



HORIZON EUROPE

THE EU RESEARCH & INNOVATION PROGRAMME

2021 – 2027

Horizon Europe
Information Days –
Cluster 4

11-12 October 2023

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



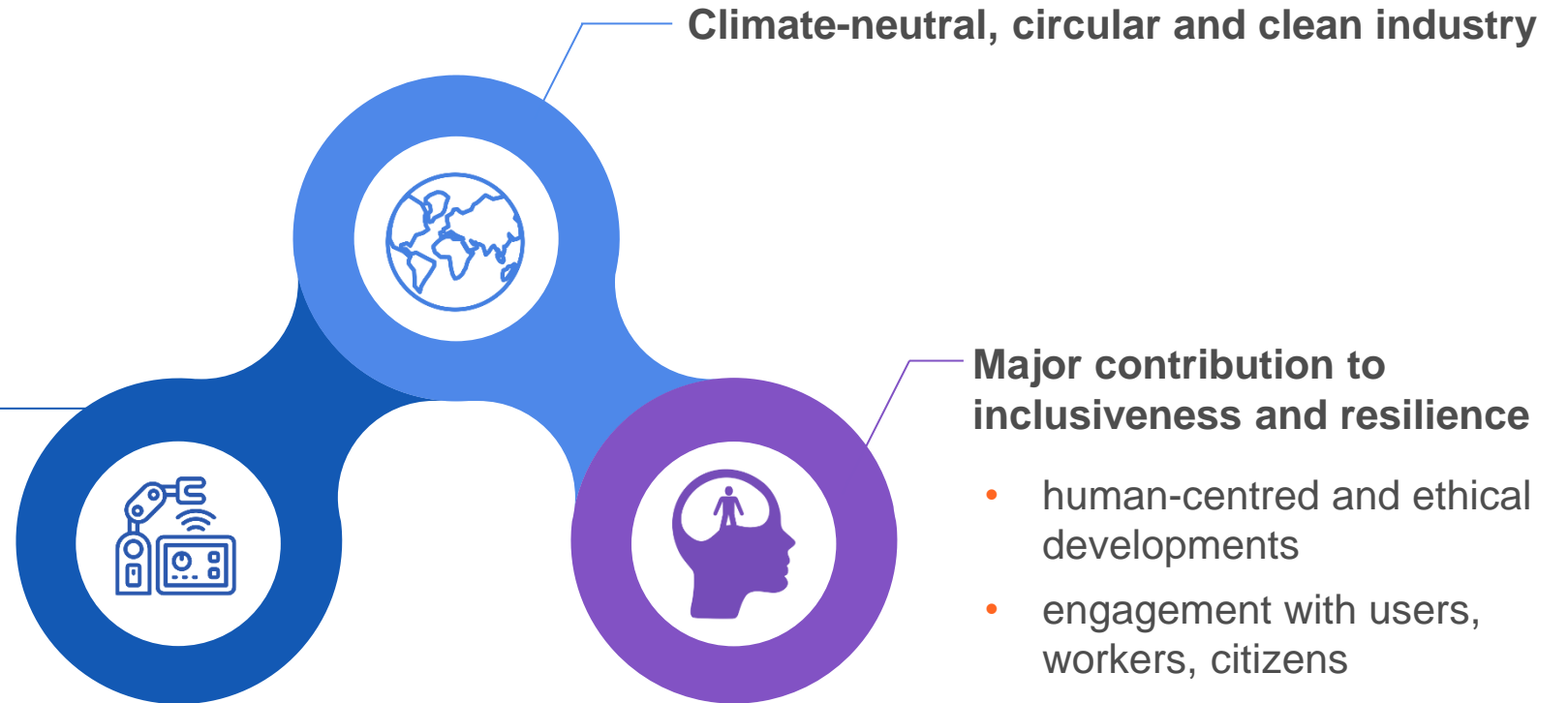
Cluster 4 - Vision

*Competitive technologies respecting the boundaries of our planet,
and reflecting human needs*

