to direct electricity driven process units in a plant;
- Contribute to achieving the EU climate neutrality objective as well as Europe's 2040 90% GHG reduction target;
- Achieve 25% energy savings compared to electrified heating systems;
- Enable the economic viability of the entire unit compared to the electrified heating systems and increase the competitiveness and resilience of the European process industry.

Scope: The input of heat often generated by fossil fuel combustion is the biggest consumer of energy in the process industries and responsible for 60% of process industries GHG emissions. The topic focuses on new electrically driven industrial processes where heating is replaced by the input of mechanical power or by electric forces. These electrified processes could represent a major reduction of GHG emissions as well as an important source of energy savings.

Proposals under this topic should:

- Demonstrate and/or integrate highly efficient electrically driven technologies substituting heating processes e.g., high gravity distillation, membrane technology, vapour recompressions, mechanical activation, electricity induced forces, electrochemical or photochemical processes;
- 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 advanced materials requirements and equipment design;
- Ensure process safety, sufficient flexibility and ease of process control;
- Showcase improved performance, scalability and cost efficiency of the proposed solution through, at least, one realistic use case that can be replicable with demonstrable economic return to electrified heating systems.

The inclusion of a GHG avoidance methodology[5] is recommended and should provide detailed descriptions of baselines and projected emissions reduction.

Proposals submitted under this topic should include a strong business case and sound exploitation strategy, as outlined in the introduction to this Destination. As project output a more elaborated exploitation plan should be developed, including preliminary plans for scalability, commercialisation and deployment (feasibility study, business plan and financial model) indicating the possible funding sources (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-CL4-2025-INDUSTRY-01-32: Green and resilient flexible production processes (Processes4Planet partnership) (RIA)

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 constantly adapt to energy input variations;
- Enable new flexible and efficient production processes, leading to productivity gains despite of volatile energy supply variations;
- Increase significantly material and energy efficiency while facing variations of the energy input when compared to state-of-the-art industrial processes;
- Contribute to achieving EU climate neutrality objective as well as Europe's 2040 90% GHG reduction target[6].

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 significant variations and the potential of energy storage is limited. The optimal use of the renewable energy supply will require that processes can perform smooth 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. As it is expected that most investments will be made in operations that run at maximum capacity to fulfil market demand, the combination (hybridation) of various decarbonisation technologies can also be considered.

Proposals under this topic should:

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[5] 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

[6] Europe's 2040 climate target, Staff Working Document, p. 59

- Redesign and modify existing processes to enable more flexibility in operation, or adaption, of process steps that limit the flexibility. If hybridation is considered the proposal should also include the redesign and modification of existing processes, or adaptation of process steps, to enable combination of technologies and energy sources;
- Redesign and modification of the 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 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.

Digital tools and advanced control to support the flexibility of the process can be elements of a solution but should not be the main focus of the proposal.

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

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[7] with the aim to provide a constant 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;
- Save up to 55% of final energy consumption and support stability and operational flexibility of the power grid, including implementation of storage solutions to buffer energy demand peaks;
- Enable the use of green energy labelling and documentation, scheduling of energy use and price compensation models to achieve optimal grid load;
- Prove the technical and economic feasibility of the integrated use of renewable energy carriers in industrial sites;
- Use industrial symbiosis and cross-sectorial cooperation to pave the way for achieving the UE Green Deal and 'Fit for 55' objectives.

Scope: There is a broad range of renewable energy carriers (e.g., electricity, hydrogen, solar heat, steam, etc) which can be utilised in plants and sites of 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 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 system in industrial sites can ensure systemic emission reduction. Sector coupling can increase the efficiency of

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[7] Industrial sites refers to industrial clusters, hubs, parks form by several energy intensive industries. Individual plants may be considered in those sectors e.g., cement where plants are not typically integrated in industrial sites

generation and enable solutions that avoid losses, supporting stability and efficiency of power systems.

Proposals under this topic should:
- Focus on the development of 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;
- Develop systemic solutions embracing industrial symbiosis;
- If relevant, contribute to further evolution of existing EU, MS or regionally funded Hubs4Circularity;
- Demonstrate full integration and use of advanced digital technologies from fields of distributed process control strategies, 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 footprint reduction by optimal integration of energy from renewable sources as well as providing demand side flexibility;
- Develop of skills to cope with continuous fluctuations and unexpected events.

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).

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

This topic implements the co-programmed European partnership Processes4Planet.

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

Expected outcome: Net-zero technology manufactures, energy intensive industries as well as engineering, procurement and construction firms (EPC) will benefit from the following outcomes:

- Enable the establishment of collaboration between equipment manufacturers, energy intensive industries, and engineering procurement and construction firms paving the way to strategic industrial cooperation;
- Foster win-win situations in which equipment manufactures and engineering companies 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[8] can be applied to a wide range of energy intensive sectors and processes. However, despite offering a compelling solution for energy intensive industries looking to optimise their energy usage and for net-zero technologies manufactures looking for new markets, net-zero technologies are rather underrepresented in the energy intensive industries ecosystems. To capture this opportunity, net-zero technology manufactures, and energy intensive industries should act now in strong collaboration to assess feasibility and explore options to integrate net-zero technologies into existing systems and processes.

Proposals under this topic should:

- Establish cooperation between net-zero technology manufacturers, energy intensive industries and engineering, procurement and construction firms for the smart integration (process redesign) of one or several net-zero technologies in specific processes or sectors within the energy intensive industries;
- Analyse possible options given the variable availability, prices of electricity and grid capacity. Options should consider what are the technical challenges and how do the different options relate to each other. Options should ensure if relevant optimal system integration of complementary solutions; and examine which options are for the different companies the most attractive to implement;
- Redesign and propose the necessary modifications of processes for the efficient and flexible incorporation and the integration of net zero technologies in existing industrial plants;
- Base themselves on a sound techno-economic analysis that confirms the economic viability in view of evolving regulatory frameworks;

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

- Establish an optimal balance between standardisation and modularisation to be able to provide tailored solutions at competitive prices;
- Take into account the need to avoid significant investments in equipment that will be redundant after the phasing out of the fossil fuels;
- 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 net-zero technology manufacturers to energy intensive industries and engineering, procurement and construction firms. Interoperability and secure and trusted data sharing between the stakeholders of the value chain should be ensured.

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 (tbc).

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

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 (DR), (plasma) smelting reduction, electric arc furnace (EAF), and electrolysis) by tackling fundamental problems 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 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 (mainly, 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 and safety of the finished product.

The strong dependence of the final steel quality from the variable quality of the raw materials, which are iron carriers and reductants, and the overall production process, has to be taken into account under the consideration of cost, overall and specific energy efficiency, CO_2 emissions and strategic resources (in particular strategic raw materials[9]).

Availability of high-grade raw materials, such as ore and scrap, will become critical in the transformation process as the demand for steel is projected to increase, creating a shift towards the use of low-grade raw materials, including waste products.

Projects are expected to contribute to all 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 level 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, to innovative installations for low CO2 iron and steel production;
- 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;

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

- 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;
- 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 a strong and wide collaborative approach between academia, industry (including SMEs) and research with the purpose to support: i) understanding, validating, and solving essential problems 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 2024/77410 on a Code of Practice on industry-academia co-creation for knowledge valorisation.

Proposals should:

- De-risk and extend operational windows of low CO2 iron- and steel making technologies considering system-level scenarios with different combinations of iron feedstock, reductants and aggregate states (solids, molecules, ions, protons, electrons);[11]
- Analyse and compare the use of direct reduced iron (DRI) with varying qualities and medium-/low-grade raw materials from primary and secondary sources to push for closing material cycles;
- Aim at taking advantage of pilot plants in Europe to create a correlation between real-world processes and laboratory-based research;
- Consider the upgrade of low-grade iron ores and iron-containing residues such as, but not limited to, calcination, pre-oxidation sintering/pelletisation and/or cold bonded agglomeration. Analyse the effects on the production process;
- Target the heterogeneity of available reductants in terms of type, sustainability and purity;
- Couple the analysis with plant design optimisation, and measures to mitigate risks during operation and on the medium/long term;
- Consider effects of solutions indicated in the outcomes of the proposed project on specific regional or country level conditions, such as water use and recovery;
- 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;

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

[11] D. Raabe, The Materials Science behind Sustainable Metals and Alloys, Chem. Rev. 2023, 123, 2436−2608, https://pubs.acs.org/doi/10.1021/acs.chemrev.2c00799

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

Multidisciplinary research activities must address at least one the following:

- Introduce sensors or develop new ones that may include a soft and integrated set of sensors. Use fast digital techniques for data collection, processing and analysis. Develop enhanced models.
- Identify skills for new solutions and use available results of previous dedicated projects, like ESSA12.
- Use input from finalised/ongoing research in heat recovery via heat exchange technologies that could produce a positive impact on the system energy balance.

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 European co-programmed Clean Steel Partnership.

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[12]http://smtp.eurofer.be/assets/Uploads/D7-2-Flyer-ESSA-Project-1.pdf#:~:text=The%20ESSA%20project%20will%20develop%20new%20modules%20and,new%20skills%20in%20industry%20training%20and%20VET%20systems.

Energy-intensive Industries – Circularity and Zero Pollution

Indicative budget for section: 60M€

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

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

- Prove the technical, economic, and environmental feasibility of the upcycling of secondary raw 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 secondary raw materials[13] 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, resource flows, logistics into business models of circular schemes;
- Consider the upcycling of secondary raw materials in an integrated way, including the development of better separation and sorting technologies as well as digitalisation and automatisation of the processes.
- Identify the processes and secondary raw materials which offer the highest upcycling potential and accordingly develop novel upcycling technologies and processes;
- Identify the likely impacts of the upcycling solutions with respect to economic and job creation potential, environmental footprint referring to the full set of planetary boundaries including freshwater intake and resilience aspects;
- Apply the safe and sustainable by design framework to guide the innovation process, in particular by minimising presences 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;

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

- Consider advanced monitoring and sensing in the process industries and 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 interoperability 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 with existing Hubs4Circularity financed at EU, national or regional level 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-CL4-2025-INDUSTRY-01-36: Safe and clean processing technologies and products (Processes4Planet partnership) (RIA)

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;
- Reduce the risk and negative health impacts at work by empowering employees and promoting a participatory approach;
- Increased knowledge on the industrial emission releases when it comes to emerging and less known groups of hazardous pollutants not regulated at EU level.

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:

- Develop novel processing technologies with 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 on the function of the materials, the production cost, the associated risk or recyclability;
- 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 linked to 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 should 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.

Enabling deployment of net zero energy intensive industries

HORIZON-CL4-2025-INDUSTRY-01-38: Synergies and mutual learning with national and regional initiatives in Europe on Industrial decarbonisation OR Thriving for human-centric, sustainable and resilient energy intensive industries (CSA)

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 under Horizon Europe and Innovation Fund 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[14] and should 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;15
- 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.

