

**EN**  
**Horizon 2020**  
**Work Programme 2018-2020**

Building a low-carbon, climate resilient  
future: Green Deal call

Version 12 June 2020

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## Introduction

This Call is a direct contribution to the European Commission's European Green Deal Communication<sup>1</sup>, which sets out the path for a fundamental transformation of Europe's economies and societies. The Call responds to the pressing need to confront the climate crisis and provide greater protection for the continent's unique environment and biodiversity. At the same time, the Call addresses the equally urgent challenge of aiding Europe's recovery in the wake of the Covid-19 crisis, contributing directly to the EU's Recovery Plan for Europe<sup>2</sup>.

The Call's ambition matches the magnitude of the task: its goal is to use research and innovation to kick-start the environmental, social and economic transformations required to tackle the climate challenge, while helping the EU recover from the Covid-19 crisis, and increasing its resilience and capacity to respond to such novel threats in the future. Science, knowledge and evidence – not short-term crisis contingencies – provide the compass for charting the path towards more resilient economies, societies and governance systems, and for designing a new, green growth strategy for the EU, embracing digitisation and enhancing Europe's competitiveness.

The challenge is not just technical: it requires profound adaptations in life-styles and behaviour. Research and innovation offers unique opportunities to reach out and engage with Europe's citizens in novel ways, identifying and addressing specific vulnerabilities with a view to ensuring that no one is left behind by the transition. Mainstreamed throughout this Call, these aspects are also covered via specific actions, aiming for improved societal relevance and impact.

In addition, the Call underlines the need to continue building Europe's knowledge systems and infrastructures. It stresses the importance of international cooperation, addressing the needs of less-developed nations, particularly in Africa, in the context of the Paris Agreement as well as the Sustainable Development Goals (SDGs).

This last Call under Horizon 2020 differs in important respects from previous ones. Given the immediacy of the twin challenges it addresses, it aims for clear, discernible results in the short- to medium-term, embedding them in a perspective of long-term change. Interventions are more targeted, resulting in fewer, but at the same time larger and more visible, actions, with a focus on rapid scalability, dissemination and uptake. Demonstrating the feasibility of new technologies and solutions, and paving the way to their commercialization, is key but experimentation, social innovation and citizen engagement are just as critical.

As spelled out in further detail just below, the Call is broken down into eight principal areas – reflecting the structure of the European Green Deal –, each comprising one to three broad, thematic topics. Alongside these eight core areas, the Call features three supporting areas, on knowledge systems and infrastructures, citizen engagement and international cooperation, respectively.

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<sup>1</sup> *The European Green Deal, EC COM (2019) 640 final, Brussels, 11 December 2019.*

<sup>2</sup> *Europe's moment: Repair and Prepare for the Next Generation, EC COM (2020) 456 final, Brussels, 27 May 2020*

*Area 1: Increasing climate ambition: cross sectoral challenges*

In line with the long-term vision for climate neutrality set out in the *Clean Planet for All* Communication,<sup>3</sup> this area addresses research and innovation needs for climate mitigation and adaptation. The emphasis lies on three specific sectors where such needs are particularly acute, namely: (1) the devastating impacts of recurrent wildfires across Europe; (2) the pivotal role of Europe's cities in driving climate action and related social and governance innovation and; (3) the equally important responsibility of Europe's regions to accompany and assist their communities and economies in adapting to climate change.

The area comprises the following topics:

- 1.1. Preventing and fighting extreme wildfires with the integration and demonstration of innovative means
- 1.2. Towards climate-neutral and socially innovative cities
- 1.3. Climate-resilient innovation packages for EU regions

*Area 2: Clean, affordable and secure energy*

The production and use of energy accounts for more than 75% of the EU's greenhouse gas emissions; therefore, further decarbonising the energy system is fundamental for reaching the climate targets set for 2030 and 2050. Renewable sources play a central role and their smart integration, using smart grids, power to X (like for instance hydrogen), storage solutions and corresponding networks, energy storage, and sector integration. Decarbonisation needs to take place at the lowest possible cost, while tackling energy poverty is critical for households unable to afford key energy services.

The area comprises the following topics:

- 2.1. Demonstration of innovative critical technologies to enable future large-scale deployment of offshore renewable energy technologies and their integration into the energy system
- 2.2. Develop and demonstrate a 100 MW electrolyser upscaling the link between renewables and industrial applications

*Area 3: Industry for a clean and circular economy*

Energy-intensive industries, particularly steel, chemicals and cement, are an essential part of Europe's economy and supply critical value chains. However, they also account for 20% of the EU's greenhouse-gas emissions, making their decarbonisation and modernisation a top priority. Following the recommendations of the High-Level Expert Group on Energy-Intensive Industries, the actions under this area support switching to alternative, climate-neutral energy and feedstock sources. Furthermore, in line with the EU's new industrial strategy,<sup>4</sup> they support adopting more

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<sup>3</sup> A *Clean Planet for All*, EC COM (2018) 773 final, Brussels, 28 November 2018

<sup>4</sup> A *New Industrial Strategy for Europe*, EC COM (2020) 102 final, 10 March 2020

circular product designs, given that only 12% of the materials used by industry come from recycling. Supportive policy measures, helping consumers to make more informed choices, are likewise covered.

The area comprises the following topics:

3.1. Closing the industrial carbon cycle to combat climate change

3.2. Demonstration of systemic solutions for the territorial deployment of the circular economy

#### *Area 4: Energy and resource efficient buildings*

The construction and renovation of buildings, together with their use and operation, consumes significant amounts of energy as well as mineral resources. In total, buildings account for 40% of all energy consumed. By contrast, the annual renovation rate of the EU's building stock hovers around only 0.4-1.2% across Member States; it will have to at least double to reach the EU's energy and climate objectives. Renovating and retrofitting social housing, schools and hospitals is particularly important, as it could free up more financing for education and public health, as well as for supporting households that cannot afford all their energy needs.

The area comprises the following topic:

4.1. Building and renovating in an energy and resource efficient way

#### *Area 5: Sustainable and smart mobility*

For the EU to become climate-neutral by 2050, transport must become 'drastically less polluting': a 90% reduction in emissions is required. All transport modes must contribute to this goal, with an emphasis on boosting multimodality (using different transport modes). Slashing transport emissions at ports and airports, as well as in cities is a top priority; together with ramping up the production and deployment of sustainable alternative fuels; eliminating fossil-fuel subsidies; as well as developing automated and connected multimodal mobility.

The area comprises the following topic:

5.1. Green airports and ports as multimodal hubs for sustainable and smart mobility

#### *Area 6: Farm to fork*

Food production today causes air, water and soil pollution, accelerates climate change and the loss of biodiversity, and consumes excessive amounts of natural resources, while a significant portion of food produced goes to waste. European food should become the global standard for sustainability; therefore, in line with the *Farm to Fork Strategy*,<sup>5</sup> the actions under this area pave the way to a more sustainable food policy. This will strengthen the efforts of farmers and fishermen

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<sup>5</sup> *A Farm-to-Fork Strategy*, EC COM (2020) 381 final, 20 May 2020

and -women to tackle climate change, protect the environment and preserve biodiversity while contributing to more circular economies and lifestyles.

The area comprises the following topic:

6.1. Testing and demonstrating systemic innovations for sustainable food from farm to fork

*Area 7: Ecosystems and biodiversity*

Ecosystems provide essential goods such as fresh water and clean air; by mitigating natural disasters, pests and diseases, they help regulate the climate. In line with the *Biodiversity Strategy*<sup>6</sup> adopted by the European Commission, the actions under this area aim to halt biodiversity loss, caused by changes in land and sea use, direct exploitation of natural resources, and also climate change. Particular emphasis is put on effective afforestation, forest preservation and restoration, as well as the role of oceans in mitigating and adapting to climate change. Lasting solutions to climate change require greater attention to nature-based solutions, promoting the bio-economy in full respect of biodiversity.

The area comprises the following topic:

7.1. Restoring biodiversity and ecosystem services

*Area 8: Zero-pollution, toxic-free environment*

To protect Europe's citizens and ecosystems, the EU needs to better monitor, report, prevent and, if need be, remedy the pollution of its air, water, and soil, as well as address downstream effects that threaten the safety of consumer products. Restoring the natural functions of ground and surface water is essential for preserving and restoring biodiversity in lakes, rivers, wetlands and estuaries, as well as to prevent and limit damage from floods. Actions under this area envision measures addressing pollution from several sources, such as urban runoff, new or particularly harmful sources including micro-plastics and chemicals, or large industrial installations. In addition, they support the development of a chemicals strategy for sustainability, with the goal of ensuring a toxic-free environment.

The area comprises the following topics:

8.1. Innovative, systemic zero-pollution solutions to protect health, environment and natural resources from persistent and mobile chemicals

8.2. Fostering regulatory science to address chemical and pharmaceutical mixtures: from science to evidence-based policies

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<sup>6</sup> *EU Biodiversity Strategy for 2030*, EC COM (2020) 380 final, Brussels, 20 May 2020

*Area 9: Strengthening our knowledge in support of the EGD*

The urgency and scale of the challenges addressed by the European Green Deal require the mobilisation and further advancement of the world-class scientific capacities and resources offered by the European Research Infrastructures. This will aid the transition towards a climate-neutral Europe, with a 50% emission reduction target by 2030. Pilot activities under this call will provide research and innovation services for breakthrough research in two priority areas: (1) energy storage and; (2) advanced climate/environment observation and monitoring. Expected impacts range from answering short-term needs under this call to longer-term perspectives under Horizon Europe.

The area comprises the following topics:

- 9.1. European Research Infrastructures' capacities and services to address European Green Deal challenges
- 9.2. Developing end-user products and services for all stakeholders and citizens supporting climate adaptation and mitigation
- 9.3. A transparent and accessible ocean: towards a digital twin of the ocean

*Area 10: Empowering citizens for the transition towards a climate-neutral, sustainable Europe*

The European Green Deal communication stresses that the transition towards sustainability must be just and inclusive, put people first and bring together citizens in all their diversity. This calls for citizen engagement and social innovation in all areas of the Green Deal. This also requires ambitious cross-cutting actions to engage and empower people and communities and to support behavioural, social and cultural changes wherever this is most needed for a fair and inclusive transition, leaving no-one behind. Such actions must address change at the collective level through participatory processes and experimental research on behavioural, social and cultural change; and at an individual level by empowering citizens as actors of change, including through the co-creation of R&I contents<sup>7</sup>.

The area comprises the following topics:

- 10.1. European capacities for citizen deliberation and participation for the Green Deal
- 10.2. Behavioural, social and cultural change for the Green Deal
- 10.3. Enabling citizens to act on climate change and environmental protection through education, citizen science, observation initiatives, and civic involvement

*Area 11: International cooperation*

In the context of the Paris Agreement and the Sustainable Development Goals (SDGs), the EU and other developed nations have committed to assisting emerging and less developed ones in their

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<sup>7</sup> See UN Global Sustainable Development Report 2019, *The Future is Now – Science for achieving sustainable development*, <https://sustainabledevelopment.un.org/gsdr2019>

transition to cleaner, more sustainable energy systems. This is an important part of the EU's ambition to be a global climate leader. The R&I Partnership on Climate Change and Sustainable Energy under the European Union/African Union High-Level Policy Dialogue on Science, Technology and Innovation is an expression of this commitment. The actions under this area support its realization, together with capacity building and appropriate financing solutions, including those designed to attract more private capital.

The area comprises the following topic:

11.1. Accelerating the green transition and energy access partnership with Africa

**Contribution to focus areas**

The Green Deal Call contributes in its entirety to the Horizon 2020 focus area 'Building a low-carbon, climate resilient future'.

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## Area 1: Increasing Climate Ambition: Cross sectoral challenges

LC-GD-1-1-2020: Preventing and fighting extreme wildfires with the integration and demonstration of innovative means

### Specific Challenge

The Green Deal explicitly calls to “reduce the incidence and extent of forest fires”. It also calls “to boost the EU’s ability to predict and manage environmental disasters” as an immediate priority. Large-scale and more intense wildfires are becoming an increasing concern. Fire is a natural component in many ecosystems across Europe but more and more Europeans suffer directly and indirectly from wildfires. Between 2017 and 2020, fires have killed hundreds of persons and ravaged forests and Natura 2000 sites not only in Southern Europe, but increasingly also in Central, Eastern and Northern Europe.

In addition to the extraordinary socioeconomic impact in terms of loss of human lives of residents and first responders, health, infrastructures and economic activity, extreme wildfire events have also serious and sometimes irreversible ecological impacts when considering soil and water degradation and biodiversity loss.

Moreover, wildfires are among the first contributors to climate change, with up to 20% of total global greenhouse gas emissions per year<sup>8</sup>. Furthermore, the large surfaces burnt cannot absorb so much CO<sub>2</sub> any longer, reducing the climate change mitigation potential of carbon sinks. Extreme wildfires are now observed more frequently in higher altitudes and latitudes and further contribute to accelerating climate change by increased black carbon fall-out on ice/snow and by melting of underlying permafrost.

In addition, large wildfires degrade air quality through the direct emissions of toxic pollutants affecting first responders and local residents, while populations in regions far away from the wildfires can be exposed to other pollutants as the air is transported, with short- and long-term impact on health.

Climate change, forestry change, ecosystem degradation and rural depopulation increase the depth and breadth of wildfires in the EU. Climate change is predicted to increase fire risk, with longer fire seasons, more frequent fires, new fire-prone regions and more severe fire behaviour. The burnt area in southern Europe during the 21st century would sharply increase - by 50% for a 2 °C global temperature increase scenario, by 100% for a reference climate scenario<sup>9</sup>. Extreme wildfire events as in Southern Europe in 2017-2018 and in California, Brazil and Australia in 2019 are likely to become common in Europe.

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<sup>8</sup> 7–16 Gt CO<sub>2</sub>-eq per year <https://www.sciencedirect.com/science/article/pii/S1674927818300376>

<sup>9</sup> JRC’s PESETA II Project: Climate Impacts in Europe (2014).

## Scope

The new context of extreme wildfires requires accelerating the shift towards implementing a more holistic fire management approach that integrates environmental, climate, health & safety/security, cultural and socio-economic aspects with:

1. Research, demonstration and deployment of innovative means and methods tailored to extreme wildfire behaviour, such as better techniques, models, solutions and capabilities for preventing, predicting, monitoring and fighting wildfires, and mitigating their impact, including better technologies, equipment and decision support systems for first responders.
2. Proactive governance, large-scale and community-based risk assessments, awareness and preparedness - where citizens, local communities, the forestry and bio-economy sectors play a central role.

The topic will be implemented through two distinct sub-topics. Proposals should address only one of the subtopics

**Subtopic 1.** The Innovation Actions (IA) funded under this call will speed up the pan-European adaptation process to extreme wildfires by advancing and applying research and innovation including demonstration pilot sites while making best use of existing data (e.g. remote sensing, in-situ or community-based data), technologies (e.g. Big Data and Artificial Intelligence) and services (as Copernicus, Galileo and EGNOS) and closely engaging and coordinating all concerned actors and communities with the support of a Coordinated Support Action.

Innovative means and methods need to be developed, integrated and demonstrated on the field across Europe (including EU Outermost regions) and tailored to geographical and socio-economic scenarios, with different types of fuels (e.g. forest/bush /peat fire threats), landscapes and biodiversity values (e.g. coastal/alpine/agriculture/rural/Wild-Urban Interface/islands) and scales (e.g. local/regional /national/cross-border/EU/international) , etc.

The approach should be systemic: encompassing different climate scenarios, biogeographical/socio-economic contexts, traditional practices and new means for faster and smarter management of all phases: prevention & preparedness (including forecasting and landscape management for impact mitigation), detection & response (including fire containment, extinction, potential evacuation and recovery) and post-fire restoration<sup>10</sup> & adaptation.

The fire management phases are inter-connected. For instance, detection & response phases can only be optimised when detailed information, such as fuel loads, is available from prevention. The IAs should consider an Integrated Fire Management strategy<sup>11</sup> to include viewpoints from all

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<sup>10</sup> Based on CBD guidance on ecosystem-based approaches to climate change adaptation and disaster risk reduction <https://www.cbd.int/doc/decisions/cop-14/cop-14-dec-05-en.pdf>

<sup>11</sup> e.g. guidance developed by actions supported under Horizon 2020 topic LC-CLA-15-2020

parties in a participative way. Hence the proposals should cover all three intervention areas (A, B and C) while focusing on a subset of activities per intervention area, as described below.

## **A. Prevention & Preparedness**

The integration of environmental, climate and socio-economic conditions (including tangible and intangible cultural heritage) with proactive governance (public and private actors), community-based risk awareness, prevention and preparedness activities can include among others:

- Support the integration of socioeconomic and environmental information on wildfire causes and impacts into existing EU databases (e.g. EFFIS) with a focus on extreme wildfire events, the causes of wildfire ignitions (e.g., accidental, criminal and natural causes) and the demographic dynamics and trends (e.g. rural abandonment and other land use change activities).
- Improve fire and landscape management of both public and private lands (including forest, agricultural and agro-forest lands using both traditional and innovative approaches for sustainable fuel management and monitoring (biomass, density), including community-based incentive programs for biomass reduction, land requalification, and new bioeconomy value chains that maximise wood and non-wood forest products and services whilst improving biodiversity and resilience.
- Enhance access to official fire danger index rating and warnings in cooperation with existing EU initiatives (e.g. Copernicus services, EFFIS, with resolution tailored to the conditions), through upscaling the use of mobile apps, digital infrastructure and advanced cyber technologies.
- Build a common culture on risk prevention and preparedness across Europe, including behavioural change of citizens, local authorities, businesses and schools, through education and training, community involvement and awareness campaigns to encourage self-protection, safety and environmental protection (through spatial planning), with special attention to Wildland Urban Interface areas.
- Support the integration of wildfire prevention and resilience into governance and insurance models, including alternative risk transfer solutions and products, and accounting for risks due to cascading effects on society at large and critical infrastructures in particular.
- Improve the understanding of the link between the exposure to smoke and air pollutants from fires and health and well-being in local communities and first responders.
- Broad Earth System studies for weather and climate drivers as well as biophysical feedback of global forest fires on climate to improve existing wildfire information systems from national to global scales<sup>12</sup>- leading to new operational seasonal (coarse) and short-term (high-resolution) forecasts, using climate-vegetation-fires models but also historical wildfires records and paleoclimate evidence.

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<sup>12</sup> i.e., Global Wildfire Information System and European Forest Fire Information System.

## **B. Detection & Response**

Anticipation and mitigation of high-impact events will benefit from research and innovation in space, aerial, ground, material and digital technologies, which should be integrated altogether with environmental, climate and social disciplines and existing EU initiatives on monitoring and suppression of wildfires, in a broad range of weather conditions and geographical scenarios. Activities can include among others:

- Measures to stimulate investments from private sector in new technologies for retrofitting and/or developing new detection & response technologies.
- Fast-track research and innovation in space and aerial means (e.g. satellites, pseudo-satellites, aircraft including drones, remote sensing systems) for detection, targeting and extinction of fires, such as better water-bomber helicopters / planes able to operate safely at night; modular firefighting units fit for cargo/multi-mission aircraft; improved scooping, tanking and discharging.
- Develop better firefighters' and manned & unmanned ground/air vehicles' location, route management, patrolling optimization and automation in real time - including via (EU) aerial/satellite navigation/observation/communication services - to guide and protect fire brigades and vehicles operating simultaneously to respond efficiently to fires in all conditions.
- Near real-time high-fidelity fire propagation forecasting, based on precise topography, weather, fuel and combustion modelling, via aero-space data and services, advance sensing (e.g. temperatures, winds), machine-learning and supercomputing.
- Better, more interoperable and secure incident-management, decision-making and communication, coordination and command systems, able to incorporate information from multiple platforms (manned and unmanned) and non-traditional sources (as social media), particularly in non-urban environments and across European countries e.g. air-to-air, ground-to-ground and air-to-ground, exploiting satellite and ad-hoc communication links for near real-time transmissions.
- Better integration of wireless sensors, early warning systems, fire retardant rapid deployment, search & rescue and evacuation of persons and animals (e.g., contingency plans) and better connection with other sectors that also monitor forest data, such as Distribution System Operators tracking aerial power lines.
- Advanced personal monitoring and protective equipment for emergency responders (e.g., smart garments, gear and breathing apparatus) tailored for wildfire conditions, assisted with advanced ICT decision support systems, land/air robotics and improved fire retardants/extinguishing agents.
- Better training, including virtual reality simulators for air fleet and ground resources.
- Better and faster estimates of the impact of fire events on direct losses, number of people affected, critical infrastructure networks, hazards and contaminants dispersion, water sources and other cascading effects.

### **C. Restoration and Adaptation**

The actions should aim at supporting the socio-ecological transition towards more resilient communities, in particular those most exposed to wildfire risk. Activities can include among others:

- Evaluate and upscale the deployment of ecosystem-based restoration solutions across various biogeographical contexts, building on the solutions developed by EU-funded demonstration projects on nature-based solutions (NBS)
- Advance and demonstrate systemic and structural measures for fuel treatments aiming at resilient wildland-urban interfaces, taking into account the relevant spatial scales and fire ecology principles in relation to climate change.
- Demonstrate sustainable post-fire ecosystem restoration solutions of damaged ecosystems aiming at restoring biodiversity, including local soil microbiota for ecosystem resilience and supported by monitoring services and complementary geospatial analysis.
- Contribute to the definition of a common EU legal framework for the governance systems and operational activities regarding forest and communities protection from climate-related risks.
- Test and develop public-private cooperation mechanisms to leverage investments from the private sector, including insurance companies in order to stimulate the development of preventive measures and reduce losses from wildfires.
- Support mechanisms and promotion of governance systems for restoration and adaptation through the involvement, coordination, and cooperation of different actors and sectors bridging between national and local administrative levels.

Expected size of proposals: The Commission considers that IA proposals requesting a contribution from the EU of between EUR 15 to 20 million would allow the specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

**Subtopic 2.** To ensure that the demonstration of innovative and integrated approaches fulfils the expected impacts, the Innovation Actions will be supported by a Coordinated and Support Action (CSA).

Activities of the CSA may include amongst others:

- Support the clustering and cooperation among Innovation Actions under this topic and with other relevant actions funded under Horizon 2020 (including the European Green Deal call, such as call area 7 on biodiversity and ecosystems), Cohesion and Civil Protection funds.
- Facilitate the integration of the three intervention areas in each of the Innovation Actions.
- Engagement with citizens, local communities, the forestry, insurance and social infrastructure sectors as well as all relevant actors to facilitate the implementation of demonstration projects.