Green and digital 'twin' transitions

Industrial and digital transformation

- mastering technologies
- deploying technologies and technology infrastructures
- securing autonomy in strategic value chains



Major contribution to inclusiveness and resilience

- human-centred and ethical developments
- engagement with users, workers, citizens
- social innovation

Cluster 4 – Six Destinations

Destination 1: Climate neutral, circular, and digitised production

Destination 2: Increased Autonomy in Key Strategic Value Chains for Resilient Industry

Destination 3: World leading data and computing technologies

Destination 4: Digital and emerging technologies for competitiveness and fit for the green deal

Destination 5: Strategic autonomy in developing, deploying and using global space-based infrastructures, services, applications and data

Destination 6: A human-centred and ethical development and industrial technologies

Call - TWIN GREEN AND DIGITAL TRANSITION 2023

FUNDING RATES FOR PARTNERSHIP TOPICS

- Innovation Actions in co-funded partnerships Made in Europe, Processes for Planet and Clean Steel:
- 60% funding for with-profit entities, used in some topics
- Pilot started in 2021-22, continued in 2023-24

BUSINESS CASE

- Expected impact in terms of market opportunities
- ... and deployment capacities in EU in short to medium term

EXPLOITATION STRATEGY

- Identify needs, obstacles and necessary actions – e.g. matching value chains
- For TRL 7, credible strategy for full-scale deployment in EU
- Where relevant, skills addressed through training material that can be up-scaled, e.g. through ESF+

Manufacturing Industry

Call - TWIN GREEN AND DIGITAL TRANSITION 2024 – TWO STAGE

- HORIZON-CL4-2024-TWIN-TRANSITION-01-01: Bio-intelligent manufacturing industries (Made in Europe Partnership) (RIA)

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- HORIZON-CL4-2024-TWIN-TRANSITION-01-03: Manufacturing as a Service: Technologies for customised, flexible, and decentralised production on demand (Made in Europe Partnership) (RIA)
- HORIZON-CL4-2024-TWIN-TRANSITION-01-05: Technologies/solutions to support circularity for manufacturing (Made in Europe Partnership) (RIA)

WORK PROGRAMME 2023-2024 – DESTINATION 1 “CLIMATE NEUTRAL, CIRCULAR AND DIGITISED PRODUCTION”

HORIZON-CL4-2024-TWIN-TRANSITION-01

**Open: 19 Sep 2023
Deadline: 7 Feb 2024**

HORIZON-CL4-2024-TWIN-TRANSITION-01-TWO-STAGE

**Open: 19 Sep 2023
Deadline: 7 Feb (1st stage), 24 Sep 2024 (2nd stage)**

HORIZON-CL4-2024-TWIN-TRANSITION-01-01: Bio-intelligent manufacturing industries (Made in Europe Partnership) (RIA)

Expected Outcomes:

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

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

Procedure: Lump sum costs

Indicative budget: EUR 25 million

EU contribution per project: EUR 4-5 million

Type of Action: RIA

TRL: starting at 4 achieving 6

HORIZON-CL4-2024-TWIN-TRANSITION-01-03: Manufacturing as a Service: Technologies for customised, flexible, and decentralised production on demand (Made in Europe Partnership) (RIA)

Expected Outcomes:

- Easy access to flexible and decentralised manufacturing and remanufacturing capacities, especially for SMEs, reducing the required investments for manufacturers while enabling them to use more sustainable and circular facilities.
- Availability of automation, emerging and digital technologies for the servitisation of manufacturing assets assuring optimal performance, fast reconfiguration and upgrade with minimal downtime, remote monitoring and predictive maintenance via trusted, secure and interoperable cross-company data exchange.
- Improved value chain integration through the availability of technologies and models for securely exchanging and leveraging life-cycle data of servitised manufacturing assets, also in view of the reuse or recycle of assets, components, and materials.