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[14] Mutual Learning Exercise on Industrial decarbonisation | Research and Innovation (europa.eu)
[15] Framework conditions for deployment and uptake of low-carbon technologies - Publications Office of the EU (europa.eu)

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[16], European[17], national or regional initiatives, funding programmes and platforms and in particular with the Horizon Europe Partnerships 'Processes4Planet' and 'CleanSteel' (including the steel side of the Research Fund for Coal and Steel programme), including any relevant major European initiative on industrial decarbonisation.

OR

Expected outcomes: Projects should contribute to the following outcomes:

- Contribute to the technological update needed for energy intensive industries to be at the forefront as a solution-providers of our society as well as an attractive employer for young talents;
- Enable via digital technologies such as artificial intelligence (AI) or robotics radical workplace innovation, optimising human-machine interactions and capitalising on the added value of human workers;
- Enable the development of innovative technologies in a human-centric way while reducing the risk and negative health impacts at work;
- Increase industrial resilience and sustainability by empowering rather than replacing workers;
- Incorporate new technologies and rethink production processes with respect to human-centric design, environmental- and societal impacts and resilience.

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 respect the boundaries of our planet 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. e.g., technologies:
  - supporting the interplay with multimodal communication for seamless interaction (human support decision, user modelling for decision support prediction, etc.);

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[16] IEA Working Party on Industrial Decarbonisation (WPID) - Home (sharepoint.com), NET-ZERO INDUSTRIES MISSION - Mission Innovation (mission-innovation.net), Climate Club, Just Transition Fund
[17] 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.

- facilitating remote presence and creating new capabilities for operating, co-design of processes and workplaces;
- supporting new forms of human-machine interaction by providing real-time feedback on personal performance and holistic intuitive workplace interfaces;
- co-designed in accordance with user expectations and the integration of workplace experience.

- Carry out initial assessment of the maturity of process automation, demonstrating its scope and implementation for Energy Intensive Process Industries, demonstrating implementation of digital technologies for a vertical and horizontal interconnectivity and operability;
- Improve the capacities of actors, for instance by developing a user-friendly digital European Industry information system providing permanent data access, based on FAIR, for a digital, data-driven and interconnected industry;
- Identify key demand-side innovations and user trends with impact on resource consumption of process industries;
- Identify and combine key skills to build an inclusive culture of co-creation and impact driven decision making according to Industry 5.0 principles;
- Develop an Industry 5.0 framework and engage with a wide range of stakeholders e.g., labour authorities, to raise awareness, attract talent, increase acceptance as well as gather and exchange good practices, and enable policy and regulations adaptation;
- Empower employees in a participatory approach for the reduction of risk and health issues at work;
- Dissemination and communication of information and knowledge to stakeholders from engaged societal areas (industry, policy, research and education, civil society), including the general public.

Topic supporting the goals for Processes4Planet and CleanSteel partnerships.

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

Raw Materials

Indicative budget for section: 100M€

HORIZON-CL4-2025-INDUSTRY-01-61: Recycling/Reuse/Recovery technologies for critical/strategic raw materials from EoL products (IA)

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[18] industrial value chains and strategic sectors which will alleviate critical raw materials dependency. Projects are expected to contribute to the following outcomes:

- Increase recovery rate of critical and strategic raw materials as set out in CRM Regulation[19] through developing raw materials recycling and re-use of components and/or products from end-of-life products.
- Improve cost effectiveness and 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 footprint.
- Improve responsible supply of raw materials to Europe in line with the EU principles for sustainable raw materials, 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[20], particularly to the 2030 benchmarks.

Scope:

- Actions should develop material efficient high-quality recycling and preparation for re-use 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.

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[18] To be updated after publication in the Official Journal
 Annex I and II
[19] To be updated after publication in the Official Journal
[20] To be updated after publication in the Official Journal

- Actions should focus on the whole chain of 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 recycling and re-use. Recycling where the recycled material is of lower quality and functionality than the original material (downcycling) should 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-CL4-2025-INDUSTRY-01-62: Strategic Partnerships for Raw Materials: Innovative Approaches for production of Critical Raw Materials (IA)

Activities are expected to 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:

- Strengthen EU cooperation with countries the EU established strategic partnerships on Raw Materials;
- 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, 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[21], particularly to the 2030 benchmarks.

<u>Scope:</u>

- Actions are expected to develop and demonstrate extraction and processing technologies to facilitate exploitation of the primary raw critical raw materials (minerals and metals only) for the EU to strengthen the EU supply chains.
- Actions have to collaborate with countries the EU has signed Strategic Partnerships on Raw Materials.[22] A project has to focus on one single geographical group among these four: South America (Argentina, Chile), Africa (Namibia, Zambia, DRC, Rwanda), Asia (Kazakhstan, Uzbekistan), Europe (Serbia, Greenland) and have at least one country from that group.
- The consortia should contain raw materials industry from at least X of the partner countries and raw materials users from the EU. Technology should be demonstrated on the resources of the partner country.
- 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 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.

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[21] To be updated after publication in the Official Journal

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

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

Activities are expected to 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:

- Sustainable Extraction and Processing Technologies: Projects will focus on the development of sustainable extraction and processing technologies for semiconductor raw materials. This may include novel methods for mineral extraction, ore beneficiation, purification, and recycling to reduce resource consumption, energy intensity, and environmental footprint throughout the production lifecycle;
- Circular Economy and Resource Efficiency: Projects will promote the adoption of circular economy principles and resource-efficient practices in the semiconductor raw materials industry. This may involve the development of closed-loop systems, material recovery processes, and waste valorisation techniques to minimize waste generation, optimize resource utilization, and enhance material recovery rates.
- Green Chemistry and Clean Production: Projects will prioritize the use of green chemistry principles and clean production techniques to minimize the use of hazardous chemicals, reduce emissions, and mitigate environmental impacts associated with semiconductor raw material production. This may include the development of alternative solvents, eco-friendly reagents, and low-carbon manufacturing processes;
- Supply Chain Resilience and Traceability: Projects will address supply chain challenges related to the sourcing, traceability, and sustainability of semiconductor raw materials. This may involve the implementation of blockchain technology, supply chain transparency mechanisms, and responsible sourcing practices to ensure ethical procurement, minimize supply chain disruptions, and enhance stakeholder trust.

Overall, projects funded under this topic will contribute to the development of a more sustainable and resilient semiconductor raw materials industry, aligning with the EU's goals for green transition, digital transformation, and resource efficiency.

Scope:

The semiconductor industry plays a vital role in powering technological advancements across various sectors, including electronics, telecommunications, and renewable energy. However, the production of semiconductor raw materials often involves resource-intensive processes and environmental challenges. This call aims to support the development of innovative solutions for sustainable production practices in the semiconductor raw materials sector. The scope of this call encompasses activities focused on research, technology development, and collaboration to address key challenges related to resource efficiency, environmental impact, and supply chain resilience.

Collaborative Innovation and Knowledge Sharing: Projects will foster collaboration among industry stakeholders, research institutions, and technology providers to accelerate the development and adoption of sustainable production solutions for semiconductor raw

materials. Knowledge-sharing activities, such as workshops, training programs, and networking events, will facilitate the exchange of best practices, lessons learned, and technical expertise across the semiconductor value chain.

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

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 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;
- Improve industrial viability, safety and environmental impacts of the operation in a way that leads to measurable improvements;
- Improve the diversification of the EU sourcing of critical raw materials from third countries; and
- Improve responsible supply of raw materials to Europe in line with the EU principles for sustainable raw materials, 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[23], particularly to the 2030 benchmarks.

Scope:

- The objective of the European Partnership on Raw Materials is to strengthen 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.[24] Particularly the following 2030 benchmarks:

  o 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, refining and recycling.

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[23] To be updated after publication in the Official Journal
[24] To be updated after publication in the Official Journal

- 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.
- 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[25], MERCOSUR, CARIFORUM, Andean Community and countries with which the EU has concluded strategic partnerships on raw materials[26]. 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 implementation of the SRIA that will identify the partnership's priorities;
  - 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
  - It should serve as a center for knowledge on partner countries' R&I activities in raw materials
- Proposals should pool the necessary financial resources from the participating national (or regional) research programmes with a view to implementing joint calls for transnational proposals resulting in grants to third parties. 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.
- 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

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[25] *African Union member states* includes countries whose membership has been temporarily suspended
[26] https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/raw-materials-diplomacy_en

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.

o 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 X mln for the whole duration of Horizon Europe. It is expected that the partnership organises joint calls on an annual base from 2022-2027 and therefore it should factor ample time to run the co-funded projects.

o The total indicative budget for the partnership is EUR X mln

o 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.

Innovative Advanced Materials

Indicative budget for section: 85M€

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

Activities are expected to start at TRL 3 and achieve TRL 5 by the end of the project – see General Annex B.

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

- 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%;
- Reduce maintenance costs by at least 30% of current prices;
- Improve performance of structural or functional components and products, combining longevity and efficiency;
- Break frontiers between functional and structural materials by applying a variety of monitoring applications enabling management tracking, self-powering and self-sensing, reducing maintenance costs and extending the lifetime;
- Speed up market uptake by upfront applying 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:

The inherent brittleness of cements and concretes, with low flexibility and poor stability in aggressive environments, imposes limits to the durability of these materials. Extending products' life (use phase) is a crucial 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, 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 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;
- 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 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, production, processing 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.

This topic is expected to support the future co-programmed European Partnership IAM4EU.

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

Activities are expected to start at TRL 2 and achieve TRL 6 by the end of the project – see General Annex B.

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

- Prolong lifespan and performance of components and products across sectors by the use of IAMs-based coatings, functionalised surfaces and sealings capable to withstand 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.

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 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, and electrical properties;
- Facilitate product recyclability and improve circularity;
- 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; aviation; rail;; infrastructures; construction, including HVAC[27] components;
- Reduce costs of production and manufacturing.

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% with respect 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;
- Use new digital technologies 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.

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.

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[27] Heating, Ventilation and Air Conditioning

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.

This topic is expected to support the future co-programmed European Partnership IAM4EU.

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

Expected Outcome:

- Leverage innovation procurement processes to stimulate innovation in advanced materials addressing specific needs or challenges faced by public procurers.
- 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 the areas of construction, electronics, mobility, and renewable energy in line with the needs identified in the Commission communication on Advanced Materials for Industry Leadership ([28]).

Scope: The use of advanced materials ([29]) 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.

([28]) See COM(2024) 98 final.

(29) Advanced materials are understood as materials that are rationally designed to have (i) new or enhanced properties, and/or (ii) targeted or enhanced structural features with the objective to achieve specific or improved functional performance. This includes both new emerging manufactured materials (high tech materials), and materials that are manufactured from traditional materials (low tech materials). OECD working description on advanced materials https://one.oecd.org/document/ENV/CBC/MONO(2022)29/en/pdf

The 2023 Energy Efficiency Directive ([30]) 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.