- Extensive and structured knowledge sharing (i.e. Disaster Risk Knowledge Management Centre DRKMC) and evaluation-based analysis of past wildfire events (lessons learnt) to improve the effectiveness of activities and better prevent wildfires.
- Develop better readiness of response units for cross-border, regional, international assistance, in line with Union Civil Protection regulations and guidelines.
- Recommendations for harmonized training and standard operating procedures for first responders to improve interoperability, to achieve better preparedness of available assets and to share facilities.
- Facilitate international collaboration and global outreach.

Expected size of proposals: The Commission considers that proposals requesting a contribution from the EU of between EUR 2 to 3 million would allow the specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. Up to one proposal under this sub-topic will be funded.

In line with the strategy for EU international cooperation in research and innovation, multilateral international cooperation is encouraged for both sub-topics, in particular with United States, Canada, Australia, Russia, Japan, Brazil, South America, Indonesia and South Africa to leverage knowledge, resources and best practices, as well as to decrease risks and increase impact worldwide.

#### Expected Impact

The actions funded under this call topic should jointly contribute substantially to the following targets by 2030 in Europe (with respect to 2019):

- 0 fatalities from wildfires.
- 50% reduction in accidental fire ignitions.
- 55% reduction in emissions from wildfires.
- Control of any extreme and potentially harmful wildfire in less than 24 hours.
- 50% Natura 2000 protected areas to be fire-resilient.
- 50% reduction in building losses.
- 90% losses from wildfires insured.
- 25% increase in surface area of prescribed fire treatments at EU level

Activities should go beyond the state of the art and previous R&I activities at EU level<sup>13</sup>, cooperate with ongoing relevant Horizon 2020 projects<sup>14</sup>, involve the relevant national and EU agencies (e.g.

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<sup>13</sup> FP7/Horizon2020/COST/JRC, LIFE and Civil Protection projects examples in Projects For Policy (P4P) Forest fires - Sparking fire-smart policies in the EU: <https://op.europa.eu/en/publication-detail/-/publication/0b74e77d-f389-11e8-9982-01aa75ed71a1/language-en/format-PDF/source-91693190>, e.g. Firefighter Innovation Network FIRE-IN: <https://fire-in.eu>  
EU Regional/Cohesion projects on forest fire protection and research and innovation e.g. [https://cohesiondata.ec.europa.eu/projects/row-2scn~y6qh\\_3fwi](https://cohesiondata.ec.europa.eu/projects/row-2scn~y6qh_3fwi)

<sup>14</sup> such as from calls LC-CLA-15-2020 and H2020 SU-DRS02-2018-2019-2020

EEA, EASA, ...) and end-users from EU Member States / Associate States. Activities should make best use of existing EU initiatives and services (such as Copernicus, Galileo and EGNOS).

The most promising results demonstrated may be up-scaled and deployed into:

- National climate change adaptation, disaster risk reduction strategies, land use policies and spatial planning, in line with EU policy guidelines and legislation, including forest, biodiversity and bio-economy related strategies.
- The European Forest Fire Information System (EFFIS) (including forecasts and risk assessments) and the Disaster Risk Management Knowledge Centre (DRMKC) Risk Data Hub, as well as the Knowledge Centres for Biodiversity and Bioeconomy and the Forest Information System for Europe (FISE).
- Union Civil Protection Mechanism (UCPM) and Emergency Response Coordination Centre (ERCC)<sup>15</sup>.
- Copernicus Emergency Management System (EMS) e.g. for Rapid Mapping, Risk & Recovery; Copernicus Land Service e.g. for monitoring changes in land cover and land use; Copernicus Atmosphere Monitoring Service e.g. for detecting, monitoring the intensity of fires and forecasting pollutants propagation; Copernicus Security Service e.g. for support to EU external action; the Group on Earth Observations<sup>16,17</sup> and Galileo Emergency Warning Service.
- Horizon Europe's Mission on Adaptation to Climate Change including Societal Transformation - with strong focus on citizen engagement.
- EU co-funded regional and interregional initiatives "promoting climate change adaptation, risk prevention and disaster resilience" e.g. to support environmental areas and regional civil protection infrastructures and units to prevent and fight wildfires.
- At international policy level, Sendai Framework for Disaster Risk Reduction (2015-2030) placing disaster risk reduction as a key element of sustainable development efforts.
- International standardisation bodies for international industrialisation of solutions, such as the International Forum to Advance First Responder Innovation (IFAFRI) among others.

Type of action: Innovation Action (Subtopic 1) / Coordination and Support Action (Subtopic 2)

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<sup>15</sup> [https://ec.europa.eu/echo/what-we-do/civil-protection/forest-fires\\_en](https://ec.europa.eu/echo/what-we-do/civil-protection/forest-fires_en)

<sup>16</sup> [http://www.earthobservations.org/documents/gwp20\\_22/GWIS.pdf](http://www.earthobservations.org/documents/gwp20_22/GWIS.pdf)

<sup>17</sup> [http://www.earthobservations.org/documents/gwp20\\_22/SPACE-SECURITY.pdf](http://www.earthobservations.org/documents/gwp20_22/SPACE-SECURITY.pdf)

## LC-GD-1-2-2020: Towards Climate-Neutral and Socially Innovative Cities

### Specific Challenge

The strategic long-term vision<sup>18</sup> published by the Commission for a prosperous, modern, competitive and climate neutral economy calls for a drastic reduction of greenhouse gas emissions by 2050.

The European Commission's Green Deal proposes a new growth strategy that aims to preserve the planet for future generations. It could serve as the compass to emerge from the present COVID-19 crisis and offer the opportunity to bounce forward accelerating our progresses towards meeting the EU climate change objectives.

The European Green Deal<sup>19</sup> sets an ambitious target reduction of 50%-55% by 2030. Through its roadmap for action it outlines a long-term vision for the environment, involving all sectors of the economy, geared towards reaching the goal of climate neutrality. While cities occupy only 2% of the planet's landmass, they consume over 65% of the world's energy and account for more than 70% of global man-made CO<sub>2</sub> emissions. Currently 75% of European citizens live in cities and this percentage is expected to rise to 80% by 2050. Therefore, cities<sup>20</sup> must play a crucial role in helping Europe reach the targets of the Green Deal. The Commission will support their systemic transformation towards climate neutrality leveraging, in particular, technological, non-technological and social innovation and new AI-based solutions.

The challenge resides with achieving significant progress towards climate neutrality at a large (European) scale by fostering climate-neutrality and social innovation in cities. This means capitalising on existing research and innovation, valorising available knowledge in Europe, and using Green Deal-targeted social, financial, and technological innovation to co-create, test, and deploy systemic, integrated solutions, technologies, and incentive schemes with cities to tackle the largest sources of pollution in urban and metropolitan areas. It also implies designing incentives promoting investments such as green infrastructure into cities committed to climate neutrality and the Green Deal objectives. This will help test innovative solutions, technologies, and incentives to reach the scale that will make them attractive for industry economically, for citizens in terms of affordability, liveability, and inclusiveness, and for local authorities as concern effectiveness, efficiency, and quality of life. Testing these solutions and incentives will require listening to the needs of citizens and engaging cities to act. Framing the above-mentioned elements necessitates taking into account the consequences and long-lasting impacts on cities of the current health and economic crisis, affecting for example mobility, transportation, urban planning, digitisation, provision of services, etc. It requires triggering and supporting lasting changes in social, business, and administrative practices and in individual behaviours with clear impacts on the reduction of

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<sup>18</sup> [https://ec.europa.eu/clima/policies/strategies/2050\\_en](https://ec.europa.eu/clima/policies/strategies/2050_en)

<sup>19</sup> [https://ec.europa.eu/commission/sites/beta-political/files/political-guidelines-next-commission\\_en.pdf](https://ec.europa.eu/commission/sites/beta-political/files/political-guidelines-next-commission_en.pdf)

<sup>20</sup> For the purposes of this topic "cities" should be intended as either city district (neighbourhood or zone of special interest of a city administered or governed by some type of "district council"), a city represented by a government unit (e.g. municipality) or an urban area (conglomeration or a functional area composed of many neighbouring cities or government units, represented by the respective government units).

greenhouse gas emissions, air pollution and other co-benefits that citizens, businesses and public authorities find desirable.

### Scope

This action should develop a one-stop shop platform providing the necessary technical, regulatory, financial and socio-economic expertise as well as assistance to cities for developing and implementing their climate action plans, and related social innovation action plans. The project should involve research organisations, academia, industry including social entrepreneurs, the financial sector including impact financiers, investors, philanthropists, NGOs, national and local authorities and citizens. The project will also be responsible for the management of competitive calls addressed to third parties to fulfil the objectives of this action. The platform should facilitate the coordination of European ongoing activities in the area of climate neutrality and cities and should be sustainable, scalable and self-financed beyond the life of the action. Where relevant, the action should take into due account and build on existing platforms<sup>21</sup>, experience already matured by the Covenant of Mayors<sup>22</sup> initiative and methodologies, analysis and processes developed by the Joint Research Centre of the European Commission as well as based on the principles and standards of the Join, Boost, Sustain Declaration<sup>23</sup>.

The proposal should address all of the following four activities:

#### Activity 1: Climate action plans and Green Deal innovation:

- Develop a science-based set of indicators<sup>24</sup> enabling the assessment of the climate, environmental and socio-economic impact of cities' climate neutral action plan in terms of greenhouse gas emissions reduction within the framework of the European Green Deal
- Develop innovative urban greening assessment methodologies for planning<sup>25</sup> and monitoring GHG emissions reduction to meet the Green Deal ambitious targets.
- Provide harmonised specifications for inter-operable and comparable cities evidence repositories documenting action plan approaches and impacts;
- Support cities in identifying and possibly overcoming regulatory, institutional, governance, financing, public acceptance, and other barriers preventing progress and coordinated pathways towards climate neutrality;
- Design, in close collaboration with the cities, and the European Commission a concept for a climate neutral city contract corresponding to climate action plans that includes the application process and assessment criteria. Particular attention should be paid to citizens'

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<sup>21</sup> E.g. Smart Cities Marketplace and its Matchmaking facility: <https://eu-smartcities.eu>

<sup>22</sup> <https://www.covenantofmayors.eu>

<sup>23</sup> <https://ec.europa.eu/digital-single-market/en/news/join-boost-sustain-european-way-digital-transformation-cities-and-communities>

<sup>24</sup> For urban transport, the Sustainable Urban Mobility Indicators (SUMI) should be further replicated and support offered for adoption in the context of benchmarking urban mobility in the climate neutral city

<sup>25</sup> including Sustainable Urban Mobility Plans (see <https://www.eltis.org/>)

engagement, social innovation and social entrepreneurship, environmental, economic and health benefits, and Just Transition mechanisms.

- Support cities in innovating the local governance and, where appropriate, building capacity to implement systematic and integrated climate neutral policies, building also on existing experiences developed by local networks<sup>26</sup>;
- Coordinate the group of cities committing to the climate neutral city contract: Ensuring an operational customer-driven link of this action with the cities as final users. Facilitating the sharing of experience and good practices and mutual learning between cities regarding setting up and mainstreaming co-creation processes engaging all relevant actors regarding the framing, deployment and assessment of their vision, strategy, and an action plan to reach climate neutrality while ensuring shared ownership.

Activity 2: Investment project preparation and finance:

- Provide information and consulting to cities on preparing and financing investment projects for transition to climate neutrality. This should take into account and build on the good practices developed by global, European and national initiatives and programmes such as Horizon 2020, ELTIS, ELENA, CIVITAS, EIP on Smart Cities and Communities (EIP-SCC) Marketplace, EIT Climate KIC, Intelligent Cities Challenge (ICC), European City Facility, JPI Urban Europe, Positive Energy Districts, Green City Accord, the European Green Capital award. Financial solutions should include but should not be restricted to those provided by InvestEU, EIB, EBRD and the European Structural and Investment Fund; collaboration with national development banks as well as commercial banks is encouraged

Activity 3: Social innovation and citizens' engagement:

- Support cities and local communities in testing solutions (including new technologies, non-technological, and social innovations) that stem from European R&I; this will entail a matching of cities' and local communities needs to R&I results through various means, e.g., match-making and brokerage hubs, and knowledge to identify possible solutions, as well as the support to test them at local level;
- Combine existing results of European R&I with social innovation, and take advantage of the digital transformation and infrastructure to co-create and test solutions with local communities, including changes in social practices and behaviour;
- Provide support to cities for reinforcing not only communication but also citizens engagement activities. This will include sharing and using good practices on social innovation as well as enabling cities and local communities to exchange experiences and learn from each other when testing and implementing solutions, connecting more innovators and researchers and making them aware of citizens' needs, and, through all these channels, helping cities move closer to climate neutrality.

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<sup>26</sup> e.g. CIVINETS: <https://civitas.eu/civinet>

Activity 4: Research and Innovation for climate-neutral transformation of cities:

- Once the platform is established, it will launch open call(s) to support large scale pilots for the deployment in lead cities or districts of systemic solutions combining, as appropriate, technological, nature-based, social, cultural, regulatory and financial innovation and new business and governance models to underpin for climate transition, taking stock of existing best practises and solutions already available . These calls will be evaluated through external independent peer review process.
- In order to facilitate the upscaling of these solutions and their replicability, support for each lead city and/or district, the twinning with and mentoring of at least 2 other cities and/or districts from different countries facing structural disadvantages or with a size smaller than 50 000 inhabitants, which are willing to develop their proper climate action plan and implement it in a subsequent phase beyond the life of the current action.

This action aims at a rapid, full-scale deployment at city or district level of systemic and integrated climate actions in order to reach climate neutrality by 2030. It should integrate a package of measures covering all sectors such as health promotion, water, food, energy, industry, housing (private housing and public buildings such as schools and other critical infrastructures), transport (including connected mobility and modal shift) and other sectors considered essential for climate neutrality, with digital, circularity as well as nature-based solutions as critical enablers, while respecting the do no significant harm (DNSH) principle in the specific city context and the set timeline.

Participating cities and/or local communities are expected to engage the necessary resources and commit to the deployment of their action plan and the achievement of the expected impacts stated below.

This action, in particular the activities covered under Activity 4, allows for the provision of financial support to third parties in line with the conditions set out in Part K of the General Annexes. Due to the nature of the work to be supported under the call(s) supporting deployment of innovative solutions, the contribution to a third party may go beyond EUR 60 000. The selection of the third parties to be supported under the grant will be based on an external independent peer review of their proposed work.

The open calls for proposals to be launched within the grant for the selection of third parties should respect all the rules and conditions laid out in Annex K of the Work Programme, in particular as regard transparency, equal treatment, conflict of interest and confidentiality.

The consortium must possess, among others, good knowledge and expertise in European urban-relevant programmes and initiatives, urban planning, state-of-the-art in technological innovation for climate neutrality, social innovation and stakeholders engagement, financing programmes (such as the, Horizon 2020, European structural and investment funds, EIB, EBRD...) and European / international umbrella organisations (such as the C40, CIVITAS, POLIS, EU Covenant of Mayors/ Global Covenant of Mayors, ICLEI etc.).

The Commission considers that proposals requesting a typical contribution from the EU up to EUR 53 million would allow this specific area to be addressed appropriately, of which at least 60% should be allocated to activities covered under Activity 4 to support around 20 to 30 large scale pilots. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

As the scope of this action is to support a one-stop shop platform, at most one proposal is expected to be funded under this topic.

#### Expected Impact

- Comprehensive methodology, including selecting criteria, and model for cities that want to achieve climate neutrality by 2030 covering cross-sectoral governance, citizens participations, social innovation and social entrepreneurship impact, financing and policy approaches, and an urban digital platform;
- Establish a European level structure offering support to and promotion of systemic transformation of cities towards climate neutrality;
- Empower cities and local communities through social innovation to cross social tipping points and enable the implementation of the Green Deal;
- Mobilise the demand (citizens' needs) and showcase testing of innovative solutions drawing from European R&I through a socially inclusive mechanism to lead the transition to climate neutrality.
- Put in place measures allowing climate neutrality by 2030 for the participating leading cities and districts;
- Put in place measures towards climate neutrality by 2030 in European cities that will demonstrate visible substantial reduction of greenhouse gas emissions and air pollution as part of an agreed pathway to Climate Neutrality by 2050 or sooner;
- Improved share of sustainable and active transport modes. Reducing the negative externalities of urban and peri-urban transportation: congestion, pollution and road collisions. Enhanced multimodality and facilitating the use of sustainable and clean modes of transport.
- Ensure through twinning activities and other means to maximise impact and without leaving no one behind that an appropriate geographical balance is achieved by demonstrating commitment of cooperation with at least one city per country.

Type of Action: Research and Innovation action (RIA)

## LC-GD-1-3-2020: Climate-resilient Innovation Packages for EU regions

### Specific Challenge

Every half-degree of global warming may inflict a new order of magnitude of harmful consequences on planetary health as well as economic and social cohesion. The failure of economic, financial and industrial policies to sufficiently mitigate and adapt to climate change is more than ever a primary concern for societies worldwide<sup>27</sup>. Europe's commitment to accelerate efforts regarding climate change adaptation and to reach climate neutrality and resilience by 2050 is emphasised in the European Green Deal and will be further supported by the European economic recovery plan from the COVID-19 pandemic. In some regions and communities, incremental adaptation will not be sufficient to mitigate the impacts of climate change on socio-ecological systems<sup>28</sup>. We need radical and transformative ways of reducing climate vulnerability and building resilience. Some solutions for regional adaptation have been developed and successfully tested at small scale, ranging from innovative technologies to nature-based solutions, new business models, as well as governance and social innovations. Now, the challenge is to scale up and demonstrate at large scale systemic solutions to trigger behavioural change and new ways of decision-making, while accounting for local and regional contexts. Multidisciplinary approaches that integrate technological, digital, business, governance, environmental dimensions with social innovation are needed for the development of adaptation pathways consistent with European Green Deal targets, and tailored to support the regions and communities most exposed to climate change impacts.

### Scope

The Horizon Europe Mission on Adaptation to Climate Change, including Societal Transformation will test, evaluate and scale-up a range of adaptation solutions with the aim to trigger societal transformations among key community systems (i.e., health, primary production including agriculture, forestry, fisheries and aquaculture, water, environment including biodiversity and infrastructure including clean energy and transport )that are central to resilience building and sustainable growth. Therefore, the actions funded under this call topic will serve as early facilitators in pre-identifying and upscaling the most promising cross-sectoral solutions.

Proposals should address only one of the following sub-topics:

#### **Subtopic 1) Innovation Packages for transformational adaptation of European regions and communities (Innovation Actions)**

The actions should aim at enabling rapid and far-reaching change through the development of region-specific portfolios of R&I solutions, mature enough for demonstration, which may include nature-based solutions, innovative technologies, insurance and governance models, and behavioural change. The innovation packages should cover the key community systems and comprise the adaptation solutions and pathways deemed essential for climate resilience in the

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<sup>27</sup> World Economic Forum 2019 - Global Risks Report

<sup>28</sup> IPCC 2018 - Special Report on Global Warming of 1.5 °C

specific regional contexts and the set timeline. While accounting for disparities in adaptive capacities and rates of change across countries, regions and communities, the innovation packages should:

- implement and test of the innovations in key systems demonstrating their contribution to improving resilience in the region and/or community,
- prioritise the key systems that most urgently need to be protected from climate impacts and risks, and which would significantly improve the resilience of the region or community,
- prioritise vulnerable regions or communities<sup>29</sup> with the highest exposure, the highest damage sensitivity and/or least adaptive capacity to climate change impacts,
- propose multiscale and multisectoral regional adaptation pathways allowing transformative and no-regret measures deployment, in line with national and regional climate objectives, hence ensuring a just transition and environmental justice,
- integrate systemic risk analyses and management, considering multihazards and cascading effects, as well as interdependencies between key systems,
- make use of operational climate services (e.g. Copernicus Climate Change Service) available for public institutions and key sectors,
- stimulate wide citizen and stakeholder engagement and ensure ownership of the solutions through co-creation processes,
- take stock of existing best practices and solutions already available from other programmes, such as Horizon 2020, EIT KICs, LIFE+ Programme, Structural Funds programmes the EIB, the EBRD and at national, regional, local and private level.

Expected size of proposals: The Commission considers that proposals requesting a contribution from the EU of between EUR 10 to 15 million would allow the specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

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<sup>29</sup> The definition of region and community is intentionally left open for proposals to present a compelling case for the targeted area.

## **Subtopic 2) Support the design, testing and upscale of Innovation Packages (Coordination and Support Action)**

The action should support the implementation and wide deployment of the activities under subtopic a).

In particular this action area will include:

- Citizens and regions engagement:
  - ensure the wide deployment and integration of Innovation Packages through educational and training activities across relevant sectors,
  - ensure that targeted regions and communities are involved and benefit from the Innovation Packages through early multi-stakeholder dialogue and citizens engagement and surveys,
  - engage with pan-European regional and cities networks from the beginning, e.g. European Committee of the Regions, EU Urban Agenda Partnership on Climate Change Adaptation, Covenant of Mayors for Climate and Energy, etc
  - support regions and communities in identifying and possibly overcoming institutional, regulatory and financial barriers preventing the implementation of Innovation Packages; including testing of innovative public-private partnerships prioritizing greater citizen involvement throughout the process.
- Monitoring and assessment:
  - develop a set of indicators<sup>30</sup>, in collaboration with the activities carried out under area 1, which consider regional specificities and
  - enable the monitoring and assessment of Innovation Packages,
  - identify cases of maladaptation at regional level and analyse the root causes of failures in practice; formulate region-specific recommendations to address these root causes,
  - address issues of replicability across scale and sustainability over time for the cross-sectoral solutions and regional pathways.
- Portfolio of Solutions:
  - support the preparation of the portfolio of solutions, through in-depth diagnosis and prioritization of actions, in close cooperation with regional actors,

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<sup>30</sup> The set of indicators should comply with or complement existing standards at EU and global level. For guidance, refer to the European Topic Centre on Climate Change impacts, Vulnerability and Adaptation ETC/CCA, Technical Paper (2018) "Indicators for adaptation to climate change at national level - Lessons from emerging practice in Europe". [doi: 10.25424/cmcc/climate\\_change\\_adaptation\\_indicators\\_2018](https://doi.org/10.25424/cmcc/climate_change_adaptation_indicators_2018)

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- support the regions in identifying, mapping and leveraging EU and national funding and financing programmes to support the deployment of the Innovation Packages,
- foster an enabling environment for the demonstration projects implemented by IAs, including digital services; citizen engagement, education and capacity building; business and insurance models, resource leveraging; innovative coordination approaches, etc.
- develop a fully functioning online and free-access platform or upgrade existing knowledge-exchange platforms with user-friendly information on Innovation Packages covering all relevant aspects (financial, social, technological and regulatory) and all relevant areas (health, agriculture, water, environment including biodiversity, and infrastructure including energy, etc.).