Procedure: Lump sum costs

Indicative budget: EUR 35 million

EU contribution per project: EUR 5-7 million

Type of Action: RIA

TRL: starting at 4 achieving 6

HORIZON-CL4-2024-TWIN-TRANSITION-01-05: Technologies/solutions to support circularity for manufacturing (Made in Europe Partnership) (RIA)

Expected Outcomes:

- Assessing the environmental impact of their products, including the flow of products after their use to reduce product and raw material waste with the support of digital technologies;
- Achieving a considerable net reduction of the environmental impact through the use of innovative modelling and simulation software that allows transport and manufacture monitoring, ultimately driving the decarbonisation of the manufacturing industry;
- Facilitating the development and uptake of digital tools/platforms such as the EU Digital Product Passport, to increase traceability and characterisation of materials and products (e.g. at analytical research infrastructures), including environmental footprint and quality;
- Removing barriers in the uptake of the digital tools from the market will be addressed and the workforce will be empowered through new skills.

Indicative budget: EUR 36 million

EU contribution per project: EUR 4-6 million

Type of Action: RIA

TRL: starting at 4 achieving 6

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European
Commission

Call - TWIN GREEN AND DIGITAL TRANSITION 2024

Energy Intensive Process Industries

- HORIZON-CL4-2024-TWIN-TRANSITION-01-32: Optimisation of thermal energy flows in the process industry (Processes4Planet partnership) (IA)
- HORIZON-CL4-2024-TWIN-TRANSITION-01-34: Renewable hydrogen used as feedstock in innovative production routes (Processes4Planet Partnership) (RIA)
- HORIZON-CL4-2024-TWIN-TRANSITION-01-35: Turning CO₂ emissions from the process industry to feedstock (Processes4Planet partnership) (IA)

HORIZON-CL4-2024-TWIN-TRANSITION-01-32: Optimisation of thermal energy flows in the process industry (Processes4Planet partnership) (IA)

Expected Outcomes :

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

Indicative budget: EUR 30 million

EU contribution per project: EUR 10-15 million

Type of Action: Innovation Actions

TRL: starting at 5 achieving 7

HORIZON-CL4-2024-TWIN-TRANSITION-01-34: Renewable hydrogen used as feedstock in innovative production routes (Processes4Planet Partnership) (RIA)

Expected Outcomes :

- Enable the technical and economic feasibility of innovative production routes using hydrogen as feedstock demonstrated and validated at suitable scale against current state of art of industrial processes;
- Enable the efficient use and integration of hydrogen as a feedstock in innovative industry processes, considering also fluctuation of availability;
- Support the increased utilisation of renewable energy sources combined with digital technologies in the process industries, thereby contributing to the independency on fossil fuel and fossil fuel imports as put forward in the REPowerEU Plan;
- Contribute to EU Climate neutrality goal by proving the effectiveness of the GHG emission avoidance in the targeted process;
- Support Mission Innovation 2.0 NZEID on 'Net-zero Industries' and its ambition via networking and dissemination activities.

Indicative budget: EUR 20 million

EU contribution per project: EUR 8-10 million

Type of Action: Research and Innovation Actions

TRL: starting at 4 achieving 6

HORIZON-CL4-2024-TWIN-TRANSITION-01-35: Turning CO2 emissions from the process industry to feedstock (Processes4Planet partnership) (IA)

Expected Outcomes :

- Master the capture, purification and conversion of CO/CO2 from process industry point sources and utilization of renewable energy at reasonable costs to pave the road to the production of a large range of chemicals and materials;
- Showcase the system effectiveness for the GHG emission avoidance in the process industries as well as the scalability and the cost efficiency of the proposed concept;
- Enable the economic viability of the entire unit to compete with the existing state of the art production of the same or equivalent products (e.g., fossil-based production of chemicals and materials);
- Prove the efficient integration and use of renewable energy sources, and where relevant account for their intermittency and the possibility to offer demand-response flexibility;
- Enable the increase of the competitiveness and resilience of the European process industry.

