

Work Programme 2018-2020: Draft Orientations

Societal Challenge 5 'Climate action, environment, resource efficiency and raw materials'

Version of 20/02/2017

IMPORTANT NOTICE:

These draft orientations to prepare the Work Programme 2018-2020 for Societal Challenge 5 have been elaborated on the basis of the scoping paper 2018-2020. This document contains elements aimed at facilitating an early discussion with the Programme Committee configuration for Societal Challenge 5 at its meeting on 8 March 2017. It does not represent a draft work programme, and may change in both content and structure, even substantially.

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DRAFT

Introduction

The objective of the Societal Challenge 5 'Climate action, environment, resource efficiency and raw materials' is to achieve a resource – and water – efficient and climate change resilient economy and society, the protection and sustainable management of natural resources and ecosystems, and a sustainable supply and use of raw materials, in order to meet the needs of a growing global population within the sustainable limits of the planet's natural resources and ecosystems.

The era of seemingly plentiful and cheap resources is coming to an end: raw materials, water, air, biodiversity and terrestrial, aquatic and marine ecosystems are all under pressure. The combined impacts of climate change and current production and consumption patterns are undermining our planetary habitat. Based on current trends, the equivalent of more than two planet Earths will be needed by 2050 to support the growing global population. There needs to be a decoupling of economic growth from resource use.

At the same time, climate change is a reality, with effects that are already being felt in Europe and world-wide. It is becoming increasingly clear that urgent and concerted action is needed, underpinned by research and innovation (R&I), to fight the causes of climate change and build more climate-resilient societies.

The priorities identified in this Work Programme will continue to pursue Societal Challenge 5's overall objective of helping to realise a green economy – a circular, climate-resilient economy in sync with the natural environment – and thereby contributing to achieving smart, sustainable and inclusive growth. They address the ambitious targets set at global level on the one hand by the COP21 Paris Agreement and on the other by the UN's Sustainable Development Goals (SDGs), the global Urban Agenda adopted in Quito and the Sendai framework for Disaster Risk Reduction, which all demand a fundamental shift in technology, economics, finance and society as a whole. This Work Programme is therefore structured around two calls: 'Building a low-carbon, climate resilient future: climate action in support of the Paris Agreement' and 'Greening the economy in line with the SDGs'.

At the same time, these priorities help implement high-level EU policies including the 7th Environmental Action Programme to 2020, the Circular Economy, the Energy Union (including the Communication 'Accelerating Clean Energy Innovation') and the Arctic. All of these put special emphasis on science and innovation as critical drivers for achieving long-term goals and targets. Ultimately, activities will contribute to the Commission's priorities of 'Jobs, Growth and Investment', 'Energy Union and Climate', 'Digital Single Market' and 'Stronger Global Actor', through a process underpinned by open science and open innovation, and which is open to the world and attentive to ethical, gender and responsible research and innovation issues.

All activities funded under this work programme part should as far as possible use data resulting from or made available through different initiatives of the European Commission. In particular,

the utilisation of GEOSS (Global Earth Observation System of Systems)¹ and Copernicus (the European Earth Observation Programme)² data, products and information should be privileged³. Likewise, in line with EU cooperation with the European Space Agency (ESA), activities should use ESA Earth Science data as far as possible. The data, both from ESA missions or third party missions, are for the vast majority of cases available for free web download (further details are available at <http://eopi.esa.int>). All activities related to Earth observation data and other spatial data should comply at best with and build upon the existing Infrastructure for Spatial Information in the European Community (INSPIRE)⁴.

Grant beneficiaries under this work programme part will engage in research data sharing by default, as stipulated under Article 29.3 of the Horizon 2020 Model Grant Agreement (including the creation of a Data Management Plan). Participants may however opt out of these arrangements, both before and after the signature of the grant agreement. More information can be found under General Annex L of the work programme.

Beneficiaries are invited to follow the GEOSS Data Sharing Principles and to register in GEOSS the geospatial data, metadata and information generated as foreground of the project. Further information on GEOSS can be found from: <http://www.earthobservations.org>.

Beneficiaries are also encouraged to use FIWARE for some or all of their platform developments, when relevant. FIWARE enablers are available at www.fiware.org under open source licence for business use. Free online training, a sand-box environment and technical support are available; equally, proposers may contribute to the evolution of FIWARE.