Expected size of proposals: The Commission considers that proposals requesting a contribution in the range of EUR 3 million would allow the specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact

- Support the European Green Deal targets, in particular the new EU Strategy on Adaptation to Climate Change, the EU biodiversity, bioeconomy and circular economy strategies as well as the Clean Air Programme for Europe.
- Contribute to the economic restart from the Covid 19 crisis and foster transformative change across all regions and sectors of society to increase climate resilience.

Sub-topic 1)

- Massive increase of community resilience and capacities to cope with unavoidable effects of climate change. Performance indicators shall include for instance reduction of the climate protection gap, increase in Green investments, etc.

Sub-topic 2)

- Improve knowledge access to adaptation solutions through synergies and/or integration of the online platform with Climate-ADAPT, Copernicus services and other existing Pan-European platforms.

***The conditions related to this topic are provided at the end of this call and in the General Annexes.***

Type of action: Innovation Action (Subtopic 1) / Coordination and Support Action (Subtopic 2)

## Area 2: Clean, affordable and secure energy

LC-GD-2-1-2020: Demonstration of innovative critical technologies to enable future large-scale deployment of offshore renewable energy technologies.

The European Green Deal expects to transform Europe into a fair and prosperous society, with a modern, resource-efficient and competitive economy with no net emissions of greenhouse gases in 2050. To decarbonise Europe, clean renewable power production must become the main source of energy, while keeping the stability and resilience of the European Power System.

The Commission's long-term strategy, *A Clean planet for all*, identifies offshore renewable technologies, amongst others, as a key energy system for the Clean Energy Transition. It provides estimates for the offshore wind capacity in Europe of 240-440 GW by 2050, compared to about 22 GW today, while other offshore renewables follow a more modest scenario. This increase would represent a paradigm shift in the European energy system and require a modern infrastructure to seamlessly integrate the power of offshore resources in the energy system via the grid to onshore, or via the option of power-to-X taking into account grid constraints, investments and evolving /new energy market design.

This buildout needs to ensure cost efficiency and to foster the green economy, while protecting the environment and biodiversity, and assuring a just transition. There is a need for more efficient, cost-effective, affordable and secure technologies using wind, solar, wave and/or tidal resources, considering the potential of the different European sea basins (Baltic Sea, North Sea, Atlantic Ocean, Mediterranean Sea and the Black Sea) and the complementarity of resources to reach the best capacity factor and optimized use of all the power equipment.

### Scope

Projects shall demonstrate at sea critical offshore renewable energy innovations considering the efficiency, reliability, scalability, sustainability and circularity that is needed in all areas of the offshore renewable energy system, notably:

- Offshore renewable energy power generating systems: innovative full scale integrated offshore (floating) wind, wave, tidal and/or solar systems, floating or fixed-bottom substructures, mooring and anchoring systems specifically conceived for floating offshore considering the varied subsea and metocean conditions.
- Grid infrastructure: real life demonstration of innovative Direct Current (DC), AC/DC hybrid technologies and systems as a supporting step towards large offshore DC, AC/DC hybrid grids (e.g. multi-vendor Multi-Terminal HVDC (MT HVDC) systems, grid forming converter, HVDC diode rectifiers, Modular Multilevel Converters (MMC), DC Circuit Breaker (DCCB); DC/DC converter and DC/power hub) and their control and management systems; for floating renewable energy technologies: innovative dynamic inter-device/inter-array cables and connections to converter stations at sea or offshore hubs.

- Power to X /storage systems: innovative offshore storage and/or power to X systems to maximise the use of offshore resources and increase the system resilience.

Proposals shall address at least the offshore renewable energy power generating systems and the related energy system integration requirements, and may address grid infrastructure and/or power to X/storage systems. Multi-functional platforms can be considered. The innovative demonstration actions might be part of a larger project or already making use of existing infrastructure.

Proposals shall address also the following:

- Industrial design and manufacturing processes, circularity, scalability, installation methods, transport, operation & maintenance, supply chains and the related digital infrastructures.
- Regulatory, market and financial challenges.
- Marine spatial planning issues (making multi-use of the seas possible, but also considering optimising environmental impacts) as well as currently known barriers such as costs, public acceptance and vulnerability to changing climate conditions in offshore areas, and considering needs, values and expectations of society through close and continuous discussion with stakeholders.
- Projects are requested to demonstrate the technologies at sea while respecting existing environmental regulatory framework.
- Present an environmental monitoring plan to be implemented during the demonstration action.

The project consortium shall demonstrate how it contributes to knowledge building and innovation. Development of new knowledge, models and solutions are paramount to maximize the benefits of the energy transition, to ensure that the right choices are made, and to optimize technologies and systems.

The project has to include a clear go/no go moment ahead of entering the deployment phase. Before this go/no-go moment, the project has to deliver the detailed engineering plans, a complete business and implementation plan and all needed permits for the deployment of the project. The project should clearly demonstrate a proposed pathway to obtaining necessary permits for the demonstration actions and allow for appropriate timelines to achieve these. The project should also demonstrate how it will get a financial close for the whole action. Independent experts will assess all deliverables and will advice for the go/no-go decision.

#### Expected impact

The project should clearly demonstrate all potential impacts on the future roll-out of large-scale deployment of offshore renewable energy, the market perspective considering existing or alternative (decentralised) systems and all other environmental (like GHG reductions), ecological, social and economic impacts along the value chain.

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The project should demonstrate how it contributes to the Sustainable Development Goals of the United Nations (in particular SDG 7 Affordable and Clean Energy and SDG 9 Industry, Innovation and Infrastructure).

It shall increase incentives for investment and economies of scale in offshore bringing down costs and create new business models and services.

The project should demonstrate how it contributes to the different EU policies like the SET-plan, the European Green Deal, Clean Planet for All, and the New Circular Economy Strategy.

The project shall bring the demonstrated technologies to TRL 7.

The Commission considers that proposals requesting a contribution from the EU of between EUR 20 to 40 million would allow the specific challenge to be addressed appropriately.

Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. Funding for proposals being part of a larger project will be related to the eligible costs based on the innovative part of the project.

Available budget: EUR 80 million

Type of action: Research and Innovation Action (RIA)

LC-GD-2-2-2020 Develop and demonstrate a 100 MW electrolyser upscaling the link between renewables and commercial/industrial applications

### Specific Challenge

The European long term decarbonisation strategy (LTS) “A Clean Planet for All” published by the European Commission in November 2018 refers to the potential key role of hydrogen in decarbonising hard-to-abate sectors, such as industry, cement, steel, and also contributing to decarbonisation of heavy duty and long distance transport.

To help achieve the climate neutrality objective, hydrogen needs to be produced at large scale, mainly through electrolysis powered by renewable electricity. The LTS scenarios achieving climate neutrality envisage an installed electrolyser capacity ranging between 400 and 511 GW by 2050 in the EU. However today the technology is only available at multi-MW scale (a 20 MW electrolyser project is being implemented through the co-funding of the Fuel Cells and Hydrogen Joint Undertaking, under the call 2018).

In order to reach the GW scale, an important milestone would be the development and demonstration of a 100MW electrolyser.

The challenge for this topic is to develop larger modules than the state of the art, with reduced balance of plant, managing efficiently the input power, the output hydrogen and oxygen streams, as well as the heat flows, while ensuring the reliability of the system and reducing the footprint through a more compact design. It is expected that the development of bigger modules will help create economies of scale, thus leading to further cost reductions.

The modules will then be assembled into a 100MW electrolyser system, which will be tested and demonstrated in real life conditions, operating flexibly to harvest maximum renewable power. The system will provide grid-balancing services as well as supplying renewable hydrogen to a commercial/industrial application. The hydrogen purity should meet the hydrogen market requirements. The output pressure shall be designed to fulfil, when possible, the required pressure for the hydrogen application targeted - including buffer storage needs if any - and reduce as far as possible the need for dedicated hydrogen compression units downstream. The performance and the durability of the electrolyser operating dynamically need to be assessed and potential safety issues addressed.

The activities related to the development of test methodologies, protocols and procedures for the performance and durability assessment of electrolyser components could foresee a collaboration with JRC in order to support the EU-wide harmonisation of testing protocols to benchmark performance and quantify technology progress. Where possible, the collaboration with JRC could include electrolyser component testing.

### Scope

The scope of this project is to install and operate a 100 MW electrolyser to produce renewable hydrogen, as energy carrier. Specific activities are:

**The main activity will consist of:**

- Development, installation and operation a 100 MW electrolyser for managing and using efficiently renewable energy (electricity and heat), water, Hydrogen and Oxygen flows;
- Demonstrate the increased usage and economic impact of RES mix, addressing potential curtailment issues in Demand Response operation (if grid connected) or island mode functioning (if dedicated to hydrogen production);
- Operation of an electrolyser system in real life conditions in an industrial or port environment, for example feeding a mobility hub, a fertiliser production plant, a synthetic fuel production plant, a refinery, biorefinery or other industries injecting in NG transmission grid type of application;
- Investigate possibility to make use of rejected heat or vented Oxygen;
- Operating pressure should be suitable for the application & any buffering / compression requirements.

**Other activities will consist of economic, safety and environmental assessments:**

- Demonstration of the future economic viability of the technology depending on cost of electricity and hours of operation of the electrolyser. The effect of intermittent generation on the cost-effectiveness of large electrolysers should be taken into account;
- Reduce footprint and address potential health and safety issues;
- Evaluation of the environmental performance of the system, notably in terms of GHG emissions reduction in line with the methodology of the Renewable Energy Directive II and in terms of water consumption;
- Evaluation of other ecological and societal benefits along the value chain;

The project should help develop a European value chain by building on technology and business concepts developed by European companies.

**Mandatory knowledge sharing activity:**

- Cross border dimension and knowledge sharing within Europe: as part of mandatory activities, organise 3 workshops, out of which at least 2 in European countries, outside of the beneficiary's main implantation, involving policy makers and energy stakeholders, to share knowledge on experience gathered and replication of experiences.
- Contribute to addressing common challenges, information (like reporting on impact indicators) and dissemination activities through cooperation with other relevant projects funded by the European Commission in the context of this call.

To ensure that projects jointly contribute to energy system integration, and create synergies and supply chains for Hydrogen and for offshore energy technologies, through synergies between, and

to enhance the visibility of H2020 and European Commission supported actions, projects are requested to reserve 1% of their funding to such cooperation.

The knowledge to be shared will cover the whole project cycle including project management, procurement, permitting, construction, commissioning, performance, cost level and cost per unit performance, environmental impacts, health and safety, as well as needs for further research and development.

The Commission considers that proposals requesting a contribution from the EU of EUR 60 million would allow the specific challenge to be addressed appropriately.

Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. Funding for proposals being part of a larger project will be related to the eligible costs based on the innovative part of the project.

Combination with other EU or national financing instruments will be incentivised, namely the usage of financial instruments to de-risk the operational activity, covering the hydrogen off-take in particular in the ramping-up of the project.

Financing plan (own resources and resources planned to be drawn from the international financial organisations) need to be appended to the application.

#### Expected impact

The proposed topic of the call for proposals is expected to have the following impacts:

#### Technological impacts:

- Establish a European industry capable of developing novel hundreds of MW electrolyzers using a European value chain, consisting of modules and a suitable balance of plant for managing power (electricity and heat), water, Hydrogen and Oxygen flows;
- Increase the efficiency of the electrolyser reaching an energy consumption of 49 (ALK) to 52 (PEM) kWh/kg H<sub>2</sub> at nominal power;
- Increase the current density to at least 0,5A/cm<sup>2</sup> (ALK) or 3A/cm<sup>2</sup> (PEM) and delivery pressure to 30 bar. Power electronics should allow for dynamic operation of electrolyser from 25 to 100% in seconds (following the JRC harmonised testing protocols);
- Reduce the plant's footprint by 30% thanks to the larger modules and the plant layout as well as the higher current densities;
- Reduce the electrolyser CAPEX by 20% down to EUR 480/kW and EUR 700/kW for Alkaline and PEM electrolyzers respectively, meeting the Fuel Cells and Hydrogen Joint Undertaking targets for 2024;
- Improve the maturity of technologies being tested through demonstrations in a real life environment, taking into account constraints from real operations;
- Improving durability of the membranes and components;

- Increase the stack lifetime with a degradation target (Minimum nominal energy consumption at end of Life) of 0.12%/1000 hours for Alkaline and 0.19%/1000 hours for PEM;

Improve the overall efficiency valorising also by-product heat (e.g. for space heating). Operational and environmental impacts:

- Demonstrating feasible operation of 100 MW-scale electrolysis and the use of the produced hydrogen in an application valorising the renewable character of the produced hydrogen;
- Assessment and operational experience, including safety, of the contractual and hardware arrangements required to distribute and supply hydrogen to the specific industrial and/or transport market;
- Assessment of feasibility to connect the electrolyser to a production site of renewable sources of energy such as offshore/onshore wind, or solar plants;
- Technical assessment of the suitability of the electrolyser equipment to operate in its expected environment and suggestion of best practices;
- Evaluation of the environmental performance of the system (in alignment with RED II compliant methodologies) – with attention to the CO<sub>2</sub> intensity of the hydrogen produced versus Natural Gas route, which should include an understanding of the CO<sub>2</sub> impact of the grid services mode selected and CO<sub>2</sub> footprint impact in the addressed hydrogen end-user markets;
- Evaluation of other ecological and societal benefits along the value chain.

Cost competitiveness impacts:

- Demonstrate a compelling economic and environmental case, including boundary conditions, for key applications such as transport, energy storage, raw material (hydrogen and oxygen) or heat and power production. For a LCOE of up to EUR 40/MWh (renewable sources), achieve a cost of green H<sub>2</sub> below EUR 2.5/kg and possibly aim for further reductions by generating income from the provision of services to the electricity grid (e.g. balancing or frequency services) .

Additional end study impacts addressed directly to the European Commission:

- Assessment of the legislative and Regulations, Codes, and Standards (RCS) implications of these systems and any issues identified in obtaining consents to operate the system;
- Recommendations for policy makers and regulators on measures helping to maximise the value of renewable energy and stimulate the market for renewables-electrolyser systems.

Type of action: Innovation Action (IA)

### Area 3: Industry for a clean and circular economy

LC-GD--3-1-2020: Closing the industrial carbon cycle to combat climate change -

Industrial feasibility of catalytic routes for sustainable alternatives to fossil resources

#### Specific Challenge

Greening of industrial and energy production, storage and distribution<sup>31</sup> by using CO<sub>2</sub> emissions from industrial processes.

The challenge is to sustainably convert CO<sub>2</sub> emissions from industrial processes into synthetic fuels and chemicals utilising renewable energy driven processes with novel, highly optimised and energy efficient catalytic systems. This has the potential e.g. to reduce by over 50 % the current 370 Mt of CO<sub>2</sub> emissions per annum<sup>32</sup> related to the chemical industry. However, it is necessary to demonstrate the industrial and economic feasibility of producing synthetic fuels and chemicals by scaling-up the developed technologies to reach industrial production levels and validate the industrial exploitability and circularity.

#### Scope

- Develop and deploy highly innovative and recyclable catalytic material systems to facilitate the production of synthetic fuels and chemicals from industrial CO<sub>2</sub> (including CO and H<sub>2</sub>) flue gas emissions, aiming at 50 % increase in the overall efficiency compared to the State-of-the-Art;
- Develop innovative, renewable energy driven, catalytic processes, to produce synthetic fuels and chemicals, at a sufficiently large scale to demonstrate its cost effectiveness, while reducing the use of critical raw materials;
- Demonstrate the full value chain for industrial production (including SMEs) of synthetic fuels and chemicals, whilst reducing greenhouse gas emissions;
- Address financial, regulatory, environmental, land and raw material constraints, as well as public acceptance issues and socio-economic impact related to the proposed technological pathways.

Proposals are expected to bring the core technology from TRL 4-5 up to TRL 7 at the end of the project. The Commission considers that proposals requesting a contribution from the EU of up to EUR 40 million and with a duration of up to 5 years would allow this specific challenge to be addressed appropriately. In line with the Union's strategy for international cooperation in research and innovation, international cooperation is encouraged.

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<sup>31</sup> Masterplan for a Competitive Transformation of EU Energy-Intensive Industries Enable a Climate-neutral, Circular Economy by 2050. Report by the High-Level Group on Energy-intensive Industries, 2019

<sup>32</sup> Low carbon energy and feedstock for the European chemical industry, DECHEMA 2017

Type of Action: Innovation actions (IA)

Expected impact

- Industrial scale demonstrator operational by 2026 based on Industrial Symbiosis and novel, highly optimised and energy efficient catalytic systems.
- Significant reduction of industrial CO<sub>2</sub> emissions (~200Mt p.a. reduction by 2050) with the potential to achieve a carbon intensity below 20g CO<sub>2</sub>eq/MJ.
- Enhance the effectiveness of renewable energy sources (i.e. solar, wind) by enabling the production and transmission of a flexible high energy density storage medium in the form of chemicals and synthetic fuels to be used for specific industry segments (e.g. aviation, chemical, shipping, defence) and validated through Techno-Economic and Life Cycle assessment (TEA/LCA).
- Demonstrate and validate the industrial feasibility and cost effectiveness of the technologies, at pilot plant level with a minimum chemical production capacity of 4000 tons per annum, while enhancing Europe's sustainable competitiveness in accordance with the Commissions Industrial Strategy<sup>33</sup>.
- Significant indirect impact on air quality and citizen health through the filtering of flue gas emissions from large industrial plants (e.g. energy, cement, chemical, non-ferrous metals and steel).
- Foster a cross-sectorial European innovation eco-system to deploy sustainable alternatives to fossil resources and create demonstration capacity for sustainable catalytic systems of superior efficiency towards 2030 and 2050.

Type of Action: Innovation Action (IA)

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<sup>33</sup> [https://ec.europa.eu/info/sites/info/files/communication-eu-industrial-strategy-march-2020\\_en.pdf](https://ec.europa.eu/info/sites/info/files/communication-eu-industrial-strategy-march-2020_en.pdf)

LC-GD-3-2-2020: Demonstration of systemic solutions for the territorial deployment of the circular economy

### Specific Challenge

Boosting circularity can be part of the policy response to address systemic crisis such as climate change and the recovery from the adverse socio-economic and environment impacts caused by the COVID-19 pandemic by providing circular systemic solutions for sustainable growth and economic recovery. In the context of an increasing global consumption and growing pressure on resources, there is an urgent need to decouple economic growth from resource use and to increase Europe's resilience to uncertainty in raw material supply and increase security of value chains. A sustainable, regenerative, inclusive and just circular economy can significantly help our economies to reconcile with the limits and boundaries of our planet by restoring natural systems, reducing GHG emissions and minimising loss of natural capital and biodiversity. It can also connect environmental policies with social justice through an inclusive and just transition ensuring environmental sustainability, jobs and social inclusion. A just transition framework for the circular economy can identify opportunities that reduce resource consumption and waste generation, facilitate the sustainable use of renewable resources, stimulate product innovation, and contribute positively to sustainable human development. It is essential to ensure that the transition to a sustainable, resource-efficient and circular economic model also delivers on social objectives.<sup>34</sup> The circular economy concept should be a central component in local and regional economies, which have a suitable scale for closing resources loops, creating sustainable circular ecosystems and designing participatory community-based innovation schemes. An increasing number of cities, regions, industries and businesses are engaged in testing and improving circularity in their territories, economic sectors, value chains and services. Nevertheless, the concrete implementation of systemic solutions for the territorial deployment of the circular economy still needs to be demonstrated and replicated effectively in other areas. The EU added value can be obtained where territorial circular systemic solutions will be demonstrated in a certain territory and replicated in other areas within and beyond Europe. This process of demonstration and replication will multiply the territorial contribution to achieve the policy targets of the European Green Deal, the Circular Economy Action Plan, the European Industrial Strategy and the Bioeconomy Strategy.

The projects covered under this topic and their circular systemic solutions will be part of the demonstration projects for the implementation of the European Commission's Circular Cities and Regions Initiative (CCRI) and must be carried out in close cooperation with it.<sup>35</sup>

### Scope

Each proposal must implement and demonstrate concrete systemic solutions for the territorial deployment of the circular economy (including circular bioeconomy) in one territorial cluster. The totality of the territorial clusters supported by the projects covered by this topic should reflect a

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<sup>34</sup> <https://www.chathamhouse.org/publication/promoting-just-transition-inclusive-circular-economy>

<sup>35</sup> The CCRI is part of the new Circular Economy Action Plan and aimed at supporting the concrete implementation of sustainable, regenerative, inclusive and just circular economy solutions at local and regional scale - <https://ec.europa.eu/research/environment/index.cfm>

geographical spread within Europe and include cities and/or regions of different sizes and socio-economic characteristics to the largest extent possible.

Systemic solutions are expected to demonstrate the role of the territorial circular economy to reconcile our economies and human activities with the planetary boundaries and to respond to citizen concerns and needs in the wake of systemic crisis such as climate change, biodiversity loss and adverse socio-economic and environment impacts of the COVID-19 pandemic. Systemic solutions should also increase resilience and provide concrete solutions for the socio-economic recovery and sustainable and inclusive growth of a specific territory. Sustainability, inclusiveness and social justice must be at the core of each systemic solution. Particular attention should be given to vulnerable sectors of the society and to avoid and tackle social, gender and intergenerational inequalities. Potential distributional effects of moving from a linear towards a circular economy would need to be addressed in order to produce just and fair outcomes.

A circular territorial cluster (hereinafter referred to as ‘cluster’) is a ‘circular economy basin’, a socio-economic and environmental system composed of all relevant territorial actors to implement, demonstrate and facilitate the replication of at least one circular systemic solution (hereinafter referred to as ‘systemic solution’) i.e. a large-scale and cross-sectoral demonstration project for the territorial deployment of the circular economy. Examples of clusters’ actors are administrations, industry (including small and medium enterprises – SMEs and manufacturing), scientific community, financial intermediaries and civil society (including citizens and non-governmental organisations). Each cluster should include a geographically cohesive territory (e.g. a group of neighbouring urban, peri-urban and rural areas, not necessarily limited by national borders) or territories representing components of specific value chains. The composition and dimension of a cluster must be clearly explained and justified by the proposal. The proof of formal commitments of the involved local and/or regional authorities at the proposal stage is a precondition. The support from national governments is an asset for the implementation of circular solutions.

Systemic solutions are expected to be cross-cutting among different sectors and include science, technology, governance, economic, social and environmental dimensions and components. Systemic solutions must see the active participation of all relevant cluster’s stakeholders. Each systemic solution must be based on a detailed analysis of the cluster’s circular needs, its future potential, and challenges to be tackled. A systemic solution should address economic sectors/value chains/technological processes to increase their circularity, involve circular participative and governance models, demonstrate sustainable circular services and business models. Each systemic solution is expected to involve one or more community-based innovation schemes to promote the transition to circular social practices (such as local repairing schemes for products), address environmental, behavioral and cultural aspects of the territorial transition towards a circular economy, and provide specific training, education and knowledge sharing services for local stakeholders. Systemic solutions should support an effective, sustainable and safe symbiosis within and between economic sectors, foster cooperation along and/or across value chains, identify common challenges/solutions and increase the integration between production, services and consumers. They should help to create critical mass and facilitate public and private investments.