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 one or more of the following areas: electronics, energy, construction and mobility.

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, and the CRM Act, while having the potential to be exploited as widely as possible.

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-CL4-2025-INDUSTRY-01-45: Joint EU & MS activity on Advanced Materials Commons (IA)

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 long-term 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. modelling and characterisation) that support the workflows for the design and development of advanced materials;

([30]) Energy Efficiency Directive, (EU) 2023/1791

- 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 Member States' efforts. 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 Matrials for Industrial Leadership[31]. 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 aim is to create and interconnect resources that will contribute to the Materials Commons. These 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;
- Create trust in data sharing among stakeholders, including researchers, research organisations, industry and SMEs based on FAIR[32] 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;

As the funding rate for this action will be set to 50%, proposals should gather sufficient resources from EU Member States and Associated Countries to allow this specific challenge to be addressed appropriately. No more than one proposal will be funded. The applicants are encouraged to consider a project duration of around three years.

Proposals should address all of the following:

- The MS joint strategic vision and proposed joint programme of activities to establish a digital infrastructure and each partner's commitment to contribute to it;
- An agreement amongst partners on what they will achieve, supported by a concrete action plan;
- Exploring permanent solutions to ensure sustainability of the infrastructure;
- The process that will be followed, the necessary activities, and the research and innovation assets that will be mobilised;
- An inclusive approach that fosters contributions from both academia and industry, as contributors to and users of, the digital infrastructure;

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[31] COM(2024) 98 final
[32] Findable, Accessible, Interoperable and Reusable

- Complementarity and synergies with other funds (EU, public, and/or private) and innovation-related strategies/policies/programmes/plans at national and/or regional level (this includes in particular 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);
- Scalability at European level;
- Clear targets in terms of outcomes for the measures/activities underpinned by verifiable indicators.

Proposals may include the provisions and modalities for the competitive selection and funding (joint open calls implemented via financial support to third parties - FSTP). Such projects are expected to be similar to HE Innovation Actions (TRL 6-8) and should focus on the development and/or deployment of solutions that benefit the digital infrastructure. Each of these projects should aim to deliver concrete and tangible outcomes during the duration of the project. Such projects must work in a way that fosters interoperability and common standards.

Proposers may include the following concrete elements, which can eventually be built upon and become part of the infrastructure:

- Studies to develop 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 Materials Commons;
- Data sets, including effort to unify datasets through applying common data formats, taxonomies, ontologies, and complementing datasets with standardised metadata and documentation. This includes also connectors than enable the interconnection of existing databases and tools;
- Trust infrastructures to ensure access control, traceability and digital signatures of resources;
- Workflows and the creation of tools to enable the sharing and common use of workflows;
- Software tools with standard Application Programming Interfaces (APIs), including access control and maintenance of such tools, supporting all activities along the value chain such as discovery, modelling, characterisation, analysis and simulation;
- Infrastructure to allow remote access to such tools, as well as allowing access to third party tools through the common platform.

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.

Safe and Sustainable by Design

Indicative budget for section: 45M€

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

Activities are expected to start at TRL 4 and achieve TRL 7 by the end of the project – see General Annex B.

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 throughout society in Europe, supporting their competitiveness;
- Give the Commission, regulatory agencies, Member States and associated countries access to publicly available knowledge about PFAS alternatives;
- Support EU strategies, policies and legislation, such as future PFAS restrictions under the REACH Regulation[33] , as well as requirements for the EU Ecolabel[34], EU Taxonomy[35] and Eco-design for Sustainable Products Regulation (ESPR)[36], by making safe and sustainable alternatives to PFAS available;
- Demonstrate the applicability of the 'Safe and Sustainable by Design' framework[37] 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 (e.g., as coatings, lubricants, surfactants) for their technical functions (e.g., water and oil repellence in textiles and packaging, antiadhesion, thermal stability, etc.). Nevertheless, PFAS have been detected in contaminated groundwater, surface water and soil, the remediation of which is extremely costly or very difficult[38,39]. 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. In January 2023, five national authorities from Denmark, Germany, the Netherlands, Norway and Sweden submitted to the European

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[33] 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

[34] https://ec.europa.eu/environment/ecolabel/the-ecolabel-scheme.html

[35] https://ec.europa.eu/environment/publications/proposal-ecodesign-sustainable-products-regulation_en

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

[37] 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

[38] https://www.eea.europa.eu/en/european-zero-pollution-dashboards/indicators/pfas-contamination-and-soil-remediation-signal

[39] PFAS in European seas (Signal) (europa.eu)

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[40]. 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 in the following areas:

- **Electronics (**e.g., wires, cables, heat transfer fluids), where PFAS are currently used to provide a combination of technical functions such as heat stability, corrosion inhibition, non-flammability, lubrication, anti-adhesion.
- **Construction technologies** (e.g., sealants, adhesives, coatings) where PFAS are currently used to provide a combination of technical functions such as chemical resistance in harsh environments, water repellence, heat stability, anti-adhesion and 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 example their repellence to water, oil, solvents, fuels, liquid chemicals, but also heat stability and corrosion inhibition.

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;
- The selection of the PFAS alternatives to be developed should be justified with a technology and socio-economic analysis, as well as any remaining risks related to environmental sustainability;
- 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;
- FAIR data sharing should be addressed across the entire value chain;

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[40]   [Per- and polyfluoroalkyl substances (PFAS) - ECHA (europa.eu)](#)

- Communication actions to all stakeholders and specifically citizens about the benefits of the developed 'Safe and Sustainable by Design' alternatives to PFAS substances.

Proposals should indicate to which chapters of the Strategic Research and Innovation Plan for chemicals and materials[41] they will contribute.

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

Proposals should involve appropriate expertise in Social Sciences and Humanities (SSH), in particular in the socio-economic analysis of the relevant substance or application.

Proposals should indicate clearly how they will report data produced within the project activities when the 'One Substance One Assessment'[42] initiative enter come into force.

Collaboration with existing Open Innovation Test Beds (OITBs)[43] should be explored - where relevant.

International collaboration is encouraged.

Proposals should indicate how the results of the projects will be communicated and reported to the European Commission in the form of a yearly policy brief.

Projects should build on, or seek collaboration with, existing projects and develop synergies with other relevant European, national or regional initiatives, funding programmes and platforms. For example, with projects resulting from the topic HORIZON-CL4-2021-RESILIENCE-01-08[44] and the topic HORIZON-CL4-2022-RESILIENCE-01-23[45] - which address the development of coatings, safe- and sustainable-by-design production strategies for the development of coating and additives to substitute PFAS-containing coatings, the topic HORIZON-CL6-2023-ZEROPOLLUTION-02-2-two-stage[46] - addressing substances of very high concern - and the topic Horizon 2020 LC-GD-8-1-2020[47] (in particular the project ZeroPM) aiming to explore the feasibility of new or improved technologies and demonstrating innovative solutions to protect health, environment and natural resources from persistent and mobile chemicals - including PFAS. The challenge of developing PFAS alternatives should also align seamlessly with relevant topics under other Clusters of Horizon

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41   https://ec.europa.eu/info/research-and-innovation/research-area/industrial-research-and-innovation/key-enabling-technologies/advanced-materials-and-chemicals_en
42   https://ec.europa.eu/commission/presscorner/detail/en/ip_23_6413
43   https://ec.europa.eu/info/research-and-innovation/research-area/industrial-research-and-innovation/sustainable-production-processes_en
44 https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/horizon-cl4-2021-resilience-01-08
45 https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/horizon-cl4-2022-resilience-01-23
46https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/horizon-cl6-2023-zeropollution-02-2-two-stage
47 https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/lc-gd-8-1-2020

Europe, including topics under the Chips Joint Undertaking. Proposals should specifically allocate the necessary resources for collaboration with other relevant projects.

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

Activities are expected to start at TRL 3 and achieve TRL 6 by the end of the project – see General Annex B.

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

- Reduce significantly the cost to apply Life Cycle Assessment (LCA) at company level, including SMEs, at least by 50% reduction compared to current costs;
- Reduce time to apply LCA at early stage of design and facilitate decision making for companies and policy makers by applying user-friendly and cost-effective tools, methods and data;
- Ensure reliable and predictive advanced models, including assessment of planetary boundaries, that exploit machine learning and AI to address elements of inherent uncertainty;
- Support the implementation of EU strategies such as the proposed Eco-design for Sustainable Products Regulation (ESPR)[48], the EU Ecolabel[49], the Green Claims Directive proposal[50], the One-Substance-One-Assessment package[51], the Batteries Regulation[52], the Critical Raw Materials Act[53] and the Net Zero Industry Act[54] which will benefit from scientific evidence on sustainability throughout the entire life cycle of chemicals and materials.

Scope: Proposals should identify and fill the gaps in Life Cycle Assessment (LCA) tools and methods used for improving the environmental sustainability and efficiency of chemicals, materials and products. Particularly with a reference to Environmental Footprint (EF) methods, proposals should support the further development of LCA tools and methodologies that provide a holistic view of the entire product life cycle, from raw material extraction to end-of-life disposal, enabling data-driven decisions and actions for a greener and more sustainable future, while respecting planetary boundaries. These tools should be in

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[48] Proposal for Ecodesign for Sustainable Products Regulation
[49] EU Ecolabel
[50] Green Claims Directive proposal
[51] 'One substance, one assessment' chemicals assessment reform
[52] Batteries Regulation
[53] European Critical Raw Materials Act
[54] Net-Zero Industry Act

compliance with the Safe and Sustainable by Design[55] framework which is a Commission initiative for assessing the safety and sustainability of chemicals and materials and hence should be considered as a reference in the proposal.

Multidisciplinary research activities should address all the following:

- Develop advanced user-friendly LCA tools and methodologies applicable to the entire life cycle of chemicals, materials and products that consider the planetary boundaries;
- Develop LCA datasets, in particular building on EF methods, from design to end-of-life of a selection of at least three chemicals or materials and their resulting products. The selected substances should be emerging alternatives to substances of concern (as defined in the ESPR proposal) and should have a high socio-economic value;
- Provide solutions and guidance for LCA modelling of circularity scenarios for chemicals, materials and products, in alignment with EF methods and the SSbD framework;
- Develop appropriate solutions to fill in the identified data gaps, using advanced digital technologies, modelling, machine learning and artificial intelligence;
- Ensure that the tools and methods developed 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 to ensure a holistic SSbD assessment approach;
- Engage with the widder stakeholder community to promote a harmonised use of the proposed tools and methodologies;
- Feed relevant sustainability databases managed by the European Institutions, such as the European Platform on LCA[56] (EPLCA), with FAIR data and ensure new tools developed are findable by stakeholders.

Proposals should indicate to which chapters of the Strategic Research and Innovation Plan for chemicals and materials[57] they will contribute.

Proposals should involve appropriate expertise in Social Sciences and Humanities (SSH), in particular in the socio-economic analysis of the relevant substance or application.