[Approximate budget breakdown across whole WP:

2018: RIA 70%, IA 21%, CSA 4%

2019: RIA 33%, IA 58%, CSA 3%, ERA-NET Cofund 3%

provisional for 2020: RIA 51%, IA 34%, CSA 2%, ERA-NET Cofund 7%

total for 2018-2020: RIA 51%, IA 38%, CSA 2%, ERA-NET Cofund 3%, other (prizes, PCP, other actions) 5%]

¹www.geoportal.org

²www.copernicus.eu

³Copernicus data and products, where available, should be used by the research and innovation community following the free, full and open access approach approved in the Commission Delegated Regulation (EU) No 1159/2013 of 12 July 2013. This would include the data from the Copernicus space infrastructure (Sentinels missions) and where affordable, the Copernicus Contribution mission data, when the latter can be of use for Horizon projects developing new Copernicus Services. Applicants are advised to consult information on the availability of Copernicus Sentinel Data and access to Copernicus Contributing Mission data on the Commission's website: http://ec.europa.eu/growth/sectors/space/research/index_en.htm. Where possible, proposers are also encouraged to use the Earth Observation Data Warehouse: <http://copernicusdata.esa.int/web/cscda/home>.

⁴<http://inspire.ec.europa.eu/>

Call: "Building a low-carbon, climate resilient future: climate action in support of the Paris Agreement"

[Overall indicative budget for this call: 2018 EUR 128 million; 2019 EUR 108 million]

Mission statement of this call

Climate change is a reality, with effects that are already being felt in Europe and world-wide. Urgent and concerted action – underpinned by research and innovation (R&I) – is needed to fight the causes of climate change, while also building more climate-resilient societies.

The COP21 Paris Agreement⁵ (PA) marked the beginning of a new era in the fight against climate change. Governments agreed to limit global temperature rise to 'well below' 2°C and to make efforts to limit this to 1.5°C. These goals are ambitious, and achieving them will require a trajectory of full decarbonisation with accelerated pathways towards climate neutrality. R&I is essential to find the ground-breaking solutions needed, including in particular the energy system where there are great opportunities for innovation to capitalise on the EU's strengths and to reinforce competitiveness. While mitigation is essential, countries must also adapt to the impacts of climate change, which will continue due to the inertia of the earth system, and improve the resilience of their societies in relation to the multiple risks they face. All action taken must be based on the best available science and evidence.

R&I actions in this call will therefore focus on supporting the implementation of the PA, helping understand the action required to deliver on its mitigation and adaptation goals, and producing relevant scientific knowledge in advance of key PA-related milestones, such as the implementation of the Nationally Determined Contributions (NDCs), the publication of national mid-century strategies (2020), the 6th assessment cycle of the IPCC (2018-2022) and the first global stock-take in 2023. Actions will also support relevant EU policies and objectives, such as the Energy Union, Arctic policy, EU Adaptation Strategy and EU climate diplomacy efforts. Special consideration will be given to cooperation with strategic partner countries/regions. In particular, actions will focus on:

- i) policy-oriented research into decarbonisation consistent with the PA goals and which preserves the EU's position as a front-runner in the 'green race' for low or zero carbon products, solutions and services;
- ii) in-depth assessments of impacts, vulnerabilities and risks for enhancing resilience of human systems and ecosystems and climate-proofing of assets, sectors, critical infrastructures and the built environment in support of decision making; facilitating market development of climate services; evaluation of the effectiveness and efficiency of the different adaptation options; development and application of methodologies and tools for assessing climate risk in investments, businesses and the private sector;

⁵http://unfccc.int/paris_agreement/items/9485.php

iii) enhancing, understanding and supporting the development and use of nature-based solutions, green and blue infrastructure and ecosystem-based approaches to decarbonisation and climate change mitigation, adaptation and resilience, including the linkages between adaptation and disaster risk reduction;

iv) providing robust assessments of the impacts of climate change on vulnerable areas/hot-spots such as oceans and the cryosphere (with the main focus on the Arctic) and associated planetary feedbacks, as well as developing solutions for adaptation and sustainable development, including for the EU's Outermost Regions and overseas countries and territories;

v) science to address emerging issues and key knowledge gaps, enabling long-term improvement of climate science with a view to producing policy-relevant information for mitigation and adaptation.