Indicative budget: EUR 30 million

EU contribution per project: EUR 10-15 million

Type of Action: Innovation Actions (60% funding)

TRL: starting at 5-6 achieving 7

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Circularity and Zero Pollution in process industries

- HORIZON-CL4-2024-TWIN-TRANSITION-01-38: Hubs for circularity for industrialised urban peripheral areas (Processes4Planet partnership) (IA)
- HORIZON-CL4-2024-TWIN-TRANSITION-01-41: Breakthroughs to improve process industry resource efficiency (Processes4Planet partnership) (RIA)

HORIZON-CL4-2024-TWIN-TRANSITION-01-38: Hubs for circularity for industrialised urban peripheral areas (Processes4Planet partnership) (IA)

Expected Outcomes :

- Demonstrate zero urban waste in a near commercial scale environment through systemic resource recovery as alternative material feedstock; a decrease of GHG emissions is also expected by explicitly addressing the reduced flow of goods (due to geographical proximity);
- Reduce the freshwater consumption of the urban area by 50%, and re-use 90% of the solid waste generated by the water treatment;
- Citizens living in cities will benefit from a healthier environment through industrial/urban symbiosis by lowering emissions through circular and renewable energy sources and waste reduction;
- Use urban/industrial symbiosis and cross-sectorial cooperation to pave the way for achieving the EU Green Deal and “Fit for 55” package objectives: providing recommendations for optimized regional framework conditions by highlighting barriers and suitable innovation-oriented policies and looking for possible synergies with the cities selected by the Cities Mission.

Indicative budget: EUR 40 million

EU contribution per project: EUR 15-20 million

Type of Action: Innovation Actions

TRL: starting at 5 achieving 7

HORIZON-CL4-2024-TWIN-TRANSITION-01-41: Breakthroughs to improve process industry resource efficiency (Processes4Planet partnership) (RIA)

Expected Outcomes :

- Achieve a step change in the process industry's green transformation by improving by at least 30 % the industrial processes resource efficiency compared to the state of the art;
- Enable the techno-economic feasibility of novel technologies and processes, demonstrated and validated at suitable scale against current industrial processes to produce the same products;
- Overall positive environmental and if relevant health and safety impact demonstrated;
- Reduce the CO2 intensity of the process industry and contribute to the climate neutrality goal;
- Enable the increase of the competitiveness and resilience of the European process industry.

Indicative budget: EUR 30 million

EU contribution per project: EUR 10-12 million

Type of Action: Research and Innovation Actions

TRL: starting at 4 achieving 6

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Clean steel

- HORIZON-CL4-2024-TWIN-TRANSITION-01-44: Digital transformation and ensuring a better use of industrial data, which can optimise steel supply chains (Clean Steel Partnership) (IA)
- HORIZON-CL4-2024-TWIN-TRANSITION-01-46: CO2-neutral steel production with hydrogen, secondary carbon carriers and electricity OR innovative steel applications for low CO2 emissions (Clean Steel Partnership) (RIA)

HORIZON-CL4-2024-TWIN-TRANSITION-01-44: Digital transformation and ensuring a better use of industrial data, which can optimise steel supply chains (Clean Steel Partnership) (IA)

Expected Outcomes :

- Awareness and effectivity for total safety and CO2 reduction through digital transition with better use of data.
- Extension of inline and real-time tools to monitor the process and stay into the optimal window.
- Enhancement of the in-line classification of feedstock and intermediate products through the continuous analysis of composition and bulk properties by considering the assembly of sensors, specific models, and advanced data processing.
- Increasing data sharing in steel plants to realise the seamless digital integration of the value chain and the interoperability of systems and tools by implementation of existing and enhanced standardised protocols.
- Novel sensors and models for real-time process control and energy forecasting to match demand and offered energy mix. The expected outcome is an enhanced merging of planning activities and approaches to run plant processes.
- Application of digital technologies and methods to develop decision-supported planning and process monitoring tools operable in offline or online modes.
- Traceability of materials and process information throughout the value chain for product quality, efficiency and process integration control (including multi-scale modelling of structure, and structure vs. properties correlations).