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

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[55] 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
[56] European Platform on LCA | EPLCA
[57] https://ec.europa.eu/info/research-and-innovation/research-area/industrial-research-and-innovation/key-enabling-technologies/advanced-materials-and-chemicals_en

Risks from Chemicals[58] (PARC) and ensure complementarity with the SSbD toolbox[59] and also engage with the IRISS project[60] on the different value chains. Additionally, projects should build on the results obtained by the ORIENTING[61] project funded under the CE-NMBP-42-2020[62] topic which has aimed to operationalise methodologies for LCA and to advance the Product Environmental Footprint (PEF). Projects should also contribute to yearly policy briefs, for example under the ESPR. Proposals should allocate the necessary resources for the above activities.

Synergies with Horizon Europe missions as relevant are encouraged.

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[58] Partnership for the Assessment of Risks from Chemicals | Parc
[59] Safe and sustainable by design toolbox | Parc
[60] About IRISS
[61] Orienting EU Project
[62] Materials life cycle sustainability analysis

Textiles

[PLACEHOLDER TOPIC ON TEXTILES PARTNERSHIP- MORE INFORMATION ON 16 MAY MEETING]

Indicative budget for section: 10M€

Destination 4: Digital and Emerging technologies

Artificial Intelligence in Science

Indicative budget for section: 15M€

HORIZON-CL4-2025-DIGITAL-01-61: AI Foundation models in materials science (RIA)

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, 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[63];
- 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.

Scope: The objective of this call 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.[64]

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[65]. The purpose of this topic is to tap into the

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[63] COM(2024) 98 final
[64] Communication on boosting startups and innovation in trustworthy artificial intelligence | Shaping Europe's digital future (europa.eu)

potential promises of foundation models for science and be at the forefront of this technology development.

A foundation model[66] can integrate information from various modalities of data. This model can then be adapted to a wide range of downstream narrower, more specialised 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 subtask/scientific problem 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;
- Be adaptable to different problems in the domain of materials science;[67]
- 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;
- 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;
- Be based on a robust and reliable architecture, as any potential errors and problems would be propagated to the downstream applications.

Proposals should:

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[65] 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 | Earth data), Helmholtz (Helmholtz Foundation Model Initiative - Helmholtz Home), or the University of Michigan (Scientific Foundation Models (scifm.ai))

[66] 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

[67] An example in materials science, for inspiration only: *2401.00096.pdf (arxiv.org)

- 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[68] principles;
- Contribute to efforts to reach common standards for data formats, metadata, taxonomies and ontologies;
- Prove access to 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[69]) and thus enhance data-driven discovery in materials science;
- Identify 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, 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;
- Contribute to and exploit synergies with projects funded under the topic of EU Materials Commons infrastructure, under call topic HORIZON-CL4-[*fill-in final title*], as well as with other European and national initiatives to guarantee that solutions and tools developed are compatible with relevant European harmonization actions.

Multidisciplinary research activities between AI and domain scientists *[to specify which roles]* should address all of the following:

- Conceptualisation and planning: the scope, objectives and expected outcomes of the foundation model;
- Data identification, collection and management of (preferably diverse) datasets;
- Model development, validation, testing [and, as appropriate, model evaluation and benchmarking, as for example DOME[70]];
- Integration of domain knowledge into the model.

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.

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[68] Findable Accessible Interoperable Reusable data.
[69] Example for inspiration only: https://www.nature.com/articles/s41597-024-03039-z
[70] https://dome-ml.org/

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-DIGITAL-01-62: Facilitated cooperation for AI in Science (CSA)

<u>Expected Outcome</u>: Projects are expected to contribute to the following outcomes:

- Identify the long-term research and societal challenges where AI can make a significant meaningful breakthrough contributing to EU's competitive edge in science, through a Strategic Research and Innovation Agenda;
- Consolidate and structure the resources for AI in Science at European level, as a feasibility test towards a potential R&I initiative beyond the CSA that could optimise access to relevant data, infrastructure and talent for more and better AI-enabled research;
- Coordinate and strengthen the network and community of scientists and stakeholders for AI in Science, raise awareness and mobilise capacities for the European community of researchers and research organisations towards new paradigms of research with AI.

<u>Scope</u>: 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 preparing a possible future R&I partnership, distributed large-scale infrastructure and / or research facility.

The project should develop a Strategic Research and Innovation Agenda for AI in Science by mobilising large groups of 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, 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 fields identified that could be solved with AI.

The SRIA should also include areas where AI can improve generic scientific tasks e.g. virtual research assistant / tools for literature based discovery and improving / enabling research workflows 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 should also be explored.

The project should take into account the landscape of relevant AI technologies, availability of existing AI assets for scientific research, key AI-ready datasets (existing or needed), existing knowledge bases or knowledge graphs and research infrastructures in the SRIA process, as well as the preparation of the R&I initiative. An assessment of the computational

infrastructure (public and private) capacities for the AI-enabled scientific research, including HPC, should also be included.

The project should prepare a large-scale R&I initiative for AI in Science beyond the CSA, as a partnership, facility, or another instrument to be discussed and agreed upon with the Commission and the Member States and Associated countries. The instrument should offer resources and services to boost the integration of AI in different fields of science and AI uptake at larger scale in research processes.

Such a potential facility should also enable reproducibility and transparency and promote open science and open-source AI models, based on new paradigms for disseminating scientific knowledge in machine readable formats for increased transparency. Interoperability for data sharing should also be considered in the scenarios assessment. Ultimately, the potential facility should also enable cooperative sharing of AI models for scientific discovery and promote applications in science that can be also capitalised on in industry or other sectors. It should also contribute to identifying novel ways to capitalise and improve on the data, research infrastructures, networks, HPC or other conditions at EU level for AI-enabled science.

A feasibility test process should also be launched to pilot the potential institutional, governance and services of the ecosystem elements identified as priority, such as the potential facility, where the different scenarios would be tested together with a diverse range of users and stakeholders from the research community, industry, start-ups, civil society and policy-maker communities. This would provide real-world feedback to the different scenarios identified and draw lessons from the early results. Based on the feasibility test results, the project should develop a roadmap on the needed steps for an effective coordination between the domain and AI scientific communities.

The proposals should also provide coordination, dissemination and matchmaking for interdisciplinary AI-enabled science to facilitate stakeholder engagement, coordination of AI in Science initiatives across Europe and fostering of interdisciplinary cooperation for new knowledge creation and accelerated scientific discovery harnessing AI for scientific challenges, also in the prioritised fields of the SRIAs.

Additionally, developing human competences and skills, too, is of a crucial importance when developing the technology for science, and for adopting new AI-enabled scientific workflows. A strategy for skills development for AI in Science should be presented, associating social partners when relevant.

The CSA should develop a coordination platform to facilitate dissemination on AI in Science, organise awareness raising events for the benefits of AI in Science and create opportunities for exchanging on good practices, matchmaking AI scientists and domain scientists through, for instance, open calls for collaboration, and public / private funding leveraging.

The project should also address international cooperation in particular with other relevant actions on AI in Science like the Trillion Parameter Consortium or others.

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 and PRACE networks, ESFRI, AI Factories as well as the Partnership on AI, Data, Robotics and the ELLIS Network, Digital Innovation Hubs and other relevant initiatives should be achieved. Projects should also create synergies with collaborative platforms for sharing AI-enabled datasets, AI models and workflows like AI4EOSC and AI on Demand.

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. 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 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: 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 3: 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 4: 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 5: 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 2023 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 6: 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 7 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 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 (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 by increasing its capacity in designing, building, and operating its own 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 7: 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 EU 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. Space R&I activities will be driven by a pilot mission that will also 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 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 candidate 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 29 topics and actions, 14 remain fully open while 15 are proposed for limited participation.

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

Call – STRATEGIC AUTONOMY IN DEVELOPING, DEPLOYING AND USING GLOBAL SPACE-BASED INFRASTRUCTURE, SERVICES, APPLICATIONS AND DATA 2025

HORIZON-CL4-2025-SPACE-01

Heading 1 - Accessing Space

For this Heading, a prize is included under "Prizes" in the section "Other Actions" of this work programme.

In addition, proposals are invited against the following topic(s):

HORIZON-CL4-SPACE-2025-01-11: CSA on access to European spaceports

Specific conditions

Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 1 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 million.
Type of Action	Coordination and Support Action (CSA)
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). • Participation limited to legal entities established in Member States only, or to legal entities established in specified associated and/or other third non-EU countries in addition to Member States: 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 and the associated countries Norway, Iceland and the United Kingdom. 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.

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).
Not gender relevant	Yes

Internal (not published) – Policy trackers	Climate action: 0% Biodiversity: 0% Clean Air: 0% Digital Age: 40% Artificial Intelligence: 40% Sustainable Development Goals: 40% EC policy priorities 2025-2027: 100%
Internal (not published) – Flags	• KSO A – A competitive and secure data-economy • KSO A - Secure and cybersecure digital technology • KSO A - High quality digital services for all • KSO D – A resilient EU prepared for emerging threats
Internal (not published) – Synergies	• European Space Programme • European Defence Fund (EDF)

Expected Outcome: Common regulatory practices 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 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.

In order to achieve the expected outcomes, international cooperation is strongly encouraged.

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 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.

HORIZON-CL4-SPACE-2025-01-12: Digital solutions for autonomy for space transportation systems, design and simulation tools - Digital enablers and building blocks

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 1.0 and 3.0 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 million.
Type of Action	Research and Innovation Action (RIA)
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). • Participation limited to legal entities established in Member States only, or to legal entities established in specified associated and/or other third non-EU countries in addition to Member States: In order to achieve the expected outcomes, and safeguard the Union's strategic 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 United Kingdom. Proposals including entities established in countries outside the scope specified in the topic 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.
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.
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)[71].
Other points to raise	Topic under co-Programmed European Partnership

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[71] 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

Not gender relevant	Yes
Internal (not published) – Policy trackers	Climate action: 0% Biodiversity: 0% Clean Air: 0% Digital Age: 100% Artificial Intelligence: 40% Sustainable Development Goals: 0% EC policy priorities 2025-2027: 100%
Internal (not published) – Flags	• KSO A – A competitive and secure data-economy • KSO A - Industrial leadership in KET that work for people • KSO A - Secure and cybersecure digital technology • KSO A - High quality digital services for all • KSO D – A resilient EU prepared for emerging threats
Internal (not published) – Synergies	• European Space Programme • Digital Europe Programme (DEP) • European Defence Fund (EDF)

<u>Expected Outcome</u>: 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, enhanced ground-board high-data rate communication and multicore 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;

- 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: 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.

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).

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-SPACE-2025-01-13: Digital solutions for autonomy for space transportation systems, design and simulation tools – targeting demonstration

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 4.0 and 7.0 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 million.
Type of Action	Innovation Action (IA)
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).