Systemic solutions could include criteria of industrial symbiosis and industrial ecology. They should facilitate technology deployment, with special attention to more efficient and sustainable technologies (e.g. advanced and efficient manufacturing processes that enable decreasing the use of energy, raw materials and other natural resources, increasing the use of secondary raw materials, closing the industrial water, energy and materials' loops and reducing GHG emissions and pollution). The replicability and scalability potential of the clusters' systemic solutions and their business models is essential.

The economic sectors/value chains/technological processes involved in each systemic solution should be selected according to local and regional circular economy needs, potential and smart specialisation priorities, while also taking into account, if relevant, international dimensions with regards to value and supply chains. This selection must be clearly justified and explained in the proposals. Examples of these economic sectors/value chains/technological processes are: waste (including bio-waste, plastics and nanoplastics waste), water, soil, food, feed, organic and waste-based fertilisers, wood, terrestrial and aquatic bio-based value chains, packaging, textile, plastics, mobility (including electric mobility), logistics, components and systems for renewable energy generation, use and storage, electrical and electronic equipment, composites, urban planning and use of spaces, building materials, construction and buildings (including building interiors). When relevant, systemic solutions should include industrial symbiosis. The totality of the systemic solutions presented by all clusters are expected to address several economic sectors/value chains/technological processes and involve diverse community-based innovation schemes. This variety will provide policy-makers and territories not participating to the proposals with a wide spectrum of concrete systemic solutions to be replicated and adapted in their areas. A systemic territorial approach involving several economic sectors and its inclusion in a local or regional circular economy action plan would be an added value.

Proposals shall explore synergies with other funds, including Cohesion Policy funds, Just Transition Fund and InvestEU, hereby showing pathways to market up take.

Each systemic solution must monitor and evaluate the cluster's transition towards a circular economy, identify its strengths and weaknesses as well as their causes, analyse regulatory obstacles and drivers and provide clear and precise policy recommendations to improve related EU regulation (including inputs on standardisation and certification), analyse existing financial schemes and propose concrete options for their improvement. Systemic solution should also address the need to study, optimise and control innovative circular production processes and methods to achieve sustainability. Externalities must be addressed and life cycle assessment (LCA) included in each systemic solution. Benchmark cost and environmental footprint of each systemic solution must be compared with equivalent linear solutions.

Proposals must ensure the exchange of relevant information and experiences within and across clusters as well as with policy-makers and territories not involved in the proposals. Setting up twinning exercises between the clusters can be efficient ways to facilitate the exchange of good practices and experiences.

Proposals must demonstrate a deep and comprehensive knowledge on relevant European projects and initiatives on circular economy and circular bioeconomy with special reference to local and regional level. This is fundamental in order to ensure complementarity and cooperation with existing projects and initiatives and avoid overlapping and repetitions.

The technology readiness level (TRL) of each circular solution at the end of the project should be 6-7. Proposals should clearly state the starting and end TRL of the key technology or technologies targeted in the project.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 20 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

#### Expected impact

Demonstrate systemic solutions for the territorial deployment of the circular economy:

- demonstrate the technical and economic feasibility of at least one circular systemic solution per territorial cluster;
- identify the economic, social and environmental benefits and challenges of each circular systemic solution;
- contribute to overcome market failures, testing public-private partnership models, interregional cooperation mechanisms and/or multilevel funding synergies useful for de-risking business investments;
- contribute to connect different stakeholders of specific value chains, including key actors of the regional innovation ecosystems and final users;
- provide policy-makers and public and private investors with concrete examples of effective and sustainable systemic circular solutions to be replicated in other areas;
- foster the emergence of a structured pipeline of investment projects.

Socio-economic and environmental impact:

- create jobs and new sustainable business opportunities in the short to medium perspective;
- increase circularity of clusters' economic sectors and community-based innovation schemes;
- improve the sustainability and circularity of the clusters' overall ecosystem, management of local resources, and reduce GHG emissions;
- promote circular practices amongst citizens and increase their participation in these practices;
- improve consumers' understanding and acceptance of circular products and services;
- promote the role of ecosystems services and nature based solutions in the circular economy;
- promote the use of natural capital accounting into business strategy and decision making to optimise the circular economy;
- promote decoupling economic activity from the consumption of finite resources;
- promote eco-design, use of secondary raw materials and substitution or circular use of critical raw materials in businesses and value chains based on local resources.

Facilitated the replication and scalability of systemic solutions in order to multiply the economic, social and environmental benefits to achieve policy targets of the European Green Deal, Circular Economy Action Plan, the European Industrial Strategy and EU Bioeconomy Strategy at regional, national, European and international level:

- ensure replicability, scalability and visibility of successful systemic solutions;
- ensure knowledge transfer between the territorial clusters developing circular solutions and other territories within and beyond Europe;
- facilitate industrial exploitation of demonstrated research results;
- contribute to connect SMEs to large companies value chains;
- contribute to connect and upgrade open access circular demonstration facilities across Europe.

Type of action: Innovation Action (IA)

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## Area 4: Energy and resource efficient buildings

LC-GD-4-1-2020: Building and renovating in an energy and resource efficient way

### Specific Challenge

With rising focus on the building sector (e.g. the ‘renovation wave’ initiative of the European Green Deal) in view of the full decarbonisation by 2050, the built environment remains a strategic domain for R&I. The priority is the design and construction of new or retrofitting of existing buildings as zero-emission/zero-pollution, positive energy powerhouses within sustainable green neighbourhoods. There are two major components of this transition. Firstly, a transition in design and construction of buildings to reduce their embodied emissions and to increase the energy efficiency of their operation; also the retrofitting of existing buildings to increase their efficiency. Secondly, a transition to energy positive buildings (producing electricity, covering their heating and cooling needs and contributing to the grid stability) with sustainable, renewable energy technologies. These two components are closely linked, since greater building efficiency can reduce demand for heating and cooling and allow a greater range of zero emission technologies to become viable. It also means, reducing demand through effective building designs (incorporating thermal design and orientation), including those that are adapted to their local environments (climatic conditions) and use. The multiplication of such buildings allows the creation of green neighbourhood “living labs” (including social housing and non-residential buildings such as hospitals, schools, public buildings, commercial buildings, etc.) with additional urban functionalities (e.g. shared EV charging facilities).

### Scope

Proposals are expected to deliver at least two (residential and non-residential, new and/or retrofitted) large-scale, real-life demonstrations of promising technology, process and social innovations, in different regions of Europe. The demonstrations should address the following aspects:

- Scalability design of green, positive energy neighbourhoods well embedded in the spatial, economic, technical, environmental, regulatory and social context of the demonstration sites.
- Energy and resource efficient, seamless industrial construction/renovation workflows from design through to offsite manufacturing, installation and post-construction monitoring:
  - With recycling/reuse of construction materials (or industrial by-products) or reduction of the amount of materials and components used, in order to reduce the embodied energy of buildings;
  - Demonstrating high replicability, reduced maintenance costs and long-term performance, as well as, socio-environmental performance (e.g. air quality/natural ventilation, natural lighting, etc.) and potential for adaptation, reuse or deconstruction in the future;

- Ensuring that proposed solutions do not influence negatively the fire and seismic safety of the buildings;
- Minimizing disruption for building occupants and the time spent on site;
- Delivering post-construction/renovation monitoring of both operational energy performance (minimizing design-built performance gap) and durability of the construction/renovation components.
- Sustainable and highly energy-efficient building designs (incorporating thermal design and orientation), adapted to local environments and climatic conditions, including active-passive solutions for the building envelope, with:
  - Digital and EGNSS<sup>36</sup> based methods of design and construction, smart monitoring and tracking of building and renovation processes (e.g. Building Information Modelling, digital twins and augmented reality, robotics, etc.);
  - Innovative and more energy efficient Building Integrated Photovoltaics (BIPV) converting the building envelope into electricity-producing surfaces, while satisfying building functions in addition to architectural and aesthetic considerations.
- Sustainable, innovative zero-emission and more cost and energy efficient, RES power generation in the buildings combined with urban service facilities (e.g. charging facilities) and HVAC technologies :
  - Power generation systems (e.g. highly performant Photovoltaic solutions adapted to the conditions of use; BAPV where BIPV is not an option);
  - HVAC solutions (e.g. reversible heat pumps with refrigerants that are not greenhouse gases, or less developed clean heating options such as hydrogen).
- Energy storage systems (e.g. using second life batteries from electric vehicles) with bidirectional charging functionalities, that do not limit the use of living space (e.g. neighbourhood optimized storage including management systems for optimal integration, flexibility and interoperability with the grid).
- Highly energy-efficient building operation at reduced maintenance costs and long-term performance with the help of digital technologies to optimise energy generation, consumption, storage and flexibility at neighbourhood scale, as well as digital solutions to increase the usability, energy efficiency and secure operation of building systems and appliances, ensuring optimal comfort for users and a healthier living environment:
  - Optimal dynamic matching of on-site renewable energy generation and building/neighbourhood consumption; integrated demand-response, considering also non-energy benefits (e.g. security, air quality, etc.);
  - Smart home services, advanced automated controls, i.e., smart meters, smart water control, smart EV charging, smart elevators, smart security etc.; based on inclusive design, understanding the occupants preferred usage of the building and harmonising the building - occupants interaction;

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<sup>36</sup> European Global Navigation Satellite System. See <https://www.gsa.europa.eu/segment/egnss-service>

- Integration between building energy management systems/building automation control systems, renewable electricity/energy generation, storage, urban service facilities and the grid;
- Potential for local flexibility to be aggregated and bundled; possibility to trade and commoditise energy flexibility creating new services and revenue streams for building owners/tenants.
- Citizen awareness raising activities linked to green neighbourhood “living labs” (led by “green schools” where relevant), to facilitate social innovation, promote education and training for sustainability, conducive to competences and positive behaviour/good habits for a resource efficient and environmentally respectful energy use.
- Coordination on standards and regulatory aspects to ensure operational efficiency of buildings and HVAC technologies also addressing the design-built performance gap.

The objective of the demonstrations is to test, in view of scaling up and wide replication, the proposed innovations across the whole value chain (from planning and design through manufacturing and construction to end use, including all relevant players, governance and financing institutions, planners, owners, architects, engineers, contractors, facility managers, tenants, etc.). The objective is also to adapt this value chain to new operation patterns resulting from the innovations (new business models and services, new usages, changed behaviour). Therefore, the validation of the market and consumer uptake potential should be carried out in the form of real life “living-labs” and under conditions that are open to innovation. On this purpose, the project will set up (or use existing) innovation clusters in different regions of Europe, where relevant with a link to other initiatives (e.g. R&I partnerships). Such innovation clusters need to include the local/regional/national value chain(s), to demonstrate, evaluate and ultimately replicate the innovative solutions in different environment and market conditions, with due consideration of social, business and policy drivers. This will also ensure the validation of the innovations for different building types - residential (e.g. social housing) and non-residential (e.g. hospitals, schools, public buildings) - and various climatic zones.

Proposals are expected to bring the technologies from TRL 5/6 to TRL 7/8 at the end of the project.

The Commission considers that proposals requesting a contribution from the EU of between EUR 15 to 20 million would allow the specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

### Expected Impact

When compared to the state of the art the innovative solutions developed in the projects are expected to bring the impacts listed below:

- Primary energy savings triggered by the project (in GWh/year);
- Investments in sustainable energy triggered by the project (in million Euro);
- High energy performance (nearly zero-energy level within the meaning of Directive 2010/31/EU for retrofitted / positive energy buildings for new constructions);

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- Reduction of greenhouse gas emissions towards zero (in tCO<sub>2</sub>-eq/year) for the total life-cycle compared to current situation shown through cradle-to-cradle Life Cycle Assessment;
- Reduction of the embodied energy in buildings by 50 % without concessions with respect to energy consumption and comfort;
- Reduction of air pollutants towards zero (in kg/year) for the total life-cycle compared to current situation shown through cradle-to-cradle Life Cycle Assessment;
- Demonstration of high potential for replicability using new or existing innovation clusters incorporating the whole value chain;
- Shortened construction/retrofitting time and cost by at least 30 %, in order to allow market uptake and social affordability;
- Improved final indoor environment quality by at least 30 % and reduction of dust and noise during retrofitting by at least 30%, leading to higher rate of users' satisfaction;
- Contribute to the development and implementation of zero-GHG approaches in the building sector.

Relevant indicators and metrics, with baseline values, should be clearly stated in the proposal.

Type of Action: Innovation Action (IA)

## Area 5: Sustainable and smart mobility

LC-GD-5-1-2020: Green airports and ports as multimodal hubs for sustainable and smart mobility

### Specific Challenge

A clear commitment of the European Green Deal is that “transport should become drastically less polluting”, highlighting in particular the urgent need to reduce greenhouse gas emissions (GHG) in aviation and waterborne transport. In aviation, traffic volumes are expected to increase significantly by 2050 and the sector is already generating 14% of the EU GHG emissions from transport. At the same time, waterborne transport is accounting for approximately 90% of global trade and 13% of EU transport GHG emissions, while also experiencing continuous growth. In this context, airports, maritime and inland ports play a major role, both as inter-connection points in the respective transport networks, but also as major multimodal nodes, logistics hubs and commercial sites, linking with other transport modes, hinterland connections and integrated with cities. As such, green airports and ports, as multimodal hubs in the post COVID-19 era for sustainable and smart mobility have a great potential to immediately start driving the transition towards GHG neutral aviation, shipping and wider multimodal mobility already by 2025. This topic addresses innovative concepts and solutions for airports and ports, in order to urgently reduce transport GHG emissions and increase their contribution to mitigating climate change.

### Scope

Building on best practices (technological, non-technological and social), as well as ongoing projects and planned initiatives in European airports and ports, proposals should address the activities EITHER under area A) Green Airports OR under area B) Green Ports. Proposals should clearly indicate which area they are covering.

### **Area A: Green Airports**

Perform large-scale, real-life high TRL demonstrations of green airports, addressing the topics a), b) and c) listed under heading “1. Transport” and integrating a number of the constitutive aspects listed below them, as well as a minimum of half the aspects listed under each of the three remaining headings (“2. Terminal”, “3. Energy” and “4. Cross-cutting aspects”), collectively describing the various airport aspects to be considered:

#### 1. Transport

- a) Access and multimodal connections to the airport (e.g. from cities or other nodes)
- b) From the airport terminal to the aircraft (airside)
- c) At the airport landside (logistics, ground handlings and operations, as well as green energy production/supply of sustainable alternative fuels or electricity)

- Demonstrate low-emission energy use (electrification or sustainable alternative fuels) for aircraft, airports, other / connected and automated vehicles accessing or operating at airports (e.g. road vehicles, rolling stock, drones), as well as for public transport and carpooling, with re-charging/re-fuelling stations and use of incentives;
- Showcase the use of innovative de-icing and anti-icing procedures and infrastructures;
- Apply innovative digital / satellite-based solutions, including new tools and traffic optimisation mechanisms for multimodal access, passenger and freight flows into and out of the airport, as well as between airports, facilitating airport access and reducing traffic from / to the city or other nodes;
- Promote the development of sustainable alternative fuels production facilities, as well as the necessary underlying infrastructure (for distribution, fuel handling logistics and blending operations) to facilitate the conversion of airport waste to sustainable alternative fuels and the delivery of the fuels to the airport, for small and medium airports, scalable to large airports, therefore allowing deployment at a significant number of airports;
- Promote intermodal mobility and modal shift (e.g. in the context of Mobility/Logistics as a Service or transport-on-demand), including efficient rail interconnection solutions and innovative train-airport station concepts;
- Develop and prepare the implementation of a new EU Clearing House for Sustainable Kerosene (EU-CHSK), to undertake testing for new value chains of renewable kerosene in Europe. The EU-CHSK should select laboratories for the actual analyses of the fuels, as well as facilities that can carry out the actual testing in jet engines, in compliance with either existing or newly developed ASTM standards, in view of future implementation of an autonomous, integrated and operational EU-CHSK.

## 2. Terminal

- Demonstrate integration of new solutions with operations, green and smart logistics and infrastructures;
- Develop the green built environment (construction/demolition) and improve procurement processes;
- Improve the energy efficiency of buildings; optimise services such as lighting, heating, natural ventilation and air conditioning (taking into account strict public health criteria), water / energy usage and efficiency; utilise low ecological impact materials;
- Enhance biodiversity, green land planning and use, as well as circular economy and recycling (in the context of zero-waste concepts).

### 3. Energy

- Address the entire energy value chain from supply to use: demonstrate energy efficient facilities for green energy production (e.g. electricity, advanced biofuels, synthetic kerosene, mixture SAF / Jet A1, green hydrogen) to power / electrify the built environment and infrastructure, transport and airport ground operations;
- Envisage industrial scale pilot advanced biofuels refineries or retooling of existing fuel refineries, as a means of producing sustainable alternative fuels and generating additional heat and power in an efficient manner and minimal environmental impact;
- Identify effective incentives to address challenges in the sustainable alternative fuels system (e.g. fuel producers, fuel distributors, airport operators, airline operators) and to promote the penetration of sustainable alternative fuels within the aviation sector;
- Assess the scalability of solutions – e.g. enabling sustainable alternative fuel producers to cover investment risks and promote advanced technology, while securing buy-in of end users (air operators).

### 4. Cross-cutting aspects:

- Air quality (indoor, outdoor, including decontamination from microbiological pathogens) and noise trade-off;
- Impact on the existing legal framework covering operational and environmental aspects, eco-labelling, certifications (robust certification and green standards setting) and Measurement, Reporting and Verification (MRV);
- Use of ICT and satellite-based solutions to effectively manage resources and assets, including management of information and production of knowledge, taking into account all the related safety and security aspects of the solutions developed and proposed;
- Sustainable evolution of airports, including their integration into the circular economy, by considering the collection/sorting of recyclable waste and activities linked to aircraft decommissioning, institutional and governance aspects, ownership, regulation, performance indicators, balance of force between regulators, airlines and airport operators, in order to accelerate the production and use of sustainable energy;
- Feasibility of a market-based instrument to prevent/reduce Food Loss and Waste (FLW) and to valorise a business case of transformation of FLW into new bio-based products. This includes FLW measurement and monitoring methodologies and the subsequent mapping of FLW total volume at stake in the considered airport;
- Non-technological framework conditions, new multi-actor governance and investment analyses.

## **Area B: Green Ports**

Perform large-scale, real-life high TRL demonstrations of sustainable maritime and inland ports, addressing at least 6 of the following 8 aspects:

- Demonstrate integrated low-emission energy supply and production at ports (e.g. electricity, green hydrogen, advanced biofuels and bioliquids) and supply systems (on-shore or off-shore), with storage, distribution and power / re-charging / sustainable alternative fuel re-fueling infrastructure for ships and other vehicles operating at/to/from ports, as well as for other uses (e.g. port equipment/machinery, on-shore power supply systems for vessels mooring in the port, etc.);
- Demonstrate sustainability and innovation beyond energy supply and demand at ports, particularly the integration with green and smart logistics and operations at/to/from ports, energy-efficient buildings, innovative construction, dredging and infrastructure activities, effective and green land use;
- Demonstrate seamless and highly efficient logistics operations, for integrated sea/river-port-hinterland connections (e.g. between sea/river, rail and road), to enable modal shifts and system-wide door-to-door multimodal passenger mobility and freight transport;
- Perform pilot activities to showcase the positive environmental effects of digitalisation (incl. satellite-based solutions) in ports, particularly with clean (e.g. electrified / hydrogen) connected and automated vehicles and cranes, as well as intelligent port systems and dynamic vessel traffic flows for improved routing and scheduling, to minimise ship time at port, enabling efficient and automated logistics chains and multimodal inter-connections;
- Deliver new tools and optimisation mechanisms for multimodal access, passenger and freight flows into and out of the port, as well as between ports, facilitating port access and reducing traffic from / to the city or other nodes;
- Assess non-technological framework conditions, such as market mechanisms and potential regulatory actions in the short and medium term, which can provide financial/operational incentives and legal certainty for implementing low-emission solutions (e.g. considering first-mover advantage, best-equipped-best-served principles and port market share effects);
- Develop and promote new multi-actor governance arrangements that address the interactions between all port-related stakeholders, including port authorities, ship owners, local communities, civil society organisations and city, regional or national planning departments, in order to accelerate the production and use of sustainable energy;
- Deliver a Master Plan for the future Green Port, with a bold vision and a roadmap with milestones to achieve GHG neutral shipping and minimal pollution in maritime and inland port areas (incl. ships in and approaching port) by 2030, 2040 and 2050; as well as addressing the associated investment / cost implications (incl. operational and capital expenditures). This master plan should also address:

- A wider socio-economic perspective, covering sustainable and smart mobility, technical, operational, economic, environmental and social aspects, relevant to shaping the green ports of the future and their integration with other sustainable transport modes, the hinterland, cities and urban mobility;
- Solutions with the highest potential for emission reduction at ports, focusing on CO<sub>2</sub> and noxious pollutant emissions (SO<sub>x</sub>, NO<sub>x</sub> and particulates), as well as water pollution and noise, but also on improving biodiversity, the soil and the aquatic environment, while considering climate change effects (e.g. sea/river-level rise, new tourism patterns, etc.);
- Analysis of the various alternatives for the provision of power supply at the port, such as fixed land energy grid vs. mobile power production and supply (e.g. LNG generators/containers) and mobile storage, for instance through the use of barges or trucks bringing energy/batteries, etc.;
- Assessment whether existing fossil fuel, LNG or other / chemical infrastructures in the broader port areas could be used to facilitate the transition towards low-emission shipping and bunkering of carbon neutral fuels;
- A holistic sustainable port design concept, leveraging green construction, demolition and dredging activities, with energy-efficient or renovated buildings, optimising land and sea/river use, improving biodiversity and circular economy;
- Scalable solutions that can be replicated/gradually scaled-up to larger or scaled-down to smaller ports, together with the demonstration of their environmental sustainability and technical, operational, and economic viability;
- Governance, business, deployment models and plans, including internal/external costs;
- Collaboration models across multiple stakeholders, paving the ground for large-scale deployment of the demonstrated innovative solutions across European ports;
- A comprehensive report of all project findings in detail, including the identified proposed suitable pathways for European ports to achieve GHG-neutrality, by use of standardised tools for assessing the comparative emission reduction of different ports;
- A handbook on how to move from planning, to implementation, replication and scaling-up the deployment of the demonstrated solutions, for different sizes and locations of ports across Europe.