Procedure:

Use of **lump sum** approach.

Indicative budget: EUR 10 million

EU contribution per project: EUR 3-5 million (lump sum)

Type of Action: Innovation Actions (70% funding)

TRL: Start at 5 and achieve 6-7

HORIZON-CL4-2024-TWIN-TRANSITION-01-46: CO2-neutral steel production with hydrogen, secondary carbon carriers and electricity OR innovative steel applications for low CO2 emissions (Clean Steel Partnership) (RIA) / Slide 1/2

Expected Outcomes for 1st technology area:

Enhance CO2-neutral steel production with hydrogen, secondary carbon carriers and electricity:

- Introduce the use of secondary carbon sources in the steelmaking process.
- Combine the reduction of fossil carbon-related emissions with improvements in the materials and energy flows.
- Adapt to the use of low-CO2 hydrogen for heating in rolling, shaping, and heat treatment, considering also a coupling between hydrogen and/or electrical heating and fuel-flexibility concepts.
- Valorisation of non-conventional ores, e.g., in (photo)electrolysis processes.
- Substitution of fossil sources as carburiser and slag foaming agent in electric arc furnaces (EAF).
- Pre-reduction or reduction smelting with hydrogen and/or electricity for residues.
- Identify and analyse the amount of European existing technologies that could be efficiently retrofitted to CO2 neutral solutions (e.g. H2 DRI).

HORIZON-CL4-2024-TWIN-TRANSITION-01-46: CO2-neutral steel production with hydrogen, secondary carbon carriers and electricity OR innovative steel applications for low CO2 emissions (Clean Steel Partnership) (RIA) / Slide 2/2

Expected Outcomes for 2nd technology area:

Contribute to innovative steel applications for low CO2 emissions:

- New or modified alloying concepts, downstream processing and manufacturing processes for new clean steel grades.
- Manufacture steels with improved life cycle contributions to CO2 emissions reduction.
- Clean steel grades with improved in-use properties.
- Innovative simulation methods and tools to accelerate development of clean steel grades.
- Advanced grades of steel for use in efficient high temperature processes.
- Advanced grades of steel for use in the railway's systems of high-speed trains.
- High-performance structural steels not containing critical strategic elements and/or characterized by increased tolerance to the content of contaminants in the scrap.
- Steel grades with increased use of low-quality input materials.

Procedure:

To ensure a **balanced portfolio** covering the **two technology areas**, grants will be awarded to at least one project in each technology area (if all thresholds attained).

Indicative budget: EUR 20 million

EU contribution per project: EUR 3-5 million

Type of Action: Research and Innovation Actions

TRL: Start at 4 and achieve 5-6

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HORIZON-CL4-2024-TWIN-TRANSITION-01-TWO-STAGE

Open: 19 Sep 2023

Deadline: 7 Feb (1st stage), 24 Sep 2024 (2nd stage)

A new way to build, accelerating disruptive change in construction

- HORIZON-CL4-2024-TWIN-TRANSITION-01-12: Enhanced assessment, intervention and repair of civil engineering infrastructure (RIA)

HORIZON-CL4-2024-TWIN-TRANSITION-01-12: Enhanced assessment, intervention and repair of civil engineering infrastructure (RIA)

Expected Outcomes :

- Extension of the service life of civil engineering infrastructure, which reduces the need to replace infrastructure, and ultimately in an overall lower CO-2 footprint for such infrastructure
- Faster and more accurate detection and analysis of maintenance and repair needs in existing infrastructure
- Reduction in time between the occurrence of infrastructure maintenance and repair-related problems and the on-site intervention
- Reduced risks to health and safety of workers in carrying out tasks linked to infrastructure maintenance and repair
- Cost savings in terms of both operational costs and deferred or avoided capital investment costs

Procedure: Lump sum costs

Indicative budget: EUR 12 million

EU contribution per project: EUR 5-6 million

Type of Action: RIA

TRL: achieve 6

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