- Participation limited to legal entities established in Member States only, or to legal entities established in specified associated and/or other third non-EU countries in addition to Member States:

In order to achieve the expected outcomes, and safeguard the Union's strategic 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, and Iceland and the United Kingdom. Proposals including entities established in countries outside the scope specified in the topic 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.
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.
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)[72].
Other points to raise	Topic under co-Programmed European Partnership
Not gender relevant	Yes
Internal (not published) – Policy trackers	Climate action: 0% Biodiversity: 0% Clean Air: 0% Digital Age: 100% Artificial Intelligence: 40% Sustainable Development Goals: 0% EC policy priorities 2025-2027: 100%
Internal (not published) – Flags	• KSO A – A competitive and secure data-economy • KSO A - Industrial leadership in KET that work for people • KSO A - Secure and cybersecure digital technology • KSO A - High quality digital services for all • KSO D – A resilient EU prepared for emerging threats
Internal (not published) –	• European Space Programme • Digital Europe Programme (DEP)

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[72] 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

Synergies	• European Defence Fund (EDF)

<u>Expected Outcome</u>: 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. 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, enhanced ground-board high-data rate communication and multicore 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;

- System/subsystem developments of 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.

<u>Scope</u>: 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.

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).

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

Heading 2 - 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 2bis - Using Space on Earth – Telecommunications and Earth Observation

Proposals are invited against the following topic(s):

HORIZON-CL4-SPACE-2025-01-31: Collaborative Earth Observation and Satellite telecommunication for Space solutions – Digital enablers and building blocks

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 1.0 and 5.0 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 million.
Type of Action	Research & Innovation Action (RIA)
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.
Legal and financial set-up of the Grant	The rules are described in General Annex G. The following exceptions apply:

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)[73].
Other points to raise	Co-Programmed European Partnership topic.
Not gender relevant	Yes
Internal (not published) – Policy trackers	Climate action: 0% Biodiversity: 0% Clean Air: 0% Digital Age: 100% Artificial Intelligence: 40% Sustainable Development Goals: 0% EC policy priorities 2025-2027: 100%
Internal (not published) – Flags	• KSO A – A competitive and secure data-economy • KSO A - Industrial leadership in KET that work for people • KSO A - Secure and cybersecure digital technology • KSO A - High quality digital services for all • KSO D – A resilient EU prepared for emerging threats
Internal (not published) – Synergies	• European Space Programme • Digital Europe Programme (DEP) • European Defence Fund (EDF)

Expected Outcome: 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.

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[73] 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

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 and ground segments being fully integrated into the terrestrial networks;

- New commercial services and applications enabling a digitalisation of space solutions;

- Advanced Earth observation payloads, technologies and processing means (on ground and in space), for all types of observation missions.

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: The areas of R&I, which needs to be addressed to tackle the above-mentioned expected outcomes are:

- R&I on End-to-End Mission capabilities (e.g., satellite network interconnectivity, seamless integration into the terrestrial networks), energy efficient connectivity and compatibility with 5G & 6G waveforms, (e.g., constellation and network software management system, optical communication), and satellites as network nodes in a distributed system (e.g., flexible and modular testbed, ubiquitous use of orbital resources, distributed computing);

- R&I on breakthrough digitalized technology steps, such as active and adaptive optics and/or higher power electronics (focal plane and RF back-ends and front-ends). Mature digital techniques and technologies to support novel operational approaches, miniaturised instruments design - including their digitalized on-board processing electronics- fit for affordable 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.

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. 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 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 is not a mandatory requirement.

HORIZON-CL4-SPACE-2025-01-32: Collaborative Earth Observation and Satellite telecommunication for Space solutions – Towards demonstration missions

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 2.0 and 6.0 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 million.
Type of Action	Innovation Action (IA)
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.

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].
Other points to raise	Co-Programmed European Partnership topic
Not gender relevant	Yes
Internal (not published) – Policy trackers	Climate action: 0% Biodiversity: 0% Clean Air: 0% Digital Age: 100% Artificial Intelligence: 40% Sustainable Development Goals: 0% EC policy priorities 2025-2027: 100%
Internal (not published) – Flags	• KSO A – A competitive and secure data-economy • KSO A - Industrial leadership in KET that work for people • KSO A - Secure and cybersecure digital technology • KSO A - High quality digital services for all • KSO D – A resilient EU prepared for emerging threats
Internal (not published) – Synergies	• European Space Programme • Digital Europe Programme (DEP) • European Defence Fund (EDF)

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

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[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

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 and ground segments being fully integrated into the terrestrial networks;
- New commercial services and applications enabling a digitalisation of space solutions;

- Advanced Earth observation payloads, technologies and processing means (on ground and in space), for all types of observation missions.

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: The areas of R&I, which needs to be addressed to tackle the above-mentioned expected outcomes are:

- R&I on End-to-End Mission capabilities (e.g., satellite network interconnectivity, seamless integration into the terrestrial networks), energy efficient connectivity and compatibility with 5G & 6G waveforms, (e.g., constellation and network software management system, optical communication), and satellites as network nodes in a distributed system (e.g., flexible and modular testbed, ubiquitous use of orbital resources, distributed computing);

- 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 ground-segment digital building-blocks), and smart multi-source EO intelligence information fusion (e.g., innovative intelligence information extraction and fusion; 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 to support space network capabilities.

Developments should aim at on-ground or in-orbit demonstration focusing on software and digital tools (e.g. algorithms), supporting HW (e.g. processors, electronics) from design to 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 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 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 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 is not a mandatory requirement.

Heading 3 - 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

Specific conditions

Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 10 million would allow the 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 million.
Type of Action	Research & Innovation Action (RIA)
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). • Participation of the JRC as member of the consortium permitted: 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.
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)[75].
Not gender relevant	Yes
Internal (not published) - Policy	Climate action: 100%

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[75]   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

trackers	Biodiversity: 0%
	Clean Air: 40%
	Digital Age: 40%
	Artificial Intelligence: 40%
	Sustainable Development Goals: 40%
	EC policy priorities 2025-2027: 40%
Internal (not published) - Flags	• KSO A – A competitive and secure data-economy
	• KSO A - High quality digital services for all
	• KSO B - Enhancing ecosystems and biodiversity
	• KSO B - Clean and healthy air, water and soil
	• KSO B - Sustainable food systems from farm to fork
	• KSO C - Climate change mitigation and adaptation
	• KSO C - Affordable and clean energy
	• KSO C - Smart and sustainable transport
	• KSO D – A resilient EU prepared for emerging threats
Internal (not published) - Synergies	• European Regional Development Fund (ERDF)
	• Programme for Environment and Climate Action (LIFE)
	• Innovation Fund
	• Erasmus + Programme
	• European Space Programme
	• Digital Europe Programme (DEP)
	• FAIRness of data
	• European Open Science Cloud (EOSC)
	• European Green Deal Dataspace
	• Destination Earth

<u>Expected Outcome</u>: 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:

- Improve the ability of Copernicus' models to assimilate new and other satellite observations (e.g. the Copernicus Sentinels, 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 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. 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.

HORIZON-CL4-SPACE-2025-01-42: **Copernicus Atmosphere Monitoring Service (CAMS) evolution: improved soil-vegetation-atmosphere modelling and data assimilation of atmospheric constituents**

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 3 million would allow the 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 million.
Type of Action	Research & Innovation Action (RIA)
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). • Participation of the JRC as member of the consortium permitted: 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.
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)[76].
Not gender relevant	Yes
Internal (not published) - Policy trackers	Climate action: 100% Biodiversity: 40% Clean Air: 40% Digital Age: 40% Artificial Intelligence: 40% Sustainable Development Goals: 40% EC policy priorities 2025-2027: 40%
Internal (not published) - Flags	• KSO A – A competitive and secure data-economy • KSO A - High quality digital services for all • KSO B - Enhancing ecosystems and biodiversity • KSO B - Clean and healthy air, water and soil • KSO B - Sustainable food systems from farm to fork • KSO C - Climate change mitigation and adaptation • KSO C - Affordable and clean energy • KSO C - Smart and sustainable transport • KSO D – A resilient EU prepared for emerging threats
Internal (not published) - Synergies	• European Regional Development Fund (ERDF) • Programme for Environment and Climate Action (LIFE) • Innovation Fund • Erasmus + Programme • European Space Programme • Digital Europe Programme (DEP) • European Defence Fund (EDF) • FAIRness of data • European Open Science Cloud (EOSC)

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[76] 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

	• European Green Deal Dataspace
	• Destination Earth

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;
- 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.

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.

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**

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 3 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 million.
Type of Action	Research & Innovation Action (RIA)
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). - Participation of the JRC as member of the consortium permitted: 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.

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)[77].
Not gender relevant	Yes
Internal (not published) - Policy trackers	Climate action: 100% Biodiversity: 40% Clean Air: 100% Digital Age: 40% Artificial Intelligence: 40% Sustainable Development Goals: 40% EC policy priorities 2025-2027: 40%
Internal (not published) - Flags	• KSO A – A competitive and secure data-economy • KSO A - High quality digital services for all • KSO B - Enhancing ecosystems and biodiversity • KSO B - Clean and healthy air, water and soil • KSO B - Sustainable food systems from farm to fork • KSO C - Climate change mitigation and adaptation • KSO C - Affordable and clean energy • KSO C - Smart and sustainable transport • KSO D – A resilient EU prepared for emerging threats
Internal (not published) -	• European Regional Development Fund (ERDF) • Programme for Environment and Climate Action (LIFE)

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[77] 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

Synergies	• Innovation Fund
	• Erasmus + Programme
	• European Space Programme
	• Digital Europe Programme (DEP)
	• European Defence Fund (EDF)
	• FAIRness of data
	• European Open Science Cloud (EOSC)
	• European Green Deal Dataspace
	• Destination Earth

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);
- 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 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 CO_2 and air pollutants in the atmosphere. Fires also change the vegetation and therefore affect the exchange of CO_2 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 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.

HORIZON-CL4-SPACE-2025-01-44: Copernicus Marine Environment Monitoring Service (CMEMS) evolution: new and innovative ocean data assimilation techniques

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5 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 million.
Type of Action	Research & Innovation Action (RIA)
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). • Participation of the JRC as member of the consortium permitted: 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.
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)[78].
Not gender relevant	Yes
Internal (not published) - Policy trackers	Climate action: 40% Biodiversity: 40% Clean Air: 0% Digital Age: 40% Artificial Intelligence: 40% Sustainable Development Goals: 40% EC policy priorities 2025-2027: 40%
Internal (not published) - Flags	• KSO A – A competitive and secure data-economy • KSO A - High quality digital services for all • KSO B - Enhancing ecosystems and biodiversity • KSO B - Clean and healthy air, water and soil • KSO B - Sustainable food systems from farm to fork • KSO C - Climate change mitigation and adaptation

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[78] 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

	• KSO C - Affordable and clean energy
	• KSO C - Smart and sustainable transport
	• KSO D – A resilient EU prepared for emerging threats
Internal (not published) - Synergies	• European Regional Development Fund (ERDF) • Programme for Environment and Climate Action (LIFE) • Innovation Fund • Erasmus + Programme • European Maritime and Fisheries Fund (EMFF) • European Space Programme • Digital Europe Programme (DEP) • Ocean sustainability and blue economy • FAIRness of data • European Open Science Cloud (EOSC) • European Green Deal Dataspace • Destination Earth

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 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 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.