**Applicable to both Area A: Green Airports and Area B: Green Ports**

Proposals for both areas (Green Airports and Green Ports), addressing the aspects described above should, where appropriate, incorporate field performance monitoring with a view to assessing the effectiveness of the deployable solutions. This should be determined by measuring the performance difference (for comparable activity levels) between the initial status, considered

before the innovative solutions are applied (baseline), and the status at a point in time at least 2 years into the project, after a number of the solutions produced by the project have been applied.

Proposals should also provide a quantified assessment of the expected improvement in airport or port energy consumption, as well as in greenhouse gas emissions and air quality.

Each consortium should be led by one “Lighthouse” airport or port, which will demonstrate the novel concepts and solutions and a further three (at most) “Fellow” airports or ports that will be actively associated in helping to define and incorporate their specificities in the more general approach and solutions, follow closely the demonstration actions and are committed to implement the best practices identified and results produced by the project. For Green Ports, each consortium should include at least one inland port. All consortia should also include academic and other partners (e.g. rail, road). All participating airports or ports must be from different EU Member States or Countries associated to Horizon 2020. All projects in each area must commit to collaborate, share a common communication strategy and organise common events.

The Commission considers that proposals requesting a contribution from the EU of between EUR 20 and 25 million would allow this specific challenge to be addressed appropriately. Typically, projects should have a duration of 48 to 60 months. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts or durations. A maximum of 20% of the requested EU contribution should be for the Fellow airports or ports.

Eligible costs are primarily those that concern the innovative elements of the project needed to:

- Foster innovative overall energy systems integration;
- Demonstrate effective integration of transport modes within and around the airport or port;
- Foster wider use of green hydrogen, electrification and sustainable alternative fuels at airports or ports.

Costs of commercial technologies are not eligible, for example:

- Buildings: purchase, construction, retrofitting and maintenance;
- Electric vehicles and charging stations: purchase, installation and maintenance;
- ICT platforms: purchase and maintenance.

Grants will be awarded to proposals according to the overall ranking list. However, in order to ensure a balanced portfolio of supported actions, at least the two highest-ranked proposals in the area of A) Green Airports and B) Green Ports will be funded, provided they attain all thresholds.

Expected Impact

- Accelerated deployment of sustainable alternative fuels (including advanced biofuels), green hydrogen and electromobility in transport, as well as sustainable energy supply and storage and waste heat recovery in airports and ports;
- Clean energy / fuel production and distribution (particularly green hydrogen and electricity) and increased alternative (bio-) fuel supply, with re-fueling and re-charging capabilities;
- Green airports and ports as multimodal hubs, optimising passenger and freight flows for low emission mobility, in a context of much stricter public health criteria;
- Energy-efficient and green airport and port operations and buildings, green and smart logistics, integration with other low-emission transport modes (in particular rail) and promoting effective modal shifts;
- Reduced aviation, waterborne and other transport emissions, as well as improved air quality, biodiversity, better integration in the circular economy and reduction of noise at airports and ports;
- Reduced emissions for cities and urban mobility, as well as improved city integration for airports and ports;
- Clear commitments and contributions to Europe-wide take up of technological, non-technological and socially innovative solutions during and beyond the project are expected, which could be in the form of follow-up actions, for instance supported by EU's Connecting Europe Facility or other funding programmes;
- Significant, direct and immediate contribution to the achievement of the European Green Deal, as well as other EU transport policy objectives (including TEN-T), while strengthening the competitiveness of the European transport sector.

Type of Action: Innovation Action (IA)

## Area 6: Farm to Fork

LC-GD-6-1-2020: Testing and demonstrating systemic innovations in support of the Farm-to-Fork Strategy

### Specific Challenge

European food is famous for being safe, nutritious and of high quality. It should now also become the global standard for sustainability. Although the transition to more sustainable systems is starting, it remains a big challenge to feed a fast-growing world population and bring food systems within a safe and just operating space - encompassing planetary health, economic viability and social welfare, and including human health. Current production practices and consumption patterns still result in air, water and soil pollution, contribute to the loss of biodiversity and to climate change, may challenge animal welfare and consume excessive amounts of natural resources, including water and energy, while an important part of food is wasted. At the same time, unbalanced diets contribute to obesity and other nutrition-related diseases. Here are some of the facts:

- Agriculture is responsible for 10.3% of the EU's GHG emissions<sup>37</sup>; Food is a significant source of GHG-emissions contributing to about 17% of EU household emissions, similar to housing (22%)<sup>38</sup>;
- Nitrogen and phosphorus cycles exceed their safe operating space in Europe, respectively by a factor of 3.3 and 2 resulting in diffuse pollution of terrestrial, aquatic and atmospheric ecosystems<sup>39</sup>;
- Antimicrobial resistance (AMR) linked to the excessive and inappropriate use of antimicrobials in animal and human healthcare leads to an estimated 33,000 human deaths in the EU/EEA every year<sup>40</sup>, and considerable healthcare costs;
- About 20% of the food produced in the EU is being wasted<sup>41</sup>;
- One in five EU adults are obese and half are overweight<sup>42</sup>. Many Europeans die prematurely, or suffer from illnesses due to diet related diseases.

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<sup>37</sup> EEA (2019), Annual European Union greenhouse gas inventory 1990-2017 and Inventory report 2019. These figures do not include CO<sub>2</sub> emissions from land use and land use change

<sup>38</sup> D. Ivanova, et al, 2017, Mapping the carbon footprint of EU regions (<https://iopscience.iop.org/article/10.1088/1748-9326/aa6da9/meta>)

<sup>39</sup> EEA/FOEN report (2020) 'Is Europe living within the limits of our planet?' <https://www.eea.europa.eu/publications/is-europe-living-within-the-planets-limits>

<sup>40</sup> Cassini et al., (2019) 'Attributable deaths and disability-adjusted life-years caused by infections with antibiotic-resistant bacteria in the EU and the European Economic Area in 2015: a population-level modelling analysis', in *Lancet Infect Dis*. Vol.19, issue 1, pp. 55-56

<sup>41</sup> <http://www.euro.who.int/en/health-topics/noncommunicable-diseases/obesity/data-and-statistics>

<sup>42</sup> <http://www.euro.who.int/en/health-topics/noncommunicable-diseases/obesity/data-and-statistics>

In addition, the COVID19 pandemic highlighted the importance of robust and resilient EU food systems within a sustainable, circular bioeconomy to respond to global shocks and disruptions in supply chains, and to mitigate socio-economic impacts of crises notably as regards food poverty.

The Farm to Fork Strategy, which is at the heart of the European Green Deal, aims to address the challenges and accelerate the transition to sustainable food systems, to ensure that the economic, social and environmental foundations of food and nutrition security are not compromised for current and future generations. It places emphasis on enabling a “just transition” for all actors of the food systems, in which also social inequalities are reduced, food poverty is addressed, and a fair income for all actors is ensured. It requires and builds on innovative systemic solutions that can be scaled up, such as smart agro-ecological practices, new protein sources other than meat, sustainable food from the oceans and aquaculture, and personalised advice relating to sustainable healthy diets<sup>43</sup>. Concerted efforts are needed to test, demonstrate and scale-up such solutions and target impact in this decade.

### Scope

A range of activities will support the deployment and scaling up of innovations that contribute to the objectives of the Farm-to-Fork Strategy<sup>44</sup>. Proposals will test, pilot and demonstrate innovative systemic solutions (TRL 5-7) in one of the following six urgent and pressing food systems’ challenges:

- A.** Achieving climate neutral farms by reducing GHG emissions and by increasing farm-based carbon sequestration and storage (IA)
- B.** Achieving climate neutral food businesses by mitigating climate change, reducing energy use and increasing energy efficiency in processing, distribution, conservation and preparation of food (IA)
- C.** Reducing the dependence on hazardous pesticides; reducing the use and increasing the efficiency of fertilisers; reducing the losses of nutrients from fertilisers, towards zero pollution of water, soil and air (IA)
- D.** Reducing the dependence on the use of antimicrobials in animal production and in aquaculture (IA)
- E.** Reducing food losses and waste at every stage of the food chain including consumption, while also avoiding unsustainable packaging (IA)
- F.** Shifting to sustainable healthy diets<sup>45</sup>, sourced from land, inland water and sea, and accessible to all EU citizens, including the most deprived and vulnerable groups (IA)

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<sup>43</sup> These solutions serve as example. Applicants should not assume that proposals that include these specific solutions are preferred.

<sup>44</sup> See European Commission Communication “[A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system](#)”, COM(2020)381

<sup>45</sup> “Sustainable Healthy Diets are dietary patterns that promote all dimensions of individuals’ health and wellbeing; have low environmental pressure and impact; are accessible, affordable, safe and equitable; and are culturally acceptable.” (FAO & WHO. 2019. Sustainable healthy diets – Guiding principles. Rome, page 11)

The Commission considers that proposals requesting from EUR 9 million up to 12 million would allow the specific challenge to be addressed appropriately under each of these scopes (A), (B), (C), (D), (E), or (F). Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Grants will be awarded to proposals according to the ranking list. However, in order to ensure a balanced portfolio of supported activities, at least the highest-ranked proposal per scope (A), (B), (C), (D), (E), or (F) will be funded provided that it attains all thresholds.

**All scopes (A), (B), (C), (D), (E), and (F):**

The Commission considers that proposals should go well beyond technological solutions. They should focus on systemic innovations that maximise synergies and minimise trade-offs to deliver on the three dimensions of sustainability (social/health, climate/environmental and economic), that consider co-benefits such as with biodiversity and animal welfare, that enhance resilience of food systems to shock and stresses, and that enable them to operate within a safe and just operating space and ensure sufficient, safe, nutritious, and affordable food for all.

Proposals should pay particular attention to:

- Applying system thinking/system approaches to define the challenge, including an in-depth systemic analysis of its drivers and root causes; to identify possible innovative systemic solutions from production<sup>46</sup> to consumption; to assess their expected and actual impact including risks, synergies, and trade-offs with regards to the three pillars of sustainability (social/health, climate/environmental and economic), food and nutrition security, food system resilience, food safety and the objectives outlined in the Farm to Fork Strategy and the Green Deal.
- Adopting a multi-actor and cross-sectoral approach engaging practitioners (primary producers, processors, retailers, food service providers, consumers), public and private institutions (governmental institutions, NGOs, industry) and citizens from farm to fork to co-create, test and demonstrate solutions from production to consumption, in practice, on a European scale but with attention for regional and sectoral needs and contexts (environmental, socioeconomic, cultural). Foster collaboration, building bridges and breaking silos between actors of the food chain and between primary sectors as well as collective action. Take specific care to engage young professionals (e.g., young farmers, young fishers, young researchers, young entrepreneurs, etc.), SMEs, consumers and citizens.
- Including the most appropriate mix of innovations, such as novel and digital technologies, new business and supply chain models, new governance models, ecological and social innovations while taking into account regional and sectoral contexts (environmental, socioeconomic, cultural) and needs, both for production and consumption. The projects shall focus on upscaling innovations (TRL level 5-7, and can include limited research activities to address specific gaps for solution building, testing and demonstration. Particular attention should be

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<sup>46</sup> From land, inland water and seas; including fisheries

given to understand behaviours, motivations and barriers, with a view to maximizing the uptake of solutions. The innovations delivered by the proposals have to take into account the EU market regulatory frameworks (e.g. safety, environmental) and relevant requirements.

- Where appropriate, capitalise on existing testing and demonstration facilities to strengthen their capacity to address the challenge and showcase solutions.
- Delivering and implementing an action plan for dissemination, communication and engagement, for building awareness, education and skills relevant to the solutions on a European scale, in and beyond the regions where the activities take place, among businesses, investors, entrepreneurs, institutions, stakeholders and citizens. Promote their widespread uptake, realize behavioural change, and stimulate investment. Proposals should foresee a dedicated work package for cooperating with European Commission services and with all selected projects under this topic on the implementation of this action plan, with a view to increasing the impact of that plan. Projects may link with other relevant European and national programmes, where appropriate.

#### Expected Impact

Proposals are expected to:

- Demonstrate innovative systemic solutions that have the potential to generate significant positive impacts by 2030 with regards to :
  - Achieving climate neutrality of farms (on land, water and sea); reducing GHG emissions; increasing carbon sequestration and storage (Scope A);
  - Achieving climate neutrality of food businesses; reducing energy use and increasing energy efficiency in processing, distribution, conservation and preparation of food (Scope B);
  - Decreasing the dependency on the use of hazardous pesticides (Scope C);
  - Reducing fertiliser use and nutrient loss of nutrients from fertilisers; increasing the efficiency of fertilisers (Scope C);
  - Decreasing the dependency on antimicrobials in animal production and in aquaculture (Scope D);
  - Reducing food losses and waste and the use of unsustainable packaging, at every stage of the food chain including consumption (Scope E);
  - Increasing the share of citizens that adhere to healthy sustainable diets, including among the most deprived and vulnerable groups (Scope F);
  - Providing sufficient, safe, nutritious, and affordable food for all (Scopes (A), (B), (C), (D), (E), and (F));
  - Improving the overall sustainability of food systems (social/health, climate/environmental and economic) (Scopes (A), (B), (C), (D), (E), and (F));
  - Improving the resilience of food systems to shocks and stresses (Scopes (A), (B), (C), (D), (E), and (F)).

- Contribute significantly to the achievement of the objectives and targets of the Farm-to-Fork Strategy<sup>47</sup> and The European Green Deal<sup>48</sup>, and in particular to:
  - Reducing GHG-emissions by at least 50% by 2050 compared with 1990 levels (Scope A, B, E, F);
  - Reducing the overall use and risk of chemical pesticides by 50% and the use of more hazardous pesticides by 50% by 2030 (Scope C);
  - Reducing nutrient losses by 50%; reduce the use of fertilisers by at least 20% by 2030 (Scope C);
  - Reducing the EU sales of antimicrobials for farmed animals and in aquaculture by 50% by 2030 (Scope D);
  - Halving the per capita food waste at retail and consumer levels by 2030 (Scope E);
  - Reversing the rise in overweight and obesity rates across the EU by 2030 (Scope F);
  - Bringing European diets more in line with dietary recommendations (Scope F).
- Achieve an increase in awareness among policy makers, businesses, investors, entrepreneurs, institutions, stakeholders and citizens of selected innovative systemic solutions, of their potential and of the requirements to promote and realise their uptake at EU scale and behavioural change (Scopes (A), (B), (C), (D), (E), and (F)).

Type of Action: Innovation Action (IA)

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<sup>47</sup> See European Commission Communication "[A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system](#)", COM(2020)381

<sup>48</sup> See European Commission Communication "[The European Green Deal](#)", COM(2019)640

## Area 7: Ecosystems and Biodiversity

LC-GD-7-1-2020: Restoring biodiversity and ecosystem services

### Specific Challenge

This European Green Deal call should be pivotal in demonstrating and promoting systemic solutions for upscaling of urgent restoration to increase biodiversity and support a wide range of ecosystem services, as requested in the Biodiversity Strategy for 2030 for damaged terrestrial, freshwater, coastal and marine ecosystems. Underpinned by knowledge in the latest IPCC and IPBES reports, large-scale ecosystem restoration is urgent – the window of opportunity is closing as we speak. It needs a systemic approach to deliver tangible benefits on the Green Deal actions for climate (mitigation, adaptation and disaster risk reduction), biodiversity, zero pollution and sustainable food systems (from farm to fork) and health and wellbeing.

Resilient, healthy ecosystems are natural carbon stocks and sinks. They can remove CO<sub>2</sub> from the atmosphere and support adaptation to climate change and disaster risk reduction. In addition to delivering a wide range of other services (oxygen source, improved health and well-being, recreation, water retention and purification, air quality, nutrient cycling or pollination), ecosystems are essential in a wide range of sectors, which impact the everyday life of Europe's citizens (food, feed, fibre or fuel provision across the bioeconomy). Yet, biodiversity is being lost, and ecosystems are degrading at an alarming rate. Pressures on biodiversity increase at a faster rate than the efforts to protect it<sup>49</sup>. The integrity of terrestrial and aquatic ecosystems and their capacity to deliver a wide range of essential services to people will be further undermined by the effects of unavoidable climate change. There is therefore an urgent need to strengthen their resilience against environmental and climate stressors while integrating the local socio-economic specificities of their surrounding environment.

Whilst solutions are available now, they are neither up-scaled nor integrated enough in today's governance, investment or policy support landscapes. The environmental emergency highlights the limits of current management approaches and calls for investment in innovative, sustainable and effective restoration (including through mobilising innovative funding and cross-sectoral collaborations) that could trigger the urgent transformational changes we need. The global biodiversity post-2020 framework seeks voluntary commitments by business and stakeholders to invest in biodiversity and new approaches to speed up actions in the frame of the UN decade for restoration.

From increased social awareness to more engagement with the private sector, there is a distinct need to build trans-disciplinary collaborations at all scales and across relevant ecosystem types. Win-win solutions and multi-purpose usage that support local biodiversity whilst delivering specific services and socio-economic benefits are sought. Hence, this call seeks answers on how to frame transformational change, which supports a just transition – to show how investing in nature restoration can explicitly help vulnerable regions and communities to improve their

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<sup>49</sup> See SOER 2020, IPBES (2018, 2019)

resilience to social and environmental shocks, when rapid changes in climate and environment, economies and social conditions occur.

This call topic therefore responds to the urgent double challenge of (i) accelerating transformative change through (ii) upscaling restoration of ecosystems at sea and on land.

This topic has the following specific objectives:

- To provide large-scale demonstrators on how systemic upscaling and replication of best practice ecosystem restoration<sup>50</sup> can be deployed at regional, national and cross-border levels, focusing on heavily degraded terrestrial, freshwater, coastal or marine ecosystems, responding to relevant restoration goals enhancing biodiversity.
- To adapt, integrate and demonstrate innovative methods (technological, non-technological, social and governance, including sustainable financing) on upscaling ecosystem restoration.
- To support the development of specific demand and supply chains in restoring specific ecosystems on land and at sea – recognising that conditions at sea can considerably differ from the ones on land (including freshwater), that speed of change and disturbance might differ, and that solutions to reverse biodiversity decline are context-specific.
- To demonstrate and test how restoration activities<sup>51</sup> and socio-ecological management of ecosystems enable sustainable, climate-neutral and -resilient, inclusive, transformative approaches.
- To explore whether incentive-based mechanisms for restoration across the bioeconomy (agriculture, forestry, marine and innovative bio-based sectors), and in national energy and climate plans, could trigger additional emission reductions, similar to how the EU's Emission Trading System (ETS) has incentivised the industrial and power sectors.
- To promote scaling up and stepping up implementation of nature-based solutions and to address barriers to implementation for systemic nature-based solutions focussing on restoration in urban, peri-urban, rural or marine areas.
- To showcase how restoring ecosystems at the necessary large scale will also help human communities to adapt to changing conditions at their local level, and how restoration activities enable a shift of social and behavioural patterns towards increased benefits for biodiversity.
- To demonstrate how to maximise synergies and avoid trade-offs between priorities for restoring biodiversity, mitigating and adapting to climate change (such as those identified jointly by IPCC and IPBES).
- To generate knowledge on how large-scale restoration can accelerate transformative change beneficial for biodiversity and climate resilience, and bring this information to UN programmes, as well as to IPCC and IPBES<sup>52</sup>, processes.

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<sup>50</sup> Based on CBD guidance on ecosystem restoration, and in line with the EU 2030 Biodiversity Strategy whose Restoration Plan aims to help bring diverse and resilient nature back to all landscapes and ecosystems..

<sup>51</sup> e.g. rewilding, nature stewardship, private conservation, etc.

<sup>52</sup> In particular assessments in preparation, policy tools and capacity building.

## Scope

This action will demonstrate how restoration (in biodiversity richness and abundance, structure, function and connectivity) of ecosystems and their services can be scaled up<sup>53</sup>, in collaboration with stakeholders, in regions with severe ecosystem degradation, so that opportunities for substantial biodiversity and ecosystem services gains will be realised, which in turn deliver social and economic benefits. This pilot is a Green Deal enabler and can be used as a testbed for further green infrastructure/nature-based solution investment by the European Investment Bank (EIB), for LIFE SNAPS<sup>54</sup>, and relevant further budget lines in the next Multiannual Financing Framework. Appropriate budget for cooperation with previous projects on ecosystem restoration and nature-based solutions<sup>55</sup>, and with Horizon Europe activities such as the Partnerships and Missions should be envisaged. This call will test and evaluate approaches to create value with the human communities undergoing transformative change, in innovative ways and by avoiding negative externalities, improving their living conditions by restoring their terrestrial and/or aquatic environment.

Proposals should address all of the following activities:

- The projects will develop a scalability plan, including at landscape scale, diffusion of solutions, and a process for commitments in adopting large-scale restoration within existing and also innovative governance and financing systems, so relevant communities can replicate the upscaling across the EU and internationally. It should seek guarantees for the non-reversibility and/or continuity of restoration activities and monitoring after the end of the projects.
- Setting baselines, goals and a monitoring framework for the projects: why an action is being undertaken, what changes are expected and by when, and how changes are monitored in order to determine if the action was successful in relation to the original goals. Actions should be prioritised according to their urgency for addressing upscaling restoration challenges, the restoration potential of degraded ecosystems, the significance of research for supporting EU policy needs and their contribution to the international biodiversity agenda.
- Restoration actions should be paired with supportive and robust management practices that reduce pressures and direct habitat damage at the local scale, to support restoration efforts in the long term.
- Prioritisation should be informed by local conditions and recovery efficiency to ensure restoration efforts are resilient and efficient. Works and investments have to be based on

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<sup>53</sup> “Up-scaling” means here substantial increase in area of restored ecosystem, whether in size or number of measures per area.

<sup>54</sup> SNAP = Strategic Nature Action Projects

<sup>55</sup> See SC5-27-2020, CLA-11-2020, SC5-13-2018-2019, SCC-02-2016-2017, BiodivERsA, Oppla, NetworkNature.

scientific outcomes of prior research<sup>56</sup>. To increase the scale, scope and pace of restoration, efforts must be based on evidence, better understanding and communication of ecosystem service recovery and thresholds for effective ecosystem restoration.

- Activities of this call related to improving ecosystem condition must be integrated into best practice monitoring activities within respective monitoring governance schemes<sup>57</sup>. No new restoration monitoring approaches should be developed within this project. The projects must explicitly foresee deliverables which allow monitoring schemes to apply (or test, if necessary) on efficiency and output indicators related to restoration, its benefits and trade-offs.
- Projects should promote innovative funding, cross-sectoral collaborations and social participation to support the design, implementation and monitoring of sustainable and effective restoration efforts. Projects will explore how systemic transformations could be facilitated through ecosystem restoration in governance, policy making, financing, public procurement, economic development, social innovation, infrastructure and regional strategic planning.
- International cooperation in adapting upscaling approaches for restoration when demonstrating their use for European conditions<sup>58</sup>, and to apply the developed upscaling approaches internationally, is encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 20 and 25 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

### Expected impact

This action shows how transformational change through ecosystem restoration delivers at large scale, delivering first visible results and examples on land and sea cases by 2024, with benefits increasing in the long-term.