Decarbonisation

LC-CLA-01-2018: Supporting the development of climate policies to deliver on the Paris Agreement, through Integrated Assessment Models (IAMs)

Specific Challenge: Under the Paris Agreement (PA), Parties of the UNFCCC have Nationally Determined Contributions (NDCs) that will have to be periodically updated. They have also been invited to formulate and communicate their mid-century low greenhouse gas emission development strategies by 2020. Finally, there will be periodic assessments of the collective progress towards achieving the objectives of the PA, with the first 'global stocktake' being to take place in 2023. These critical processes for global climate action must be underpinned by authoritative scientific results at national, regional and global levels. Science should provide the necessary tools and knowledge-base in order to support the above mentioned processes and contribute to the high quality of the major emitters' submissions.

Scope: The proposed action should address only one of the following:

a) Actions should provide new, more accurate and more comprehensive scientific knowledge on the design, requirements and impacts of climate action at national, European and global level. The potential for dynamically increasing decarbonisation ambition over time should be considered, as well as its life-style impact. This action, based on the use of ensembles of Integrated Assessment Models (IAMs), covering the entire economy and all greenhouse gases, should be able to provide useful information at global and national level for the effective implementation of NDCs, the preparation of future action pledges and the development of 2050 decarbonisation strategies in major emitting countries. This in turn is important for the 2023 global stocktake under the UNFCCC. In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged to improve the development of such models at both global and national level and assess the interaction between global and national modelling tools and projections.

b) Actions should significantly improve the state-of-the-art of IAMs, in order to provide robust and transparent assessments to support the design and evaluation of climate policies. Improvements in one or more of the following areas should be addressed: sectoral coverage across the entire economy (including bunker fuels and land-based emissions/sinks), inclusion of all greenhouse gases, representation of issues such as structural and behavioural change and uncertainty, inequality, interaction with other development goals, co-benefits of actions due to avoided impacts and reduced adaptation needs. Furthermore, actions should aim at improving geographical coverage of global models as well as through in-country development of national modelling capacity.

The Commission considers that proposals requesting a contribution from the EU of between EUR 5 million and EUR 7 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: The project results are expected to contribute to:

- supporting EU climate policy and the preparation of the EU 2020 submission to the UNFCCC and the 2023 global stocktake exercise under the UNFCCC;
- major international scientific assessments such as the IPCC reports;
- enhanced scientific cooperation with third countries (especially major emitters);
- fostering innovative policy-making through robust methodologies and tools and reduction of uncertainties;
- fostering greater transparency of models, methods and tools.

Type of Action: Research and Innovation action

LC- CLA-02-2019: Negative emissions and land-use based mitigation assessment

Specific Challenge: Most low-carbon pathways leading to well below 2°C (or 1.5°C) stabilisation of the global temperature – in line with the Paris Agreement goals – include net negative emissions to compensate for residual emissions and temperature overshoot and highlight the critical role of land-use based mitigation. There is therefore a need to quantitatively assess the potential, effectiveness and impacts of negative emission technologies/practices and of land-use mitigation options, in achieving the long-term goals of the Paris Agreement, as well as linking these to what it would mean for concrete policy challenges.

Scope: The proposed action should address only one of the following:

a) Actions should aim at assessing the effectiveness and efficiency of various negative emission technologies (NETs) and their impact on land, water and other resources, bio-diversity, ecosystems and their ability to deliver services to society, including implications for resilience,

as well as on the global economy. Actions should also address the issue of public acceptance and international governance requirements.

b) Actions should provide a comprehensive analysis of various land-use based mitigation options (NETs and non-NETs) at the global and regional level, assessing their effectiveness in providing large-scale reductions of greenhouse gases, in the context of trade-offs and/or co-benefits in relation to other pressures and goals (e.g., food, energy and water security, biodiversity) and should address feedbacks between land-use based mitigation and climate change impacts.

The Commission considers that proposals requesting a contribution from the EU of between EUR 5 million and EUR 7 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: The project results are expected to contribute to:

- the global scientific effort to produce new knowledge on the potential, effectiveness, barriers, trade-offs and co-benefits of NETs and land-based mitigation, and their socio-economic implications, in the perspective of reaching the PA goals and the socio-economic implications;
- major international scientific assessments such as the IPCC reports and the IPBES, as well as to national and EU impact assessment of possible mitigation options;
- enhanced scientific cooperation with third countries.