HORIZON-CL4-SPACE-2025-01-45: Supporting the AI/ML digital transition of Copernicus Services

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 12 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 million.
Type of Action	Research & Innovation Action (RIA)
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). • Participation of the JRC as member of the consortium permitted: 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.
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)[79].
Not gender relevant	Yes
Internal (not published) - Policy trackers	Climate action: 40% Biodiversity: 40% Clean Air: 40% Digital Age: 100% Artificial Intelligence: 100% Sustainable Development Goals: 40% EC policy priorities 2025-2027: 40%
Internal (not	• KSO A – A competitive and secure data-economy

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[79] 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

published) - Flags	• KSO A - High quality digital services for all
	• KSO B - Enhancing ecosystems and biodiversity
	• KSO B - Clean and healthy air, water and soil
	• KSO B - Sustainable food systems from farm to fork
	• KSO C - Climate change mitigation and adaptation
	• KSO C - Affordable and clean energy
	• KSO C - Smart and sustainable transport
	• KSO D – A resilient EU prepared for emerging threats
Internal (not published) - Synergies	• European Regional Development Fund (ERDF)
	• Programme for Environment and Climate Action (LIFE)
	• Innovation Fund
	• Erasmus + Programme
	• European Space Programme
	• Digital Europe Programme (DEP)
	• FAIRness of data
	• European Open Science Cloud (EOSC)
	• European Green Deal Dataspace
	• Destination Earth

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.

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. 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, 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.

HORIZON-CL4-SPACE-2025-01-46: Innovative Earth observation services in support of maritime litter detection and ship source pollution policies

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 5 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 million – from Cluster 5
Type of Action	Innovation Action (IA)
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). • Participation of the JRC as member of the consortium permitted: 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.
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	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)[80].
Not gender relevant	Yes
Internal (not published) - Policy trackers	Climate action: 40% Biodiversity: 40% Clean Air: 0% Digital Age: 40% Artificial Intelligence: 40% Sustainable Development Goals: 40% EC policy priorities 2025-2027: 40%
Internal (not published) - Flags	• KSO A – A competitive and secure data-economy • KSO A - High quality digital services for all • KSO B - Enhancing ecosystems and biodiversity • KSO B - Clean and healthy air, water and soil • KSO B - Sustainable food systems from farm to fork • KSO C - Climate change mitigation and adaptation • KSO C - Affordable and clean energy • KSO C - Smart and sustainable transport • KSO D – A resilient EU prepared for emerging threats
Internal (not published) - Synergies	• European Regional Development Fund (ERDF) • Programme for Environment and Climate Action (LIFE) • Innovation Fund • Erasmus + Programme • European Maritime and Fisheries Fund (EMFF) • European Space Programme • Digital Europe Programme (DEP) • Ocean sustainability and blue economy

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[80] 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

	• FAIRness of data
	• European Open Science Cloud (EOSC)
	• European Green Deal Dataspace
	• Destination Earth

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:

- 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);
  - Monitoring of single-vessel methane emissions (MARPOL Annex VI);
  - Detection and Identification of the possible polluter using vessel unique spectral signature.
- Design and improvement of use of artificial intelligence for the identification of spills, sewage and garbage on the sea surface and their characteristics.

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.

Heading 4 - 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 5 - 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 6 - 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 7 - Acting in Space

Proposals are invited against the following topic(s):

HORIZON-CL4-SPACE-2025-01-21: ISOS Pilot Mission Detailed Design – Servicing component

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 7.0 and 8.0 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 million.
Type of Action	Research & Innovation Action (RIA)
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: • Participation limited to legal entities established in Member States only, or to legal entities established in specified associated and/or other third non-EU countries in addition to Member States: In order to achieve the expected outcomes, and safeguard the Union's strategic interests, autonomy and security, participation is limited to legal entities established in Member States, 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.
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.
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.
Internal (not published) – Policy trackers	Climate action: 0% Biodiversity: 0% Clean Air: 0% Digital Age: 40% Artificial Intelligence: 40% Sustainable Development Goals: 40% EC policy priorities 2025-2027: 100%
Internal (not published) – Flags	• KSO A - Industrial leadership in KET that work for people • KSO C - Circular and clean economy • KSO D – A resilient EU prepared for emerging threats
Internal (not published) – Synergies	• European Space Programme • European Defence Fund (EDF)
Not gender relevant	Yes
Other points to raise	• Protection of EU strategic interests • Standards
Page length of proposals	The page limit of the application is 60 pages.
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 inspection, life extension, upgrade, repair, reconfiguration, removal, and logistic 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.

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 EROSS IOD developments and provide services related to inspection, upgrade, repair, life extension including refuelling, delivery and exchange of payload, reconfiguration, relocation, and removal of assets in space.

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 servicing component, building on key EROSS IOD results;

- Elaboration of standards (e.g. interface, IOD/V modules, etc.) for the mission with other mission components (i.e., platform, logistic and SatApps) that are key for future institutional and commercial missions;

- 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.

<u>Scope</u>: To tackle the above expected outcomes, the following R&I actions must be addressed taking into account the provided technical annex[81]:

- R&I to complete detailed mission and system design[82] for the servicing component as part of the *EU ISOS>I* pilot mission. More specifically, the project should finalise the detailed design for this component continuing the developments performed in the project *EROSS IOD*; where applicable, available alternatives should be considered to ensure that required technologies shall reach the necessary TRL at the end of the project and this must be well demonstrated in the proposal.

- Contribution to the overall ISOS pilot mission design in close cooperation with other mission components[83] and the 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).

The developed system and operational concept as well as the work plan should also be compatible with the possibility for a standalone IOD 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 explore relevant and promising solutions derived in Horizon Europe, Horizon 2020 and European Innovations Council (EIC) relevant activities, in particular, the topics: Future Space Ecosystem (HORIZON-CL4-2021-SPACE-01-12/ 2022-SPACE-01-11/ 2023-SPACE-01-12). 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. Furthermore, proposed activities should be complementary to 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' 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 is not a mandatory requirement.

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[81] Guidance document for the Pilot Mission ISOS>I published on the EU funding and tenders portal (https:// …)
[82] Comparable with a mission design phase C according to ECSS-M-ST-10C
[83] see topics HORIZON-CL4-2025-SPACE-01-XX, HORIZON-CL4-2025-SPACE-01-XX, HORIZON-CL4-2025-SPACE-01-XX

HORIZON-CL4-SPACE-2025-01-22: ISOS Pilot Mission Detailed Design – HOST: Platform component

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 12.0 and 17.0 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 million.
Type of Action	Research & Innovation Action (RIA)
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: • Participation limited to legal entities established in Member States only, or to legal entities established in specified associated and/or other third non-EU countries in addition to Member States: In order to achieve the expected outcomes, and safeguard the Union's strategic interests, autonomy, and security, participation is limited to legal entities established in Member States, 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.
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.
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.
Not gender relevant	Yes
Internal (not published) – Policy trackers	Climate action: 0% Biodiversity: 0% Clean Air: 0% Digital Age: 40% Artificial Intelligence: 40% Sustainable Development Goals: 40% EC policy priorities 2025-2027: 100%
Internal (not published) – Flags	• KSO A - Industrial leadership in KET that work for people • KSO C - Circular and clean economy • KSO D – A resilient EU prepared for emerging threats
Internal (not published) – Synergies	• European Space Programme • European Defence Fund (EDF)
Internal (not published) – Other points to raise	• protection of EU strategic interests • standards

Page length of proposals	The page limit of the application is 60 pages.
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 inspection, life extension, upgrade, repair, reconfiguration, removal, and logistic 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.

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 the servicing component, IOD/V experiments and 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 platform component;

- Elaboration of standards (e.g. interface, IOD/V modules) for the mission with other mission components (i.e., servicing, logistic and SatApps) that are key for future institutional and commercial missions;

- Maturation of enabling technologies and innovative system and operational concepts, contributing to the pilot mission;

- Enhancing opportunities for IOD/V by actively promoting experiment plug and play on the platform;

- 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[84]:

- R&I to complete ISOS Pilot mission detailed mission[85] and system design 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[86] and refuelling capability (for the HOST and the hosted servicing component), that can be extended and reconfigured to meet different demands (e.g., 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[87] and the 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 and European Innovations Council (EIC) relevant activities, in particular, the topics: Future Space Ecosystem (HORIZON-CL4-2021-SPACE-01-12/ 2022-SPACE-01-11/ 2023-SPACE-01-12). 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. Furthermore, proposed activities should be

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[84] Guidance Document for the Pilot Mission ISOS>I published on the EU funding and tenders portal (https:// ...)

[85] Comparable with a mission design phase C according to ECSS-M-ST-10C

[86] Ability to receive functional upgrades through SatApps modules that will be connected to HOST via dedicated Universal Service Interfaces (USI)

[87] see topics HORIZON-CL4-2025-SPACE-01-XX, HORIZON-CL4-2025-SPACE-01-XX, HORIZON-CL4-2025-SPACE-01-XX

complementary to 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' 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 is not a mandatory requirement.

HORIZON-CL4-SPACE-2025-01-23: ISOS Pilot Mission Detailed Design – Logistics component

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 10 and 12 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 million.
Type of Action	Research & Innovation Action (RIA)
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: • Participation limited to legal entities established in Member States only, or to legal entities established in specified associated and/or other third non-EU countries in addition to Member States: In order to achieve the expected outcomes, and safeguard the Union's strategic interests, autonomy, and security, participation is limited to legal entities established in Member States, Norway, Iceland and the United Kingdom. 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.
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.
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.
Not gender relevant	Yes
Internal (not published) – Policy trackers	Climate action: 0% Biodiversity: 0% Clean Air: 0% Digital Age: 40% Artificial Intelligence: 40% Sustainable Development Goals: 40% EC policy priorities 2025-2027: 100%
Internal (not published) – Flags	• KSO A - Industrial leadership in KET that work for people • KSO C - Circular and clean economy • KSO D – A resilient EU prepared for emerging threats

Internal (not published) – Synergies	• European Space Programme • European Defence Fund (EDF)
Internal (not published) – Other points to raise	• Protection of EU strategic interests • Standards
Page length of proposals	The page limit of the application is 60 pages.
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 inspection, life extension, upgrade, repair, reconfiguration, removal, and logistic 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.

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 standards (e.g. interface, IOD/V modules) for the mission with other mission components (i.e., servicing, HOST and SatApps) that are key for future institutional and commercial missions;

- Maturation of enabling technologies and innovative system and operational concepts, contributing to the pilot mission.