- Demonstrate the importance of biodiversity for maintaining and enhancing natural carbon sinks and reducing greenhouse gas emissions, locally reverse the degradation of ecosystems, recover ecosystem functions, increase connectivity and resilience, and improve the delivery of a range of ecosystem services<sup>59</sup>.

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<sup>56</sup> e.g. on Mapping and Assessing Ecosystems and their Services, LIFE, or through SC5-07-2015.

<sup>57</sup> As developed for restoration in EU and worldwide schemes, or through SC5-2020-20, or pollinator monitoring, or Earth Observation-based monitoring, using Copernicus data, or natural capital accounting, where adequate and relevant

<sup>58</sup> This includes the EU Outermost regions

<sup>59</sup> For socio-economic benefits restoration to improving ecosystem services, see e.g. SWD(2019)305 final

*Horizon 2020 - Work Programme 2018-2020*  
*Building a low-carbon, climate resilient future: Green Deal call*

- Support objectives under the European Green Deal including the EU commitment to reduce emission by 50-55% by 2030 and become net carbon-neutral by 2050. Contribute to the implementation of, the EU Biodiversity Strategy for 2030 and the EU Nature Directives, the Water and Marine Strategy Framework Directives, the Farm-to-Fork Strategy, the Pollinators Initiative, the Climate Law, the Bioeconomy Strategy and Action Plan, and EU Urban Policies, the new EU Adaptation Strategy (planned for 2020). Support the EU Covenant of Mayors, the UN Decade of Restoration and the UN Sustainable Development Goals, including land degradation neutrality and land consumption targets.
- Pilot and identify suitable innovative systems and methodologies for ecosystem restoration to maintain and enhance natural carbon sinks and other ecosystem services, with a view to significantly reducing the carbon and environmental footprint of Europe.
- Uptake of public-private partnerships and (voluntary) market-based incentives for business and individuals within restoration initiatives. Trans-disciplinary research and stakeholder engagement shall ensure co-funding for long-term maintenance and buy-in from the private sector.
- Enhance empowerment, engagement and reconnection of citizens with nature and increased social awareness on restoration action.
- Develop and implement solutions together with vulnerable regions and communities on how to frame transformational change, which supports a just transition by investing in nature, to explicitly help them to improve their resilience when rapid changes in climate and environment, economies and social conditions occur.

Type of action: Research and Innovation action (RIA)

## Area 8: Zero-pollution, toxic free environment

LC-GD-8-1-2020: Innovative, systemic zero-pollution solutions to protect health, environment and natural resources from persistent and mobile chemicals

### Specific Challenge

A recent Eurobarometer survey (2020) showed that a large majority of respondents are worried about the impact on their health of chemicals present in everyday products. The European Green Deal includes a commitment to a zero-pollution ambition for a toxic-free environment. In this context, it specifically mentions the need to rapidly address the risks posed by hazardous chemicals and, more specifically, very persistent chemicals.

Pollution from persistent and mobile chemicals is often a systemic problem, as it is driven by factors closely related to the prevailing ways of production and consumption and is reinforced by missing appropriate technical solutions, including (bio)remediation and monitoring techniques for the environment (including the marine environment). These chemicals also pose challenges for regulatory authorities to develop or enforce effective policies.

An example of these very persistent chemicals is per- and polyfluoroalkyl substances (PFAS), a group of thousands of manmade chemicals that are widely used in various consumer and industrial products (e.g. water- and stain repellent textiles, fire-fighting foams, plastics, food contact materials and cosmetics) and to which citizens and the environment are exposed. They are an increasing concern as they are persistent in the environment, very mobile, toxic and can bioaccumulate. For these reasons, they are found everywhere in the environment and their concentration increases over time, creating additional risks for human health and ecosystems. There are examples of contamination from PFAS of water and soil in most EU countries, which are costly to remediate. The overall costs to society from PFAS alone as an example are estimated to be EUR 52-84 billion across Europe (Nordic Council of Ministers, 2019), which is likely to be an underestimate, as it includes only a limited range of health effects (high cholesterol, impaired immune system, and cancer). Some studies have shown negative effects of PFAS on the immune system, including a reduced response to vaccines. Similar effects can be expected from other persistent chemicals. This is of concern considering the current COVID-19 pandemic.

### Scope

Taking into account latest policy needs and developments, this call topic aims at demonstrating innovative solutions to protect health, environment and natural resources from persistent and mobile chemicals. Selected projects are expected to advance our knowledge on health impacts and environmental effects and to address a specific pollution problem of contamination of environmental resources (such as soil, sediments, air and drinking water). The solutions should lead to cost-effective monitoring and to mitigation or elimination of the issues (e.g. mitigation or remediation efforts in particularly affected geographic areas). They should also lead to better understanding of environmental fate and help prevent negative impacts from persistent and mobile chemicals (and, where relevant, their precursors) on humans and the environment. The projects

may include appropriate technologies, business, governance and social innovation aspects and cover all innovation deployment phases up to the realisation of innovative solutions in the real life conditions (the first market applications, TRL 4-6; may include some activities at a higher TRL). In particular, projects may consider analytical methods and monitoring, enabling to quantify entire groups of persistent and mobile chemicals in food, soil or drinking water. This would allow achieving a higher level of consumer protection, as such ‘group’ methods are essential for regulating groups of harmful substances that have similar structures.

The successful projects shall include elements (one or several), such as

- research and development of (bio)remediation technologies of contaminated soil and water (including sources of drinking water) contaminated by persistent and mobile substances and their precursors;
- development of new cost-effective high-resolution methods to measure persistent and mobile chemicals in different media;
- environmental and human (bio)monitoring<sup>60</sup> of persistent and mobile chemicals;
- gathering of toxicity and toxico-kinetic information (including *in vitro* and *in silico* approaches) in order to allow characterising all risks to human health and ecosystems, at low environmental levels;
- development and improvement of models to predict and assess long-term trends and risks for persistent mobile substances;
- development of best practices for the management of waste containing persistent and mobile substances;
- detection and identification of specific pollution problems<sup>61</sup>.

Proposed solutions should be sustainable, cost-effective and easily implementable to encourage their uptake. Therefore, close consultation with potential end-users during the project life-time is recommended.

The Commission considers that proposals requesting a contribution from the EU of between EUR 8 to 12 million would allow the specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

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<sup>60</sup> All exposure data resulting from the projects data shall be shared via Information Platform for Chemical Monitoring IPCHEM (<https://ipchem.jrc.ec.europa.eu/RDSIdiscovery/ipchem/index.html>). Procedures and the network of reference laboratories established by HBM4EU (<https://www.hbm4eu.eu>) should be used.

<sup>61</sup> Wherever relevant, applicants are invited to make use of the services offered through Copernicus data, in particular the Copernicus Climate Change and Atmosphere Services, for better understanding the complex relationships between pollution and climate change.

Expected impact

- Better understanding of relevance for human and environmental health of the problem of emerging and a persistent pollution relevance;
- Better understanding and modelling of environmental fate and degradation pathways;
- Support the aims of the new Circular Economy Action Plan<sup>62</sup> aiming at minimising the presence of substances that pose problems to human and environmental health;
- Solutions for better load reduction, (bio)remediation and detection technologies, including real time monitoring approaches;
- Improved risk assessment to facilitate optimal risk management;
- Improved hazard and exposure data;
- Data of regulatory relevance accessible to policy makers and for risk communication.

Type of Action: Research and Innovation action (RIA)

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<sup>62</sup> COM(2020) 98 A new Circular Economy Action Plan For a cleaner and more competitive Europe ([https://ec.europa.eu/environment/circular-economy/pdf/new\\_circular\\_economy\\_action\\_plan\\_annex.pdf](https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan_annex.pdf) )

LC-GD-8-2-2020: Fostering regulatory science to address combined exposures to industrial<sup>63</sup> chemicals and pharmaceuticals: from science to evidence-based policies

### Specific Challenge

Under ‘Towards a zero-pollution ambition for a toxic free environment’, the European Green Deal will propose a new Chemicals Strategy for Sustainability, aiming at better protection of both humans and the environment against hazardous chemicals. In addition, there is growing concern about the occurrence of pharmaceuticals in the environment<sup>64</sup>.

Humans, wildlife and domestic animals are exposed to combinations of different chemicals via air, water (including the marine environment), food and feed, consumer products, materials and goods. The scientific understanding of combination effects has progressed in recent years and approaches for risk assessment and management of unintentional mixtures and combined exposures to chemicals are available.

In parallel with the development and implementation of regulatory approaches, there is a need to improve the scientific knowledge base. Current knowledge shows that exposures to combinations of chemicals pose risks to ecosystems and human health that may not be sufficiently managed under existing regulations. There is a need to advance [regulatory] science to provide policy-makers and risk assessors with validated and practically applicable approaches, methods and tools and to study the effectiveness and efficiency of different policy approaches. The effects of exposure of humans and the environment to combinations of chemicals must also be further explored.

### Scope

This topic calls for applied research studies, demonstrating how new tools and methodological approaches from regulatory science that are workable in a regulatory context and are based on the latest scientific evidence, can be applied to identify, quantify and prevent harmful co-exposures to industrial<sup>1</sup> chemicals and pharmaceuticals.

The applicants can address some or all of the following:

- (i) Development of innovative tools to detect and measure complex mixtures in the various environmental compartments<sup>65</sup>;
- (ii) Comparisons of different possible regulatory approaches to manage unintentional chemical mixtures and co-exposures, regarding effectiveness (improved protection of health and the environment), workability, cost-effectiveness and benefits to society and business;

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<sup>63</sup> In this context the term ‘industrial chemicals’ is used to identify chemicals of anthropogenic origin, e.g. including pesticides, biocides, cosmetics etc.

<sup>64</sup>Section 5.6 of the Commission Communication on the EU strategic approach to pharmaceuticals in the environment [COM\(2019\) 128 final](#), 11.03.2019.

<sup>65</sup> All exposure data resulting from the projects data shall be shared via Information Platform for Chemical Monitoring IPCHEM (<https://ipchem.jrc.ec.europa.eu/RDSIdiscovery/ipchem/index.html>). Procedures and the network of reference laboratories established by HBM4EU (<https://www.hbm4eu.eu>) should be used.

- (iii) Estimations of the degree to which current and possible future regulatory practices/approaches underestimate (or possibly occasionally overestimate) risks related to chemicals exposure (based on particular case studies, modelling and overall estimations);
- (iv) Develop and apply modelling, statistical approaches and other relevant methods to identify and study the health impacts on human populations and the environment of exposures to the combinations of different chemicals, e.g. through linking results from exposure monitoring with observed health effects;
- (v) Case studies to identify safety margins for specific unintentional exposures to combination of chemicals to protect human and ecosystems health, while taking into account chronic exposures over longer time scales;
- (vi) The possible effects on humans, in particular on vulnerable sub-populations, from (chronic) exposure to low levels of pharmaceuticals via the environment, taking account the inherent pharmacological properties and the potential for combined effects from co-exposures with other chemicals;
- (vii) Combining and analysing EU data sources to generate insights on real-life and potential exposure combinations, typical exposure routes and uses;
- (viii) Development, improvement and validation of models for predicting (chronic) exposure to combinations of chemicals, which can be applied in a premarket stage (risk assessment, risk management measures, including, e.g. authorisation and restriction of chemicals) and possibly already at the design phase of chemicals and materials as well as retrospectively (e.g. in the setting of environmental quality objectives).

Expected impact

- Support the implementation of existing risk assessment and risk management approaches to reduce the most critical exposures, including the setting of limit values;
- Support the introduction of new regulatory approaches such as, e.g. Mixture Assessment Factors;
- Scientific evidence to enable mitigation of co-exposure to pharmaceuticals and industrial<sup>1</sup> chemicals in the environment and the technosphere.

Selected projects under this topic are strongly encouraged to continuously share information and participate to joint activities as appropriate.

The Commission considers that proposals requesting a contribution from the EU of between EUR 4 to 6 million would allow the specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Type of action: Research and Innovation action (RIA)

## Area 9: Strengthening our knowledge in support of the EGD

Climate action requires additional research and innovation efforts that extend beyond innovative solutions at a relatively mature state of development. Despite significant progress in our understanding of the complex issues linked to climate change and sustainability over the past few decades, it is crucial to further improve relevant knowledge. Area 9 of the Green Deal call contains dedicated activities to strengthen the European knowledge base, adopting a longer-term perspective while also acting as a bridge to Horizon Europe.

This section calls for activities that:

- mobilise world-class capacities and resources, notably those provided by European Research Infrastructures (RIs), to support breakthrough solutions in energy storage and advance climate/environment monitoring and observation;
- deliver end-user products and services that help decision-makers identify which modes of production, consumption and lifestyle are compatible with climate resilience and pathways achieving climate neutrality by 2050;
- prepare the ground for the development of a digital twin of the ocean, to better connect and understand the unknown ocean and its crucial role in our survival, and provide evidence for informed decisions.

Proposals are invited against the following topic(s):

LC-GD-9-1-2020: European Research Infrastructures capacities and services to address European Green Deal challenges

### Specific Challenge:

The urgency and the scale of Green Deal challenges require the mobilisation and advancement of world-class scientific capacities and resources such as those offered by European Research Infrastructures. They will contribute to the transition towards a climate neutral Europe, targeting at least 50% emissions reduction by 2030. As a pilot under Horizon 2020, activities will focus on the provision of research and innovation services for breakthrough research in two priority areas: energy storage and advanced climate/environment observation and monitoring. Expected impacts range from answering short-term needs of thematic European Green Deal objectives to longer-term perspective including Horizon Europe.

### **Energy storage:**

In order to boost the advancement of knowledge and technology in the field of energy storage, European researchers need effective and customised access to the best research infrastructures. The aim of this action is to bring together, integrate on European scale, and open up key national and regional research infrastructures to European researchers from both academia and industry, as

well as to develop any missing services, which better fit specific needs for research and technological developments.

**Advanced climate/environment observation:**

European research infrastructures such as ICOS, ACTRIS and IAGOS<sup>66</sup> are key enablers of the knowledge necessary to conceive, develop and assess European policies to address climate change and air pollution. They are essential to observe, understand and predict complex processes of the atmosphere, the concentration and flux of (long-lived) greenhouse gases, the interaction of short-lived atmospheric constituents and air pollutants. They provide sustained long-term, high quality and interoperable data, also used to calibrate satellites, validate or constrain climate models, weather forecasts, air pollution forecasts etc.

Yet, these research infrastructures do not cover appropriately “hotspots” such as cities and industry intensive sites (frequently not far from cities) despite their major role: cities and their surrounding are strong emitters of greenhouse gases and air pollutants; due to the high density of population, the impact on citizens’ health is very high. In particular, in situ measurements in and around cities to quantify anthropogenic emissions of greenhouse gases<sup>67</sup> and nanoparticles (with still unknown potential health damage) are lacking.

Scope:

Proposals will address one of the following sub-topics:

***(a) Support Europe leadership in clean energy storage technologies***

This sub-topic aims at:

- supporting the development of a world-class European research and industrial ecosystem underpinning energy storage activities and the related value-chain;
- enhancing the competitiveness of current and emerging industries by providing easy and seamless access to the most advanced scientific infrastructure available in Europe and related services;
- enabling breakthrough research and innovation in energy storage systems and related materials across the whole value chain and with a life-cycle approach;
- supporting a fair transition towards climate neutrality through a better understanding of socio-economic issues underpinning a paradigm change and of how to foster climate-neutral social practices.

Activities will cover the coordinated and integrated provision of transnational and virtual access by wide communities of key research infrastructures as well as joint developments of specific services to facilitate and integrate the access procedures, to improve and customise the services

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<sup>66</sup> [ICOS](#) Integrated Carbon Observation System; [ACTRIS](#) Aerosols, Clouds and Trace gases Research Infrastructure; [IAGOS](#) In-Service Aircraft for a Global Observing System; when relevant, complemented by European networks of national facilities.

<sup>67</sup> [CO2 Green Report 2019](#)

the infrastructures provide, and to further develop on-line and testing services. User training may be supported, to maximise the benefits and to ensure the optimal use of the services provided.

This action brings together several complementary and interdisciplinary facilities relevant for energy storage research and innovation, addressing different TRLs and covering the whole value chain in view of possible industrial applications. They will provide transnational and virtual access to technically advanced instrumentation and scientific methods in a coordinated and user-friendly way as well as training for their use and services linked to material modelling, data mining and experiment design.

Activities will also contribute to address the objectives of the European initiatives, such as the Battery Alliance, to tackle critical issues relating to performance, reliability and safety of storage technologies and to support strategies addressing the whole life-cycle.

Proposals should clearly identify potential industrial users and research communities, which can benefit from this pan-European open access to services and advanced instrumentations offered by internationally renowned facilities and strengthen the cooperation among researchers and industrial users.

Proposals are expected to duly take into account all relevant ESFRI and/or ERICs and other world-class research infrastructures as well as relevant major European initiatives, such as the Open Innovation Test Beds, to exploit synergies.

Proposals will also have to highlight how they contribute to attract new talents and create expertise support new skills through training addressing researchers and industrial users.

Trans-national and virtual access provision shall follow the rules specified for integrating activities under point (ii) “Trans-national and/or virtual access activities” in part D of the section “Specific features for Research Infrastructures”. Compliance with these provisions will be taken into account during evaluation.

Proposals should adopt the guidelines and principles of the [European Charter for Access to Research Infrastructures](#). They should define a data management plan, even when they opt out of the extended Pilot on Open Research Data. When they address the curation, preservation and provision of access to the data collected or produced under the project, proposals should build upon the state of the art in ICT and e-infrastructures for data, computing and networking, and ensure connection to the European Open Science Cloud.

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), proposals should, whenever appropriate, pay due attention to any related international initiative (i.e. outside the EU) and foster the development of global standards.

Proposals should include clear indicators allowing the assessment of the progress towards the general and specific objectives, other than the access provision.

As the scope of this topic is to ensure integration and access to key European infrastructures in this domain and to avoid duplication of effort, at most one proposal is expected to be submitted.

*The Commission considers that proposals requesting a contribution from the EU of up to EUR 7 million would allow this topic to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.*

***(b) European research infrastructures and monitoring networks for greenhouse gases observing, air quality and citizens' health in cities***

The proposals will address one of the two objectives b1) or b2). All proposals should propose a roadmap for upscaling (section b3).

**(b1) Enhancing European research infrastructures for greenhouse gases observation**

The action should enhance greenhouse gases observation capacity of European research infrastructures, notably anthropogenic CO<sub>2</sub> emissions, in and around cities and other large emissions sites such as industrial sites, transport infrastructures.

The action should include:

- Scientific and technical work, i.e. (1) the drafting of concepts, architecture and engineering plans for extending and upgrading existing European research infrastructures and, when relevant, the creation of instrumentation prototypes or testbeds for up-to-date instrument arrays; (2) plans for the efficient curation, preservation and provision of access to their data in line with FAIR principles;
- Conceptual work i.e. (1) plans to integrate the new capacities into the existing European research infrastructures and related governance; (2) estimated budget for upgrade and operation and outlines of long-term funding plans;
- Pilot implementation in at least one representative urban site, showing the engagement of national/local authorities and demonstrating the ability to integrate complementary measurements systems and methods as well as data. When applicable, the action should consider solutions relevant to air quality assessment e.g. measurement of co-emitted species from fossil fuel burning. It should address quality control, traceability of measurements and standards. It should include the development of core data services upgrading the current services offered by the European research infrastructures.

The action should propose a flexible design with generic core elements and complementary observations depending on the specific nature of sites. The action should address the selection criteria and process for selecting the pilot implementation site(s).

The action should seek, at all stages, synergies and interoperability among European research infrastructures and with air quality monitoring networks as well as coordination with European observational programmes and initiatives<sup>68</sup>.

**(b2) Enhancing observations for air quality in urban areas**

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<sup>68</sup> such as Copernicus (including the CO<sub>2</sub> monitoring Task Force), GEOSS and IG3IS framework of WMO.

The action should enhance urban air quality monitoring networks and other relevant observing infrastructures in measuring air pollutants such as particles and their precursors (both in mass and particles number concentrations, including specific nanoparticles data at traffic and airport sites). Engagement of the health community and citizens is required to address the scarce availability of sub 100nm particles concentration data, which has hampered epidemiological studies on their effects.

The action should include:

- Scientific and technical work to upgrade air quality monitoring networks ensuring measurement of maximum exposure to nanoparticles and efficient curation, preservation and provision of access to data in line with FAIR principles;
- Pilot implementation in at least two representative sites, showing the engagement of national/local authorities and demonstrating the ability to integrate complementary measurements systems and methods as well as data. It should address quality control, traceability of measurements and standards. In particular, it should develop interoperable solutions and ensure measurements between cities are comparable. It should test innovative solutions such as mobile instrumentation and build on citizens' observatories initiatives.

The action should explore, at all stages, synergies and interoperability with European research infrastructures as well as among air quality monitoring networks. The action should address the selection criteria and process for selecting the pilot implementation sites.

### **(b3) Roadmap for upscaling**

The actions should propose the optimal design of well-coordinated, inter-operable, large city scale networks building on existing European research infrastructures and city air quality monitoring networks and on the relevant work done respectively under b1) and b2).

- The actions should propose strategies to engage stakeholders, including citizens, to build commitment at local, national and European level and promote long-term sustainability.
- The actions should engage in networking and training and promote interoperability, , dissemination and exchange of experience and practices.
- The actions should propose appropriate framework to coordinate with or contribute to key relevant European initiatives such as Copernicus, EOSC, and support global initiatives such as the Paris Agreement, 2030 Agenda for Sustainable Development Goals, IPCC. It should also ensure relevance to the Mission on Climate Neutral Cities by 2030.
- The actions should propose possible roadmaps for upscaling and replicating the solutions for enhancing the European research infrastructures and city air quality monitoring networks.

*The Commission considers that proposals requesting a contribution from the EU of up to EUR 13 million for greenhouse gases observation and up to EUR 8 million for air quality monitoring would allow this topic to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. Expected impact*

- The development of synergies among research infrastructures in different disciplinary areas, including social sciences, and improved, optimised and harmonised research services to address Green Deal objectives will foster economies of scale and improved use of scientific resources across Europe and beyond.
- Users, both from the scientific and industrial community, will benefit from integrated and efficient access to the best research infrastructures as well as from advanced research services addressing their specific needs.
- RIs will foster the development of new skills and a new generation of researchers ready to optimally exploit the most advanced and essential instruments and resources for research and innovation addressing Green Deal challenges.