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[88]:

- R&I to complete ISOS Pilot mission detailed mission and system design 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[89] and the 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 and European Innovations Council (EIC) relevant activities, in particular, the topics: Future Space Ecosystem (HORIZON-CL4-2021-SPACE-01-12/ 2022-SPACE-01-11/ 2023-SPACE-01-12/ 2023-SPACE-01-22). 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. Furthermore, proposed activities should be complementary to national activities and activities funded by the European Space Agency (ESA).

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[88] Guidance Document for the Pilot Mission ISOS>I

[89] see topics HORIZON-CL4-2025-SPACE-01-XX, HORIZON-CL4-2025-SPACE-01-XX, HORIZON-CL4-2025-SPACE-01-XX

Proposals are 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.

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-SPACE-2025-01-24: ISOS Pilot Mission Detailed Design – SatApps component

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 2.0 and 3.0 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 6.0 million.
Type of Action	Research & Innovation Action (RIA)
Eligibility conditions	The conditions are described in General Annex B.
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.
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. 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)[90].
Not gender relevant	Yes

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[90] 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

Internal (not published) – Policy trackers	Climate action: 0%
	Biodiversity: 0%
	Clean Air: 0%
	Digital Age: 40%
	Artificial Intelligence: 40%
	Sustainable Development Goals: 40%
	EC policy priorities 2025-2027: 100%
Internal (not published) – Flags	• KSO A - Industrial leadership in KET that work for people
	• KSO C - Circular and clean economy
	• KSO D – A resilient EU prepared for emerging threats
Internal (not published) – Synergies	• European Space Programme
	• European Defence Fund (EDF)
Other points to raise	• Protection of EU strategic interests
	• Standards
Page length of proposals	The page limit of the application is 60 pages.

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 inspection, life extension, upgrade, repair, reconfiguration, removal, and logistic 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.

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.

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 standards (e.g. interface, IOD/V modules) for the mission with other mission components (i.e., servicing, HOST and logistics) that are key for future institutional and commercial missions;

- Enhancing opportunities for IOD/V by actively promoting experiment plug and play on the HOST and prepared assets;

- 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[91]:

- R&I to complete ISOS Pilot mission detailed mission and system design[92] 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[93] and the pilot mission advisory group.

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[91] Guidance Document for the Pilot Mission ISOS>I published on the EU funding and tenders portal (https:// …)
[92] Comparable with a mission design phase C according to ECSS-M-ST-10C
[93] see topics HORIZON-CL4-2025-SPACE-01-XX, HORIZON-CL4-2025-SPACE-01-XX, HORIZON-CL4-2025-SPACE-01-XX

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 and European Innovations Council (EIC) 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 be complementary to 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' 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 is not a mandatory requirement.

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

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR XX and XX million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts. (the budget ranges will be set based on the final list of technologies)
Indicative budget	The total indicative budget for the topic is EUR 10 million (this figure will be adapted up or down depending on the final list of technologies).
Type of Action	Research & Innovation Action (RIA)
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: • Participation limited to legal entities established in EU Member States, Norway and Iceland only. In order to achieve the expected outcomes, and safeguard the Union's strategic assets, interests, autonomy, or security, namely EU strategic autonomy in space and the security and integrity of EU space assets, participation is limited to legal entities established in EU Member

	States, 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.
Technology Readiness Level	Activities are expected to achieve the TRL reported next to each technology development line, 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: • To ensure a balanced portfolio covering all the space EEE 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 space

	EEE 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. 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.
Not gender relevant	Yes
Internal (not published) – Policy trackers	Climate action: 0% Biodiversity: 0% Clean Air: 0% Digital Age: 0% Artificial Intelligence: 0% Sustainable Development Goals: 0% EC policy priorities 2025-2027: 100%
Internal (not published) – Flags	• KSO A - Industrial leadership in KET that work for people • KSO D – A resilient EU prepared for emerging threats
Internal (not published) – Synergies	• European Space Programme • Digital Europe Programme (DEP)

	• European Defence Fund (EDF)
Other points to raise	This topic is related to the protection of EU strategic interests.
Page length of proposals	The page limit of the application is 80 pages.

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.

HORIZON-CL4-SPACE-2025-01-72: HORIZON-CL4-YEAR-SPACE-XX-XX: Space Critical Equipment and Related Technologies for EU non-dependence

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR XX and XX million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts. (the budget ranges will be set based on the final list of technologies)
Indicative budget	The total indicative budget for the topic is EUR 10 million (this figure will be adapted up or down depending on the final list of technologies).
Type of Action	Research & Innovation Action (RIA)
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: • Participation limited to legal entities established in EU Member States, Norway and Iceland only. In order to achieve the expected outcomes, and safeguard the Union's strategic assets, interests, autonomy, or security, namely EU strategic autonomy in space and the security and integrity of EU space assets, participation is limited to legal entities established in EU Member States, 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. |
| *Technology Readiness Level* | Activities are expected to achieve the TRL reported next to each technology development line, 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:

- To ensure a balanced portfolio covering all the space equipment 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 space equipment 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.
	Beneficiaries will be subject to 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.
Not gender relevant	Yes
Internal (not published) – Policy trackers	Climate action: 0% Biodiversity: 0% Clean Air: 0% Digital Age: 0% Artificial Intelligence: 0% Sustainable Development Goals: 0% EC policy priorities 2025-2027: 100%
Internal (not published) – Flags	• KSO A - Industrial leadership in KET that work for people • KSO D – A resilient EU prepared for emerging threats
Internal (not published) – Synergies	• European Space Programme • Digital Europe Programme (DEP) • European Defence Fund (EDF)
Other points to	This topic is related to the protection of EU strategic interests.

raise	
Page length of proposals	The page limit of the application is 80 pages.

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;

- 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.

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

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 450.000 and 500.000 would allow the 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 0.5 million.
Type of Action	Research & Innovation Action (RIA).
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). • In order to achieve the expected outcomes of the action, namely international cooperation in the field of quantum space gravimetry data exploitation, the consortium must include at least one entity from the following country: Japan.
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.
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. 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)[94].
Internal (not published) – Policy trackers	Climate action: 100% Biodiversity: 0% Clean Air: 0% Digital Age: 0% Artificial Intelligence: 0% Sustainable Development Goals: 0% EC policy priorities 2025-2027: 100%
Internal (not published) – Flags	KSO C - Climate change mitigation and adaptation
Internal (not published) – Synergies	European Space Programme

<u>Expected Outcome</u>: 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.

<u>Scope</u>: 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.

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[94]   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 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.

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.

Heading 12 – Boosting Space through support to entrepreneurship

For a description of topics related to Cassini Entrepreneurship, please refer to please refer to "Indirectly managed actions by EUSPA" in the section "Other Actions" of this work programme.

Destination 6: Digital and industrial technologies driving human-centric innovation

Standardisation, Knowledge Valorisation and Industry 5.0

Indicative budget for section: 10M€

HORIZON-CL4-2025-HUMAN-01-61: Standardisation landscape analyses tool (CSA)

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[95], and the Communication European Economic Security Strategy[96]. 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.

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[97], 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

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[95] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022DC0031
[96] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023JC0020&qid=1687525961309
[97] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023H0498&qid=1678171117168

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. In addition, state of the art standards give new impetus for technological developments and help R&I actors comply with existing regulatory frameworks.

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-CL4-2025-HUMAN-01-62: Artificial Intelligence for knowledge valorisation (CSA)

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.

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-CL4-2025-HUMAN-01-63: Value creation pilots for scaling up innovative solutions (CSA)

Expected Outcomes: 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 testing and experimentation phase may use different methodologies (randomised control trials, foresight) and involve appropriate networks and infrastructures (living labs, policy labs, digital hubs, testing and experimentation infrastructures etc).

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.

HORIZON-CL4-2025-HUMAN-01-64: Pilot initiatives on Technology Infrastructures (CSA)

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;
- 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.

[1] Reference to the report of expert group once it becomes available.

HORIZON-CL4-2025-HUMAN-01-65: Network of Industry 5.0 system innovation labs demonstrating incentives for Industry 5.0 (CSA)

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

- Increased investments in human-centricity, sustainability and resilience by companies;
- Shift in 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;
- 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: Proposals should elaborate on initiating a network of Industry 5.0 system innovation labs that would orchestrate learning ecosystems for social, ecological and collaborative manufacturing, and new modes of production and consumption viable within planetary boundaries. The living labs would mobilise different players in the industrial ecosystem and communities to transform their organisation, production and consumption processes or value chains for the challenges of Industry 5.0 (sustainability, human-centricity, resilience). Synergies with the results and tools of the "Community of Practice on Industry 5.0" should be ensured.

Proposals should engage stakeholders from local industrial communities and ecosystems in transdisciplinary research and innovation activities in the system innovation labs, including:

- A process to identify and demonstrate systemic innovation incentives and enablers towards Industry 5.0 paradigm change. 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;

- Development of local or regional anticipatory innovation, imagination or sandboxing infrastructures that could catalyse industrial transformation processes towards Industry 5.0, considering long-term competitiveness, socio-ecological changes, and development of technology that empowers humans, and increases resilience and sustainability;

- Develop digital tools to support the agile information flow, rapid conversion and orchestration of information across the value chains, coupled with scenarios or simulations that can support decision-making to envision industrial ecosystems towards Industry 5.0. The tools should incorporate trans-sectoral approaches, linking energy, materials, transport, communities and also allow for individual and wider systemic views to be understood and balanced in the decision-making processes. The tools should also include the use of technologies like AI, AR/VR and be designed by engaging industrial stakeholders, technology developers together with a diverse range of players from R&I, fab labs or makerspaces, education, civil society, government and cultural and creative sectors;

- Prototype new learning pathways & transformation journeys for industrial ecosystem / value chain players as well as new incentives schemes to shift towards the new Industry 5.0 scenarios Industry 5.0 The transformation journeys should increase learning capacities of organisations, by both upgrading organisational practices, supporting the adoption of new technologies, but also work towards leadership enablement and new green and digital mindsets based on Industry 5.0 paradigm. The tools and learning pathways should be inspired by complexity theory, biomimicry approaches, behavioural aspects, open systems theory or open-source models and aim to achieve the human-centric, sustainable and resilient goals in industry5.0;

- Prototyping should also accompany diverse stakeholders towards developing new incentives schemes or enabling policies with government, education or community players in partnership with industry and / or social players, which would support the adaptation to the envisioned learning organisation and learning ecosystems and increase the potential for sustainable system transformation;

- Document the results and benefits of the developed infrastructures, tools and processes to inform and advise policymakers of their upscaling potential and enabling conditions;

- Additionally, a strategy for Industry 5.0 related soft skills and human-technology interaction skills should be presented, to encourage the uptake of the living labs results and the Industry 5.0 shift at scale.