***(a) Support Europe leadership in clean energy technologies***

This activity will:

- enable breakthrough research and innovation in energy storage across the whole value chain and in line with a life-cycle approach, in view of possible industrial applications, by providing access to their advanced, integrated and interdisciplinary research services;
- support the development of a strong and competitive research and industrial energy storage ecosystem addressing the different steps in the value chain, including advanced materials and modelling, chemistry, systems, advanced manufacturing, reuse and recycling, innovative business models;
- allow users to benefit from integrated and efficient access to the best research infrastructures as well as from advanced services addressing specific needs;
- support, more broadly, the transition towards a climate neutral continent, with a target of 40 % emissions reduction by 2030;
- foster a new generation of researchers ready to optimally exploit the most advanced and essential tools for research and innovation in a key field for Europe;
- enhance synergies and complementary capabilities among existing infrastructures, leading to improved and harmonised services as well as foster economies of scale and improved use of resources across Europe thanks to less duplication of services, common development and optimisation of operations.

***(b) European research infrastructures and monitoring networks for greenhouse gases observing, air quality and citizens' health in cities***

This activity will:

- enable the development of evidence-based sustainability strategies, taking also account of impacts on health, through the provision of interoperable data, tools/equipment and models needed by the scientific community and public authorities/decision makers;

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- trigger the decision making process leading to the upgrade of existing infrastructure;.
- develop synergies and complementary capabilities between Research infrastructures and monitoring networks, thus promoting economies of scale and improved use of resources across Europe through the common development and optimisation of operations as well as interoperability of data and data streams;
- enhance ability to assess the impact at city scale of policy implementations initiated at city, national and European levels with respect to air quality, citizens' health and progress towards the greenhouse gas reduction-targets of the Paris Agreement as well as the impact of the EU Bioeconomy Strategy;
- boost multidisciplinary research and innovation actions including modelling to address climate change (mitigation, adaptation) and understand the potential health damage of nanoparticles; to facilitate the engagement of citizens;
- strengthen and sustained Copernicus in-situ component; improve air quality monitoring; facilitate the engagement of citizens;
- strengthen the technological development capacity and effectiveness as well as the scientific performance, efficiency and attractiveness of the European Research Area.

Type of actions: Research and Innovation Action (RIA)

LC-GD-9-2-2020: Developing end-user products and services for all stakeholders and citizens supporting climate adaptation and mitigation

### Specific Challenge

The science underpinning the European Green Deal has outlined what is at stake in terms of the impacts of climate change, the need to adapt to them, and the need to pursue decarbonisation pathways towards net zero. However, the challenges of mitigation and adaptation will ultimately be met by business and investors, government, and citizens. These actors therefore need to be empowered with solutions that are in keeping with scale of the challenge. As today's planning decisions affect our emissions and resilience for decades ahead, decision-makers need to know which modes of production, consumption and lifestyle are compatible with climate-resilience and pathways achieving climate neutrality by 2050. Climate change adaptation and mitigation solutions still fail, to a large extent, to incorporate social and behavioural factors that would increase efficiency towards our climate goals, and overcome barriers preventing achieving those goals.

Scientific research provided a vast variety of information on the climate system, the impacts of climate change at different scales and options for adaptation as well as integrated assessments of mitigation pathways. However, actions are needed for relevant climate adaptation and mitigation practical solutions and information to reach the end users and helping them in building the climate-neutral future they want and address environmental challenges posed by climate change. Actions are also needed to support the use of climate information in risk management and planning across sectors and regions.

### Scope

This action should contribute informing citizens and decision-makers about the impacts of climate change in the decades to come, identify adaptation options, and illustrate what pathways towards climate neutrality entail in terms of production, consumption, planning and lifestyle, incorporating behavioural factors. In particular, the last mile of the climate service delivery shall be tackled for the most relevant sectors and deliver solutions towards meeting the decarbonisation goals of the European Green Deal as well as adaptation options for dealing with climate change impacts.

The projects under this topic should cover some of the following aspects:

- Building on existing services and frameworks, such as Copernicus, GEOSS, EMODnet and ESA actions. This includes addressing the downstream part of the value chain and engage with end users and stakeholders, customising of data and exploitation platforms, the use, scale-up and replication of existing service models, brokerage of knowledge and dissemination to the public;
- Build robust knowledge on how the climate is changing at a scale meeting the user's needs, and what impacts are to be expected at sectoral and regional levels in Europe. Identified barriers to the predictive potential of climate models should be addressed, including by

blending the latest information from climate models, downscaling products, observations, user or citizen knowledge or other intelligent ways of filtering relevant information for users;

- Synthesising/exploiting this knowledge in a way that bridges the gap between the expert tools already used by scientists, and the needs of stakeholders who are making decisions today that will both, affect and be affected by climate change and its impacts;
- Making the above findings accessible to the public, going beyond existing tools in both scientific robustness and user relevance;
- Demonstrating the services in a near-to-operational environment with the provision of guidance services and measuring the results through key performance indicators defined with users and stakeholders;
- Multiplying the outreach through scaling up and replication to a number of players in the business and public sector, as well as in less represented areas in Europe and beyond. This includes the development of appropriate business models and knowledge brokerage activities as well as activities to tackle other relevant barriers, such as quality assurance and standards, institutional barriers, capacity building.

Actions under this topic should more specifically focus on one of the following aspects:

- Converting the mitigation pathways that are compatible with EU climate goals and adaptation strategies for potential impacts to 2050 and beyond into clear information about how production, consumption, infrastructure and lifestyle needs to change. Including consideration of co-benefits and trade-offs, and insights into the drivers and barriers for these changes, and how barriers can be overcome;
- Contributing to delivering the next-generation of climate services, in collaboration with the commercial sector, through addressing part or all of the downstream part of the value chain, focusing on sectoral and geographical gaps, providing actionable information to non-specialists for adapting to extreme climate events and new climatic conditions through tools, platforms (e.g. GEOSS & Copernicus) and/or mobile applications.

The Commission considers that proposals requesting a contribution from the EU of EUR 5 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. In line with the Union's strategy for international cooperation in research and innovation, international cooperation is encouraged in particular for this topic addressing the climate priority of the Group on Earth Observation (GEO). Expected impact

- Enable citizens, stakeholders and decision-makers to factor climate change and climate action into the decisions that will affect our lives for decades to come;
- Contribute to the exploitation of information and data from the Copernicus programme and GEO initiative;
- Bring a step change in the use of knowledge and information and allow users to become active players in climate action;

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- Make high-level information on climate change more accessible to people's lives and to provide data in a format that makes it useful for its users;
- Improve European capacity regarding availability of solution to adapt to and mitigate climate change, including by tackling sector and/or geographical gaps;
- Provide appropriate responses to European and international climate policies we committed to;
- Increase resilience of society, organisation (private and public), and individual to multiple risks;
- Improve quality of data, and information and knowledge on climate adaptation and mitigation;
- Support the development of the European Service sector regarding end-user climate services.

Type of Action: Research and Innovation Action (RIA)

DRAFT

## LC-GD-9-3-2020: Transparent & Accessible Seas and Oceans: Towards a Digital Twin of the Ocean

### Specific Challenge

Fit for purpose and sustained ocean and sea observations are an essential part of worldwide efforts to understand and protect marine social-ecological systems whilst benefiting from their ecosystem services. Observations can be samples collected on ships, measurements from instruments on fixed platforms, autonomous and drifting systems, submersible platforms, ships at sea or remote observing systems such as satellites and aircrafts.

10-20 years ago, marine data from these observations were difficult to find, only accessible through long and sometimes costly negotiations and hard to put together to create a complete picture because of different standards, nomenclature and baselines. In two decades, the European Union invested in policies and infrastructures to make knowledge of the oceans and seas central to environmental and climate policies as well as the blue economy. Its Member States, together with neighbours, have created an unrivalled marine data, modelling and forecasting infrastructure. Working together and the principles of free and open access, interoperability, and “measure once, use many times”, were largely promoted and demonstrated through, Copernicus, the European Research Framework Programmes FP7 and Horizon 2020, and EMODnet activities.

The Digital Twin of the Ocean is the next step, filling the need to integrate a wide range of data sources (from physics to ecology through biology, chemistry and geology, as well as from social or economic sciences and business operators), to transform data into knowledge and to connect, engage, and empower citizens, governments and industries by providing them with the capacity to inform their decisions. It will empower a shared responsibility to monitor, preserve and enhance marine and coastal habitats, and support a sustainable blue economy (fishing, aquaculture, transport, renewable energy, etc.). It should allow assessment of the state of ecosystems, habitats and the impact of human activities (including along coasts); forecasts of their short and long-term changes; development of biodiversity conservation strategies; management of sustainable economic activities; assessment of infrastructure vulnerability; development of mitigation, adaptation and replacement plans to deal with climate risks and optimisation of emergency responses to severe events such as sea-level rise or storm surges. It should allow the design of efficient models for adaptive scenarios to face the risks listed above, through the implementation of new integrated multidisciplinary observation approaches and may also help, guide, steer and prioritize costly monitoring activities.

It will contribute to the development of digital interactive high-resolution models of the oceans and seas, as part of the Commission’s Green Deal and Digital Package commitments to develop a very high precision digital model of the Earth (Destination Earth initiative). Building on existing partnerships (such as EuroGOOS and AtlantOS) and on the integration of existing European and national leading-edge capacities and Marine Research Infrastructures in ocean observation (Eurofleets+, EuroArgo, Jerico, Danubius, EMBRC, EMSO, ICOS, LifeWatch, etc), data infrastructures (bluecloud, EDMONET), forecasting and climate services (Copernicus services

and space data) through innovative IT technology, it will bring together research and innovation, infrastructures and communities in support to the European Green Deal and to societal transitions.

### Scope

This topic supports the development of a pilot ocean digital twin, addressing concrete cases in local or regional sea basins (connecting freshwater, coastal and marine ecosystems), and demonstrating their usefulness with regard to several of the Green Deal priorities. They should allow fit for purpose, timely, persistent and autonomous monitoring, in an integrated and harmonised way from estuaries to the coast and to deep sea and from the surface to the seabed), and the identification and testing of the most efficient solutions for sustainable ocean and coastal management (taking into account the societal dimension and the implementation of EU policies priorities). Proposals should cover the whole knowledge value chain, from data acquisition (from multiple sources: research, monitoring, industrial and citizen data) to users' services, for example and if relevant:

- Operationalising existing observing systems via the integration of existing or new automated sensors and autonomous mobile and fixed platforms allowing measurements at the required spatial, temporal scales and lower costs of a large set of parameters (chemical, physical, biological and ecological) targeting in particular observation gaps, (and the development of improved monitoring strategies and prioritisation methods;
- technologies to incorporate structured and unstructured data, e.g. from alternative sources such as citizen science or historic data collected before the digital age;
- data sharing, quality assurance, and modelling capacity, in particular through the application of big data and artificial intelligence technologies, to support timely ecosystem assessment, human impacts, and mitigation pathways;
- seamless modelling approach and advanced data assimilation to build a consistent multi-variable multi-dimensional description of the ocean, consistent from global ocean to coastal areas, and allowing a digital exploration in time and space of the ocean physics and biodiversity with different scenario;
- development of what-if scenarios, taking into account uncertainties on modelling (coupling and data assimilation) as well as on assessment of the ecosystem status, human and environmental stressors, biotic and abiotic interactions, and;
- co-creation and inter-disciplinary approaches and frameworks (cloud-based, digital, i.e. BlueCloud and Wekeo) between natural sciences, humanities and social sciences for the co-construction of research and development methods, as well as of expertise, towards decision making with local authorities, scientists, private sector to develop shared applications to increase resilience to climate change, improve disaster risk management capabilities, support maritime spatial planning, environmental reporting or sustainable economic activity; European-national coupled-modelling capacities to analyse impact of

preventive measures to adapt and mitigate climate risks at regional and local scale to foster socio-ecological synergies;

- development of close cooperation between leading European Research infrastructures, operational ocean services and e-infrastructures, and international counterparts to facilitate the operationalising of long term observing systems including common access to data on wider sea-basins and global scales and the operationalisation of a digital ocean twin that also aligns with the digital atmosphere and biosphere and objectives of the UN Decade of Ocean Science for Sustainable Development;
- developing and delivering information to citizens through new generation reporting and prediction of ocean health - how it is changing and how it might change in the future through interactive on-line tools including data, data visualisation, images, text and video on issues such as sea-level rise, species shifts, ecosystem change, conservation status.

Therefore proposals should integrate the assets from the existing European capacities already invested, valorising available data and services together with highly innovative digital technologies such as data analytics, AI, HPC computing and innovative modelling or statistical approaches to deliver societal solutions in line with the green deal priorities. Pilots should deliver a roadmap for interoperability to enable European services and infrastructures to evolve accordingly also in time in order to maintain a fully integrated digital picture of the ocean (a twin ocean) that matches ocean thematic ambitions, the green deal and the digital package.

Selected projects are expected to collaborate between themselves, with all other relevant H2020 projects, and with relevant projects from the ESA Ocean Science Cluster (<https://eo4society.esa.int> and <https://eo4society.esa.int/communities/scientists/esa-ocean-science-cluster>)

The Commission considers that proposals requesting a contribution from the EU of up to EUR 12 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. In line with the Union's strategy for international cooperation in research and innovation, international cooperation is encouraged.

#### Expected impact

The action will deliver interactive virtual tools of the ocean in a unified digital environment to:

- move towards a European Ocean Observing System by contributing to significantly increase the capacity to develop integrated multidisciplinary observatories of estuarine, coastal and marine environments and socio-ecosystems, and by promoting shared strategies, infrastructure development, data standardization, sharing, availability, access, interoperability, visualisation and use of data according to the FAIR principles;
- reinforce conservation and ecosystem-based management of marine habitats/green infrastructure, improve the planning and management of marine areas, and safeguard productivity and biodiversity of marine ecosystems and how this is influenced by the river-to-sea interaction;

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- allow for knowledge-based decision-making based on integrated sets of cross-cutting indicators at different scales, reduce risk and increase efficiency of coastal and marine economic activities and implementation of legal requirements (MSFD, Water Framework Directive, etc...);
- increase citizen engagement, taking into account cultural and emotional aspects, through increased awareness and understanding of the dynamics, interactions and evolution of seas and oceans and their role in our well-being and survival, and promoting bottom-up actions, empowering citizens in innovative co-designed services and new project designs where citizens' opinions are considered from the initial stages;
- encourage and enable the infusion of 'non-scientific data streams', in a coordinated way, through citizens engaged in data gathering, and through joint efforts from a community composed of users of the sea, including private companies, public authorities, social innovators, researchers, citizens and policy makers;
- encourage industry to look for business opportunities in ocean data and related services.

Type of Action: Innovation Action (IA)

## Area 10: Empowering citizens for the transition towards a climate neutral, sustainable Europe

The European Green Deal communication stresses that the transition towards sustainability must be just and inclusive, put people first and bring together citizens in all their diversity. This calls for citizen engagement and social innovation in all areas of the Green Deal. This also requires ambitious cross-cutting actions to engage and empower people and communities and to support behavioural, social and cultural changes wherever this is most needed for a fair and inclusive transition, leaving no-one behind. Such actions must address change at the collective level through participatory processes and experimental research on behavioural, social and cultural change; and at an individual level by empowering citizens as actors of change, including through the co-creation of R&I contents<sup>69</sup>.

Activities under this area will be implemented through three different topics addressing both collective level actions (topics LC-GD-10-1-2020 and LC-GD-10-2-2020) as well as individual level actions (topic LC-GD-10-3-2020)

LC-GD-10-1-2020: European capacities for citizen deliberation and participation for the Green Deal

### Specific Challenge

All areas of the Green Deal, from climate action to zero pollution, require citizens' active support at all stages of the transitions. Workable solutions, accepted and taken-up at scale, can only be found through the active participation of all concerned. This is particularly the case of complex issues with diverging views or interests at stake, such as the rural-urban gap, attitudes to the bio-economy, water management, the choice of energy sources, etc. Such issues can best be addressed through participatory processes involving citizens from different cross-sections of society across Europe, including by engaging them throughout the innovation life cycle<sup>70</sup> as social innovators. The Conference on the Future of Europe has further heightened awareness of the need for participatory processes and raised expectations in this respect. Strong expectations of citizen participation have also been raised in the context of Horizon Europe preparation, in particular for Horizon Europe Missions, which will be highly relevant to the Green Deal.

Such processes may include a large spectrum of co-creation activities and events based on dialogue and information exchange, including but not limited to virtual ones. Modalities of participatory processes differ according to goals and expected outcomes, from harnessing diversity of knowledge, expectations and views in order to improve knowledge quality and enrich the inputs

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<sup>69</sup> See UN Global Sustainable Development Report 2019, *The Future is Now – Science for achieving sustainable development*, <https://sustainabledevelopment.un.org/gedr2019>

<sup>70</sup> From co-design to co-implementation and co-evaluation.

to policy discussions; up to creating ‘mini-publics’ in order to extend the arenas of public discussion and improve the representativeness of policy decisions. For these processes to be effective, participants must be equipped with appropriate tools and information, they must be strongly connected to decision making bodies – examples span from simple feedback mechanisms to participatory budgeting – and they should be empowered to reflect, deliberate and propose change at a systemic level.

Participatory processes in general and citizen deliberation in particular, require different levels of expertise, as well as upfront clarification of ethical and methodological principles and a clear commitment on the side of institutions about the processes’ outcomes. Successful experiences have been led at European, national and local levels, which would gain to be expanded, structured and scaled. Moreover, such actions should be accompanied by comparative research and feedback to ensure continuous monitoring, evaluation and learning.

### Scope

This topic covers citizen deliberation and participation. Projects retained will establish transnational networks of experts, researchers, practitioners and relevant civil society organisations specialised on deliberative democracy and civic participation across Europe, including professionals in the field of public engagement. Experts on gender equality and climate justice should also be included. They will share good practice, tools and resources and implement participatory and deliberation processes on priority issues in order to deliver on the Green Deal, both at the level of local communities and at wider scale. They should establish connection across the diverse participation and deliberation processes across regions and countries up to the European level. They should build on already existing experience and tools, notably open access ones stemming from EU-funded projects such as the RRI Tools platform<sup>71</sup>.

Provision will be made for several deliberative processes, each of them implemented in a significant number of Member States or associated countries and complemented by a European online multilingual deliberative platform. Specific topics for deliberation will be co-decided with the EC services involved in implementing the Green Deal. They will support major EU actions where public participation is key, including but not limited to Horizon Europe Missions, in close cooperation with the respective mission boards, and other R&I initiatives.

A balanced overall coverage of EU and associated countries will be sought. Vulnerable and marginalised categories of the population, minorities and various age groups, including both youth and the elder generation, as well as urban, peri-urban and rural areas, will be considered and included. Gender balance will be ensured and gendered issues will receive specific consideration.

National and local governments and administrations will be closely associated from an early stage, including, to the extent possible, links with existing debates and participatory processes at their levels and taking account of national/local specificities. Clear channels for the take-up of participatory outcomes in decision-making processes will be sought at local, national and/or EU levels and feedback to citizens will be ensured.

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<sup>71</sup> <https://www.rri-tools.eu/>

Participatory experts will design methodologies for each individual exercise, relying on comparative analysis of international practice and involving people or groups concerned. Depending on specific objectives, they may either ensure consistency across Member States for transnational comparability, or select a range of different methodologies to compare their effectiveness.

An advisory board will ensure the robustness, ethical and inclusive character of the planned deliberative processes and vet the methodologies and conditions of implementation of each individual exercise.

Research teams on participatory and deliberation processes will study each individual exercise, assess and compare their results across the Member States and provide feedback and recommendations.

Coordination and cooperation will be expected between funded projects under this topic and others of this area, since deliberation and participation are important factors for behaviour change and are closely related to citizen engagement and activism. This may encompass limiting features such as the advisory board to a single one to advise and ensure consistency across the projects, and/or the online platform to a single one to maximise its reach and impact.

In line with the Union's strategy for international cooperation in research and innovation, international cooperation is encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 to 5 million would allow the specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

#### Expected Impact

Projects under this topic will enable collective design and ownership of Green Deal objectives and means, engagement and change through citizen participation and deliberation processes. Consortia should choose a basket of qualitative and quantitative indicators to measure the impact of their work. For example, they are expected to contribute to one or several of the Sustainable Development Goals<sup>72</sup> and are encouraged to make use of MoRRI indicators<sup>73</sup>.

Specific impacts include:

- Feeling of ownership and engagement through citizen deliberation and participation across Europe;
- Participatory identification of solutions contributing to the Green Deal;
- Enhanced involvement of citizens in the implementation of the European Green Deal and of the future Horizon Europe missions;
- Stronger trust in policy and science institutions among citizens on Green Deal issues;

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<sup>72</sup> <http://www.un.org/sustainabledevelopment/sustainable-development-goals/>

<sup>73</sup> <https://op.europa.eu/s/n7SQ>

- Commitment and buy-in from a broad spectrum of social groups across Europe to support the Green Deal targets and to engage in co-creation and co-implementation of transition pathways, including activation of citizens through social innovation.

Type of Action: Research and Innovation Action (RIA)

DRAFT

LC-GD-10-2-2020: Behavioural, social and cultural change for the Green Deal

### Specific Challenge

All areas of the Green Deal, from climate action to zero pollution, require considerable changes in social practices and in the behaviour of individuals, communities and public and private organisations. These changes concern, for example, mobility behaviours, minimising traffic-related emissions and energy/resource consumption, protecting or restoring biodiversity, etc. including change achieved through collective and participatory processes or a sense of environmental citizenship.

Several foci of behaviour and mindset are at play in interconnected ways: concern for one's health and well-being, concern for the planet, ethical concerns such as fairness and solidarity, etc. Ways of combining individual, collective and environmental benefits should be sought wherever possible.

Disadvantaged social groups need special attention. Their existing practices, for example, may combine environmentally friendly, circular habits with practices that are detrimental to both their own health and to the environment, but to which they see no feasible alternatives (from dietary choices to inappropriate use, reuse and disposing of materials). Similarly, differences of perception (in different regions of the EU, among different social groups, across genders and various age groups) of the urgency of the climate change and other environmental issues, and thus the urgency of related behaviour change, need focused attention. Other categories of actors have to face challenging dilemmas, such as economic agents bearing major additional costs, adaptations or even phasing out of their activities due to Green Deal requirements. In such cases, individual change must be addressed in the context of the collective benefits of the Green Deal and it must be associated to broader structural measures to support affected groups. Addressing these issues requires research and experimentation on behavioural, social and cultural change across Europe, founded on transdisciplinary expertise and strong ethical and methodological standards. Moreover, these actions must be accompanied with comparative research and feedback to ensure continuous monitoring and learning, foresee robust impact evaluation methods and take account of possible trade-offs, unintended consequences or rebound effects.

### Scope

This topic covers behavioural change at individual and collective levels, including public and private organisations as well as broader changes in social practices related to the European Green Deal. Projects retained will establish transnational and transdisciplinary networks of experts, researchers, practitioners and relevant civil society organisations on behavioural, social and cultural change. They will jointly analyse social practices and behavioural change processes including enabling as well as inhibiting factors, share good practice, tools and resources and implement relevant experimentation on priority issues to deliver on the Green Deal. They should build on already existing experience, notably stemming from EU-funded projects.