Projects 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. They 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, as outlined in the introduction to this Destination.

International cooperation is encouraged, especially with counterparts in Australia, Canada and/or US, developing learning ecosystems and skills strategies for Industry 5.0.

OTHER ACTIONS NOT SUBJECT TO CALLS FOR PROPOSALS

Public procurement

Public procurement

1. 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 in direct management (COM).

Indicative budget: EUR 2 million from the 2025 budget.

2. 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 in direct management (COM).

Indicative budget: EUR 5 million from the 2025 budget.

3. 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.

Form of Funding: Procurement.

Type of Action: Public procurement, delegated action.

Indicative budget: EUR 0.5 million from the 2025 budget.

4. **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[98] and Multilateral Dialogue on Principles and Values for Research and Innovation[99]. 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.[100]

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[101]. 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:

- 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 foreseen **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.

Type of action: Public procurement

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[98] Strategic Autonomy and European Economic and Research Security - European Commission (europa.eu)
[99] 3b27e6ed-3d55-45f6-8ddc-98210bf90784_en (europa.eu)
[100] eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=COM:2024:26:FIN
101 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).

Grants to identified beneficiaries

1. Heading 6 of Space - Monitoring Space

HORIZON-CL4-SPACE-2025-01-61: Consolidated European commercial SST capabilities on sensors

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around 15 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 million.
Type of Action	Innovation Action (IA)
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: • Participation limited to legal entities established in Member States only. In order to achieve the expected outcomes, and safeguard the Union's strategic assets, interests, autonomy, or security, participation is limited to legal entities established in Member States 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.
Financial Support to Third Parties	The beneficiary may provide financial support to third parties. The maximum amount to be granted to each third party is EUR 4 million. This amount is justified by the fact that the foreseen projects carried out by third parties will target breakthrough techniques and technologies to disruptively improve SST sensors performance and/or operations. Third parties will be asked to co-finance 33% of the total amount of each project.
Technology Readiness Level	Third parties' activities are expected to start at 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.
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)[102].
Page length of proposals	The page limit of the application is 50 pages.
Not gender relevant	Yes
Internal (not	Climate action: 0%

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[102] 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

published) – Policy trackers	Biodiversity: 0%
	Clean Air: 0%
	Digital Age: 40%
	Artificial Intelligence: 40%
	Sustainable Development Goals: 100%
	EC policy priorities 2025-2027: 40% in a Europe fit for the digital age
Internal (not published) – Flags	• KSO A - Secure and cybersecure digital technology
	• KSO A - High quality digital services for all
Internal (not published) – Synergies	• European Space Programme
	• Digital Europe Programme (DEP)
	• European Defence Fund (EDF)

Expected Outcome:

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 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.

- 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 civil and defence 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 describing 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 operation robustness, to reduce response times, to reduce operation costs, amongst others.

- Tools, techniques, and technologies necessary to significantly improve the efficiency of existing commercial sensor's network by streamlining its scheduling and tasking.

- 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 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).

HORIZON-CL4-SPACE-2025-01-62: Consolidated European commercial SST capabilities on Services

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around 4 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 million.
Type of Action	Innovation Action (IA)
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: • Participation limited to legal entities established in Member States only. In order to achieve the expected outcomes, and safeguard the Union's

strategic assets, interests, autonomy, or security, participation is limited to legal entities established in Member States. 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.

Financial Support to Third Parties	The beneficiary may provide financial support to third parties. The maximum amount to be granted to each third party is EUR 400.000. This amount is justified by the fact that the foreseen projects carried out by third parties foresees to foster EU industry competitiveness to capture new SST markets in the civil and defence domains by proposing innovative and added-value SST services.
Technology Readiness Level	Third parties' activities are expected to start at 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.

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)[103].
Internal (not published) – Policy trackers	Climate action: 0% Biodiversity: 0% Clean Air: 0% Digital Age: 40% Artificial Intelligence: 40% Sustainable Development Goals: 100% EC policy priorities 2025-2027: 40% in a Europe fit for the digital age
Internal (not published) – Flags	• KSO A - Secure and cybersecure digital technology • KSO A - High quality digital services for all
Internal (not published) – Synergies	• European Space Programme • Digital Europe Programme (DEP) • European Defence Fund (EDF)
Not gender relevant	Yes
Internal (not published) – Other points to raise	This activity concurs towards the protection of EU space strategic interests.
Page length of proposals	The page limit of the application is 50 pages.

Expected Outcome:

Projects developed under this topic are expected to contribute to the following outcomes:

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[103] 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

- To prepare EU industry to capture new SST markets in the civil and defence domains by proposing innovative and competitive services.

- To reinforce European strategic autonomy and resilience in SST domain by leveraging commercial services enhancing EU SST operational effectiveness and avoiding redundancy.

- 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…

Scope:

The R&I areas which shall be addressed to tackle the above-mentioned expected outcomes are:

- Cost-effective techniques and technologies to substantially improve existing or future SST commercial services, complementary to the ones currently delivered by EU SST.

- Improvement of algorithms for added value 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.

- 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).

Prizes

1. Heading 1 of Space – Accessing Space - Prize for EU launch services

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
In order to achieve the expected outcomes, and safeguard the Union's strategic 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. Proposals including entities established in countries outside the scope specified in the topic 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.

The reward (budget):
The indicative budget for the prize is EUR 15 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

Type of Action: Inducement Prize in direct management (COM).

Indicative budget: EUR 15 million from the 2025 budget.

Indirectly managed actions

1. Indirectly managed actions delegated to ESA

ESA.1 - Heading 4 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).

Form of Funding: Procurement.

Type of Action: Public procurement, delegated action.

Indicative budget: EUR 18 million from the 2025 budget.

ESA.2 - Heading 2 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) or 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: Procurement.

Type of Action: Public procurement, delegated action.

Indicative budget: EUR 59 million from the 2025 budget.

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: Procurement.

Type of Action: Public procurement, delegated action.

Indicative budget: EUR 8.0 million from the 2025 budget.

2. Indirectly managed actions delegated to EUSPA

EUSPA.1 - Heading 5 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.

Indicative budget: EUR 15.0 million from the 2025 budget.

EUSPA.2 Tender evaluation, 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.

The funding of 0.5 million was already included under the 2023-2024 WP.

Appendix to action EUSPA.1
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-CL4-SPACE-2025-01-51: Space Data Economy

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 1.5 and 2.5 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 million.
Type of Action	Innovation Action (IA)
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 7-9 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: 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	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)[104].
Not gender	Yes

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[104] This [decision](https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/ls-decision_he_en.pdf) 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

relevant	
Internal (not published) - Policy trackers	Climate action: 40% Biodiversity: 0% Clean Air: 0% Digital Age: 40% Artificial Intelligence: 40% Sustainable Development Goals: 40% EC policy priorities 2025-2027: 40%
Internal (not published) - Flags	• KSO A – A competitive and secure data-economy • KSO A - Secure and cybersecure digital technology • KSO A - High quality digital services for all • KSO B - Enhancing ecosystems and biodiversity • KSO B - Clean and healthy air, water and soil • KSO C - Climate change mitigation and adaptation • KSO C - Affordable and clean energy • KSO C - Smart and sustainable transport • KSO C - Circular and clean economy • KSO D - Good health and high-quality accessible healthcare
Internal (not published) - Synergies	• European Regional Development Fund (ERDF) • Programme for Environment and Climate Action (LIFE) • Innovation Fund • Erasmus + Programme • European Space Programme • Digital Europe Programme (DEP) • Space Data Economy Strategy

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[105] 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

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[105] Space data relates to data and services provided by the EU Space programme components.

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. 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.

<u>Scope</u>:

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 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 <u>one</u> 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 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).

Proposals addressing Galileo PRS (Public Regulated Service) related applications are not in the scope of this action.

HORIZON-CL4-SPACE-2025-01-52: Innovative space-based applications enhancing capabilities for a resilient Europe

Specific conditions

Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 1.5 and 1.8 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 million.
Type of Action	Innovation Action (IA)
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). • This topic requires the active involvement, as beneficiaries, of at least two crisis or security practitioner[106] 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.
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 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	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

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[106] 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.

	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)[107].
Not gender relevant	Yes
Internal (not published) - Policy trackers	Climate action: 0% Biodiversity: 0% Clean Air: 0% Digital Age: 40% Artificial Intelligence: 40% Sustainable Development Goals: 40% EC policy priorities 2025-2027: 40%
Internal (not published) - Flags	• KSO A – A competitive and secure data-economy • KSO A - Secure and cybersecure digital technology • KSO D – A resilient EU prepared for emerging threats • KSO D – A secure, open and democratic EU society
Internal (not published) - Synergies	• Internal Security Fund (ISF) • The Border Management and Visa Instrument (BMVI) • European Space Programme • Digital Europe Programme (DEP) • European Defence Fund (EDF)

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

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[107] 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

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. When applicable

and upon request of the contracting authority, the beneficiaries may be asked to interact with the relevant Entrusted Entities managing the Copernicus Emergency Management Service and/or the Copernicus Security Service, with the purpose of giving feedback about that or those services.

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.

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..

<u>Form of Funding</u>: Other budget implementation instruments

<u>Type of Action</u>: Expert contract action

<u>Indicative budget</u>: EUR 0.50 million from the 2023 budget and EUR 1.00 million from the 2024 budget and EUR 0.50 million from the 2025 budget

2. Project monitoring and use of individual experts (Industry)

This action will support the use of appointed independent experts by HaDEA and RTD for the monitoring of running industry 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. Independent experts may additionally be tasked to advise on EU research and innovation policy, including on policies related to advanced materials, Industry 5.0 and the application of AI in R&I.

<u>Form of Funding</u>: Other budget implementation instruments

<u>Type of Action</u>: Expert contract action

<u>Indicative budget</u>: EUR 1.40 million from the 2023 budget and EUR 1.60 million from the 2024 budget and EUR 1.60 million from the 2025 budget

3. Project monitoring and use of individual experts (Digital)

This action will support the use of appointed independent experts by CNECT for the monitoring of running digital actions (grant agreement, grant decision, public procurement actions, financial instruments) funded under Horizon Europe and previous Framework Programmes for Research and Innovation, and include ethics checks, where appropriate, as well as compliance checks regarding the Gender Equality Plan eligibility criterion.

<u>Form of Funding</u>: Other budget implementation instruments

<u>Type of Action</u>: Expert contract action

Indicative budget: EUR 1.25 million from the 2023 budget and EUR 1.25 million from the 2024 budget and EUR 2.00 million from the 2025 budget

4. Project monitoring and use of individual experts (Digital)

This action will support the use of appointed independent experts by HADEA for the monitoring of running digital actions (grant agreement, grant decision, public procurement actions, financial instruments) funded under Horizon Europe and previous Framework Programmes for Research and Innovation, and include ethics checks, where appropriate, 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 0.60 million from the 2024 budget and EUR 0.60 million from the 2025 budget.