Provision will be made for several experimental studies, each implemented in at least four Member States and/or associated countries. Specific topics for case studies will be co-decided with the EC

services involved in implementing the Green Deal. They will support major EU actions where such change is key, including but not limited to Horizon Europe Missions, in close cooperation with the respective mission boards, and other R&I initiatives.

Vulnerable and marginalised people, minorities and various age groups, including both youth and the elder generation, as well as urban, peri-urban and rural areas, will be considered and included, with methods and tools adapted to the target groups. Gendered issues will receive specific consideration. Change at the workplace will also be addressed, including teleworking, as well as change from collective entities such as the behaviour of businesses and their shift towards sustainable business models, the behaviour of public services and other organisations in the context, where relevant, of broader political, social and economic or financial dynamics.

A balanced overall coverage of EU and associated countries will be sought. National and local governments and administrations will be associated from an early stage, including, to the extent possible, links with similar initiatives at their levels and with their policy and regulatory action. Experimentations should also build on the bottom-up initiatives stemming from groups of citizens, notably from the younger generation, as well as from various communities and organisations, for example actors of the social economy, and seek to expand the agency of people and communities.

Experts will design methodologies for each individual exercise, relying on comparative analysis of international best practice, including comprehensive impact evaluation and involving people or groups concerned. Depending on specific objectives, they may either ensure consistency across Member States for transnational comparability, or select a range of different methodologies to compare their effectiveness.

All relevant factors of behaviour change need to be considered. Successful proposals should thus propose a transdisciplinary approach to behaviour change, looking at system dynamics and integrating historical, cultural, societal, economic and psychological perspectives, as well as gender studies and intersectional research. For example, disciplines such as anthropology, cultural psychology, cultural studies, semiotics and sociology can shed light on cultural change as one of the crucial preconditions of behaviour change; whereas engaging social and economic psychology may help to establish a more nuanced concept on the human behaviour itself. Inequalities related to climate change and the socio-ecological transition should also be considered, as well as the role of science communication, journalism and the media.

Broader institutional (legal, financial, economic) conditions that enable and facilitate behaviour change will be considered and may lead to policy and regulatory recommendations. Projects should address the feedback-loops between behaviour change and evolutions of the broader context. They should also consider the full impact of behaviour change, including trade-offs, side and rebound effects.

An advisory board will ensure the scientific soundness, ethical and unbiased character of the planned experiments, and they will vet the methodologies and conditions of implementation of each individual exercise.

Research teams will study each individual exercise, assess and compare their results across the Member States and provide feedback and recommendations.

Coordination and cooperation will be expected between funded projects under this topic and others of this area, since behavioural, social and cultural change are often directly linked with deliberation, engagement and activism. This may encompass limiting features such as the advisory board to a single one to advise and ensure consistency across the projects.

In line with the Union's strategy for international cooperation in research and innovation, international cooperation is encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 to 5 million would allow the specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

### Expected Impact

To succeed, the Green Deal requires substantial behaviour change at both individual and collective levels. Projects under this topic will enable such change through implementation research on the behavioural change of individuals, private corporations and/or the public sector across the EU. Consortia should choose a basket of qualitative and quantitative indicators to measure the impact of their work. For example, they are expected to contribute to one or several of the Sustainable Development Goals<sup>74</sup> and are encouraged to make use of MoRRI indicators<sup>75</sup>.

Specific impacts include:

- Structured transdisciplinary expertise, research and practice networks of the highest ethical and methodological standards across Europe on the above.
- A more nuanced view of mindset and social and behavioural change mechanisms including enabling as well as inhibiting factors for various groups and communities, through the lens of transdisciplinary research that integrates historical, cultural, societal, economic and psychological perspectives.
- New strategies to induce behaviour change and long-term commitment, trust and buy-in from people, communities and organisations.
- Innovative recommendations and incentives that consider differences between EU regions and social groups e.g. in terms of urgency perceptions.
- Bottom-up approaches to manage, inter alia, the uncertainty derived from climate change.
- Greater societal resilience against climate change and environmental crises.

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<sup>74</sup> <http://www.un.org/sustainabledevelopment/sustainable-development-goals/>

<sup>75</sup> <https://op.europa.eu/s/n75Q>

- Behaviour change at both individual and collective levels, among citizens, communities, workplace, decision makers and institutional actors, also contributing to systemic change at the level of political and economic structures, culture and society.

Type of Action: Research and Innovation Action (RIA)

DRAFT

LC-GD-10-3-2020: Enabling citizens to act on climate change, for sustainable development and environmental protection through education, citizen science, observation initiatives, and civic engagement

Specific Challenge:

The active role of citizens and their direct involvement is essential to address climate change and other human actions harming the environment on land, air and sea. Changes in citizen's and consumer's behaviours towards more sustainable patterns can happen through education, awareness raising, citizen science, observation and monitoring of their environmental impacts, civic engagement and social innovation. It is essential to directly involve citizens and communities in contributing to climate action and protecting the environment, thereby encouraging them to change their personal behaviour and their mindsets, reducing their carbon and environmental footprint and taking action at the individual and collective level. This would lead to a more sustainable lifestyle and relationship to the environment.

A strong emphasis is placed on strengthening environmental awareness of the young generation through education and other forms of youth engagement. Pupils and students have the potential to become ambassadors for climate action, sustainable development and environmental protection by sharing their knowledge, experience and engagement with their families, local communities, public and private decision makers, as well as through communication and the use of social media. As recommended in the European Green Deal Communication<sup>76</sup>, schools, training institutions and universities are well positioned to engage with pupils, parents and the wider community on the changes needed for a successful transition to a green economy. A European competence framework is needed to help develop and assess knowledge, skills and attitudes on climate change and sustainable development. Related demonstration activities on nature-based solutions, biodiversity conservation, waste management, sustainable energy production and consumption, marine science etc. will support the testing and the implementation of the framework.

Citizen science is a powerful tool for climate action, sustainable development and environmental protection through civic engagement. Citizen science should be understood broadly, covering a range of different levels of participation, from raising public knowledge of science, encouraging citizens to participate in the scientific process by observing, gathering and processing data, right up to setting scientific agenda and co-designing and implementing science-related policies. It could also involve publication of results and teaching science. Citizen science activities should be based on a robust scientific methodology ensuring the quality of the data collected and a fair representation of all stakeholders involved. Citizen science will help to raise awareness, to educate in science, to increase understanding of scientific processes and scientific literacy. It will also provide new tools and data for environmental monitoring, covering a broad European geography. Citizen science can strongly contribute to the delivery of environmental data with a significant

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<sup>76</sup> [https://eur-lex.europa.eu/resource.html?uri=cellar:b828d165-1c22-11ea-8c1f-01aa75ed71a1.0002.02/DOC\\_1&format=PDF](https://eur-lex.europa.eu/resource.html?uri=cellar:b828d165-1c22-11ea-8c1f-01aa75ed71a1.0002.02/DOC_1&format=PDF)

potential for further broad use, including contributing to improving relevant European policies. It will have real-life impact through adaptations in citizen/consumer personal behaviours.

Initiatives should be coherent with the objectives of the European Green Deal, the European Climate Pact<sup>77</sup> and the European Biodiversity Strategy for 2030<sup>78</sup> to engage citizens and communities in action addressing climate change, sustainable development and environmental protection. The proposed activities will build on existing initiatives and practices that demonstrate at international, European, national, regional and local level innovation in teaching and learning methods and how to engage the wider community in the changes needed for a successful and just transition. For example, experience can be learned from the European Ocean Literacy platform<sup>79</sup>, the European Atlas of the Seas<sup>80</sup>, the Plastic Pirates initiative<sup>81</sup>, the citizen science platform<sup>82</sup>, the Horizon 2020 project TeRRIFICA<sup>83</sup>, Scientix<sup>84</sup>, School Education Gateway<sup>85</sup>, resources for nature-based solutions in education<sup>86</sup>, UNESCO experience in Education for Sustainable Development<sup>87</sup>, as well as cultural, creative and artistic activities as a tool for empowering citizens.

Scope:

Actions under this topic should address one of the following two subtopics:

**1. Subtopic 1: Enabling citizens to act on climate change and for sustainable development through education**

Based on the recommendations of the European Green Deal Communication, actions will foster the development and implementation of a multidisciplinary European competence framework within the context of lifelong learning for the development and assessment of knowledge, skills and attitudes of citizens and in particular young people on climate change and sustainable development.

This framework shall be built on the best available research and rooted in the Council Recommendation on Key Competences for lifelong learning<sup>88</sup>, especially natural science, technology, mathematics, as well as social, personal, entrepreneurial, citizenship and digital competences. The participation of natural scientists, technology specialists, citizen science professionals and social sciences and humanities researchers is essential for the development of

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<sup>77</sup> [https://ec.europa.eu/clima/policies/eu-climate-action/pact\\_en](https://ec.europa.eu/clima/policies/eu-climate-action/pact_en)

<sup>78</sup> [https://eur-lex.europa.eu/resource.html?uri=cellar:a3c806a6-9ab3-11ea-9d2d-01aa75ed71a1.0001.02/DOC\\_1&format=PDF](https://eur-lex.europa.eu/resource.html?uri=cellar:a3c806a6-9ab3-11ea-9d2d-01aa75ed71a1.0001.02/DOC_1&format=PDF)

<sup>79</sup> <https://webgate.ec.europa.eu/maritimeforum/en/node/4484>

<sup>80</sup> <https://webgate.ec.europa.eu/fpfis/wikis/display/AtlasOfSeas/>

<sup>81</sup> <https://bmbf-plastik.de/en/plasticpirates>

<sup>82</sup> <https://eu-citizen.science/>

<sup>83</sup> <https://cordis.europa.eu/project/id/824489>

<sup>84</sup> <http://scientix.eu/>

<sup>85</sup> <https://www.schooleducationgateway.eu/>

<sup>86</sup> <https://oppla.eu/>

<sup>87</sup> [https://www.unesco.de/sites/default/files/2018-08/unesco\\_education\\_for\\_sustainable\\_development\\_goals.pdf](https://www.unesco.de/sites/default/files/2018-08/unesco_education_for_sustainable_development_goals.pdf)

<sup>88</sup> [https://ec.europa.eu/education/education-in-the-eu/council-recommendation-on-key-competences-for-lifelong-learning\\_en](https://ec.europa.eu/education/education-in-the-eu/council-recommendation-on-key-competences-for-lifelong-learning_en)

the framework. Taking into account the natural resistance to individual behavioural changes and to collective changes in social practices, as well as the gender gap observed in attitudes towards ecology and sustainable practices, contributions and practical knowledge provided by non-academic practitioners, NGOs and stakeholders, and international best practices, will be important. The European competence framework will be tested and validated through demonstration activities, in particular in schools, training institutions and universities, as for example through the implementation of nature-based solutions (e.g. green walls, green ponds for natural water filtering, green roofs, air quality sensors, green mobility, etc.), actions for biodiversity conservation, education on natural disasters, waste management including marine and riverside litter, sustainable energy and food production and consumption, educational activities supporting the refurbishment of school buildings, etc.

Under this subarea, clustering activities among the selected projects shall be ensured through regular exchanges (e.g. meetings, peer-learning and peer-counselling activities, etc.) in order to develop jointly the framework and to share the educational outcomes, best practices and results of the different demonstration sites. To this end, proposals should earmark the appropriate resources for coordination activities accordingly. The proposals shall also reflect a balanced geographical representation of the demonstration sites covering different regions in Europe.

The Commission considers that proposals requesting a contribution from the European Union in the range of EUR 5 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

## **2. Subtopic 2: Enabling citizens to act on climate change and for sustainable development through better monitoring and observing of the environment and their environmental impacts**

Actions in this area will target the involvement of citizens in climate- and environment-related issues and domains, such as biodiversity, marine and freshwater pollution, water scarcity and sustainable transport and food production. They will focus on the active participation of citizens through citizen science, environmental observation and civic consortia. Projects should be conducted on a broad scale, in cooperation with businesses, civil society organisations and public authorities to ensure that these actions will lead to examples on how to engage the wider community in the effective behavioural changes and changes in social practices needed for a successful and just transition (such as the Climate Adapt platform<sup>89</sup> and the Covenant of Mayors<sup>90</sup>). The key component of this area is to raise awareness, engage and empower citizens and consumers with concrete tools to monitor their impacts on the environment, to collect information enabling them to change their behaviour and to reduce their personal carbon and

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<sup>89</sup> <https://climate-adapt.eea.europa.eu/>

<sup>90</sup> <https://www.covenantofmayors.eu/>

environmental footprint as user and consumer through individual and social innovation. Actions should include the development and/or improvement of devices (low-cost sensors, consumer apps, etc.) taking into account the interoperability and exchange of future and existing data collected. Attention should be paid to promoting gender-equal participation and deconstructing gender stereotypes.

The Commission considers that proposals requesting a contribution from the European Union in the range of EUR 5 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Grants will be awarded to proposals according to the ranking list. However, in order to ensure a balanced portfolio of supported actions, at least the highest-ranking proposal per subtopic will be funded, provided it attains all thresholds.

Expected Impact:

Subtopic 1:

- The development of a multidisciplinary European competence framework within the context of lifelong learning for the development and assessment of the knowledge, skills and attitudes of citizens and in particular young people on climate change, sustainable development and environmental protection;
- the framework will serve as a reference tool for the Member States, the public and private sector, stakeholders, and NGOs to help citizens to become engaged actors in the green transformation of society;
- the development of specific educational programmes, school curricula, trainings, networking activities and exchange of good practices in the area of climate change and education for sustainable development;
- by undertaking consultations, testing and implementation of this framework in schools, universities, training institutions, municipalities, public authorities in cooperation with the private sector, teachers, trainers, students, pupils, parents, the wider community and social media will engage and make the behavioural changes needed for a successful transition;
- the participation of pupils and students, supported by scientists, educators and practitioners, in intergenerational dialogues and exchanges on climate action, environmental protection and behavioural changes for sustainable development;
- the testing, dissemination and use of the European competence framework at concrete demonstration sites (e.g. in schools, universities and identified education communities) and in innovative activities (e.g. incubators for citizen participation, informal youth city councils, use of social media and digital tools...).

Type of Action: Innovation action

Subtopic 2:

The project results are expected to contribute to:

- the development or strengthening of citizen science initiatives to engage citizens in the active collection of environmental and socio-economic data through individual new or improved devices (such as wearable sensors, a trusted user-friendly app with robust carbon footprint calculations, extreme weather community app, for the purposes of early warning, marine and freshwater litter watch, etc.);
- the provision of personalized information to citizens and consumers about their environmental impact;
- a better monitoring of the environment (land, sea, air, etc.);
- behavioural change processes on the part of citizens, consumers and communities towards more sustainable patterns in reducing their carbon and environmental footprint, changing their consumption and lifestyle choices to achieve goals of a climate-neutral, sustainable Europe through concrete and targeted advice.

Type of Action: Innovation action

## Area 11: International cooperation

LC-GD-11-1-2020: Accelerating the green transition and energy access Partnership with Africa

### Specific challenge:

As recognised in the Joint Communication for a Comprehensive Strategy with Africa (adopted on 9/3/2020), innovation is key to enable African countries to pursue sustainable pathways to development through a low-carbon, climate resilient and green growth trajectory, leapfrogging fossil fuel based and inefficient technologies. The present R&I Partnership on Climate Change and Sustainable Energy of the EU/AU High-Level Policy Dialogue on Science, Technology and Innovation is expected to strongly contribute to Action 1 of the Comprehensive Strategy with Africa.

The African continent has an enormous renewable energy potential that it has just began to successfully harness. The adoption of innovative, affordable, efficient and renewable energy solutions will support Africa achieving sustainable development growth and economic transformation. This will also help Africa addressing the urgency of climate change actions and mitigating its effects.

Africa still faces major challenges related to ensuring access to sustainable energy for all, and the development of its industrial base to create much needed jobs. In line with the Africa-Europe Alliance for sustainable investment and jobs, the EU-AU R&I Partnership on Climate Change and Sustainable Energy wants to support the development of sustainable energy solutions adequate to the African context that would address those challenges.

Experience has shown that existing innovative solutions and technologies developed for developed markets need to be adapted, tailored and demonstrated to the multi-faceted context of Africa to bring not only economic, but also environmental, social and health benefits. For facilitating market uptake and sustained deployment of technologies, R&I policies need to be coupled with capacity building and appropriate financing solutions. Additional considerations towards affordability, distribution channels as well as meaningful engagement of civil society in the implementation of research proposals are also key for the success of possible technology solutions. Attracting private and / or public investors towards sustainable energy solutions will contribute to a sustainable economic development benefitting both continents.

Significant efforts are being made (including with the support of the European Commission) to address the development of innovative solutions through research and innovation actions; however, demonstrations of the value of these solutions are still needed.

### Scope:

The proposals to be funded under this topic will cover the demonstration of innovative climate adaptation, climate mitigation and sustainable energy solutions, in the African social, economic and environmental contexts. The solutions could address developments in the areas of renewable energy sources, including solutions for off-grid communities, and their integration into existing energy system, energy efficiency in particular in urbanised and rural contexts, the water-energy-

food nexus, with the aim of providing sustainable energy access (electricity/cooking) or creating improved health, economic wealth and jobs (productive use of energy/energy efficiency).

Beside the activities related to the design, construction, commissioning and operation of the demonstration installation, the proposals are expected to develop and implement a tailored value chain approach, identifying the most suitable manufacturing value chains, on the basis of the local context, local material supply chain, local workforce with the objective to assure local sustainable economic development. The latter should also include the identification of technical, vocational and educational needs of the workforce and propose relevant training and qualification activities. The proposals are also expected to define its market strategy and its business strategy to ensure a quick and viable commercial take up of the technological solution demonstrated.

Proposals shall include a life cycle analysis showing the impacts of the proposed solutions on the environment, on climate change targets, and on the social and the economic dimensions, from a cradle to grave viewpoint. Where relevant, proposals will consider adopting a circular economy approach, aligned with the EU Green Deal priorities.

The Commission considers that proposals requesting a contribution from the EU of between EUR 5 to 10 million would allow the specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

In line with the Union's strategy for international cooperation in research and innovation, international cooperation is encouraged. As the demonstration installation will be located in Africa, relevant African partners to implement the project are expected to participate in the project.

Copernicus data and products can support the optimal location of some infrastructures (hydro energy, wind energy, solar energy, even maybe coastal marine energy) and can also support to evaluate the impact on the environment (and human) of these new energy structures and the loss of biodiversity associated with it;

In addition, proposals will need to demonstrate the benefits of the proposed solutions with particular regard to the Sustainable Development Goals 2, 4, 5, 6, 7, 8, 11, 12, 13.

Funded proposals will participate and contribute to the EU/AU Partnership on Climate Change and Sustainable Energy.

Expected impacts:

The short-term impact of the proposals will be to provide evidence of technological reliability, economic viability, and of the environmental, health, climate, social and economic impacts of its renewable energy solutions. The evidence needs to cover too the climate adaptation and climate mitigation potential of the solutions. They are expected to contribute to the strengthening of the joint EU-AU Climate Change and Sustainable Energy Partnership efforts, with emphasis of improving the visibility of EU Science Diplomacy actions in Africa.

The medium term impact will be in the creation of new markets opportunities for both European and African companies in the African continent and technological uptake to accelerate the achievements of the targets of the Paris Agreement for both continents, in line with Europe's Green Deal ambition of climate neutrality, and its external dimensions.

Economic growths and job creation, both in the EU and in African third countries are also expected in the longer term.

Type of Action: Innovation Action

DRAFT

## Other Actions

A limited number of Other Actions will be included in order to support the overall objectives and impact of the GD Call. *To be developed*

DRAFT

## Budget

Topic title	Topic identifier - (Types of action)	Budget 2020 (EUR million)
<b>Area 1</b>		
Preventing and Fighting Wildfires	LC-GD-1-1-2020 (RIA)	75
1.2 -Towards climate –neutral and socially innovative cities	LC-GD-1-2-2020 (RIA)	53
1.3 Climate-resilient Innovation Packages for EU regions	LC-GD-1-3-2020 (IA/CSA)	45
<b>Area 2</b>		
2.1 Offshore renewable energy technologies and their integration into the energy system	LC-GD-2-1-2020 (IA)	80
2.2 Develop and demonstrate a 100 MW electrolyser	LC-GD-2-2-2020 (IA)	60
<b>Area 3</b>		
3.1 - Closing the carbon cycle to combat climate change	LC-GD--3-1-2020 (IA)	80
3.2 - Demonstration of systemic solutions for the territorial development of circular economy	LC-GD-3-2-2020 (IA)	60
<b>Area 4</b>	<b>Area 4</b>	
4.1 Building and renovating in an energy and resource efficient way	LC-GD-4-1-2020 (IA)	60
<b>Area 5</b>	<b>Area 5</b>	

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5.1 Green airports and ports as hubs for sustainable and smart mobility	LC-GD-5-1-2020 (IA)	100
Area 6	Area 6	
6.1 - Testing and demonstrating systemic innovations in support of the Farm-to-Fork Strategy	LC-GD-6-1-2020 (IA)	72
Area 7	Area 7	
7.1 - Restoring biodiversity and ecosystems services	LC-GD-7-1-2020 (RIA)	80
Area 8	Area 8	
8.1 - Mitigating the effects of persistent and mobile chemicals	LC-GD-8-1-2020 (RIA)	40
8.2 Fostering regulatory science to address chemical and pharmaceutical mixtures	LC-GD-8-2-2020 (RIA)	20
Area 9	Area 9	
9.1 European Research Infrastructures capacities and services to address European Green Deal challenges	LC-GD-9-1-2020 (RIA)	28
9.2 - Developing end-user products and services for all stakeholders and citizens, supporting climate adaptation and mitigation	LC-GD-9-2-2020 (RIA)	25
9.3- Towards a digital twin of the Ocean	LC-GD-9-3-2020 (IA)	12
Area 10	Area 10	
10.1 European capacities for citizen deliberation and participation for the Green Deal	LC-GD-10-1-2020 (RIA)	10

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10.2 Behavioural, social and cultural change for the Green Deal	LC-GD-10-2-2020 (RIA)	10
10.3 - Enabling citizens to act on climate change through education, monitoring of their environmental impacts, and civic involvement	LC-GD-10-3-2020 (IA)	25
11.1 Accelerating the green transition and energy access Partnership with Africa	LC-GD-11-1-2020 (IA)	40
OTHER ACTIONS	tbd	25
<b>TOTAL</b>		<b>1000</b>

Note: Budget figures are indicative and based on the assumption of an overall budget of EUR 1 billion. Based on the final amount available, necessary adjustments will be made.