Type of Action: Research and Innovation action

Adaptation and climate services

LC-CLA-03-2018: Human dynamics of climate change

Specific Challenge: As climatic changes increasingly place populations under pressure, human beings are already adapting. However, less developed countries, particularly in Africa, show lower resilience to climate change, which requires the deployment of appropriate support to adaptation, also in the form of climate services tailored to users' needs. There is some evidence that climate change may already be playing a background role in Africa-to-Europe population migration patterns. It is important to make use of the wealth of data available from the Copernicus infrastructure to better understand these patterns in order to develop appropriate policy responses.

Scope: Actions should address only one of the following:

a) **Climate adaptation and services for Africa:** Actions should address areas where new, relevant climate data made available by Copernicus can be translated into dedicated climate services for Africa for at least two the following sectors: water, energy, land use, health and

infrastructure. Actions should deliver tools/applications that demonstrate clear end-user engagement, consultation and participation and enhance planning and implementation of climate adaptation strategies in Africa. Actions should consider activities addressed by other initiatives such as the Global Framework for Climate Services (GFCS) and provide added value.

b) **Climate and human migration:** Actions should address areas relating to climate change that may directly affect human migration and displacement patterns. Actions should identify and describe climate parameters, provide methods and demonstrate how these parameters affect human migration patterns, including the probability of migration/forced displacement and design adaptation solutions that may help in alleviating migration pressures at the source. They should also provide guidelines and policy recommendations for the European Agenda on Migration.

For both of the above, in line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged, in particular with African and/or Middle East countries.

The Commission considers that proposals requesting a contribution from the EU of between EUR 5 million and EUR 7 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: The project results are expected to contribute to:

- providing added-value to decision and policy makers in Europe and Africa;
- supporting international scientific assessments such as the IPCC reports;
- enhancing the adaptive capacity and climate resilience of societies in Africa and Europe.

Type of Action: Research and Innovation action

LC-CLA-04-2019: Climate impacts in Europe

Specific Challenge: Climate change is likely to make it harder to address poverty, disease, food and water insecurity in Europe. Rising temperatures and changing precipitation may affect the availability of food and water, leading to increased volatility in food prices, and heightened regional tensions, affecting international stability and security. An increased frequency of extreme weather events may adversely affect human, animal and plant health, disrupt the flow of natural resources and commodities, and threaten global infrastructure. Moreover, the inherent uncertainty of these various impacts is likely to increase risks in the business and financial sectors.

Scope: Actions should address only one of the following:

a) **Climate impacts on health:** Actions should address the links between climate change and impacts on human health in Europe that have thus far been poorly understood. Actions should

review the current state-of-the-art knowledge on these links⁶, identify associated costs and suggest effective adaptation strategies, quantify health co-benefits from mitigation and early adaptation, and target research actions on significant priorities. Synergies with relevant actions in Societal Challenge 1 [*reference to be added to the specific Health call*] should be considered.

b) **European dimensions of climate change:** Actions should address how climate impacts beyond European borders are likely to affect European foreign policy, security, finance, business, infrastructure, resources, commodities, supply and value chains. Actions should consider different climate (including high-end) scenarios and undertake a full risk analysis. They should also consider relevant European policies, and comment on how perceived risks may increase other pressures on Europe.

The Commission considers that proposals requesting a contribution from the EU of between EUR 5 million and EUR 7 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impacts: The project results are expected to contribute to:

- better capability in quantifying of impacts of climate change;
- highlighting mitigation and adaptation costs and co-benefits;
- understanding the European significance of climate impacts outside Europe;
- identifying potential new pressures on the European Union;
- informing European policies on international climate change negotiations;
- strengthening European resilience to climate change.

Type of Action: Research and Innovation action

LC-CLA-05-2018: Resilience and sustainable reconstruction of historic cities and settlements to cope with climate change and hazard events

Specific Challenge: European historic cities and settlements are increasingly affected by climate-change and other natural hazard events (floods, landslides, earthquakes etc.). Increasing their resilience through ‘preparedness’ interventions and securing their sustainable reconstruction in case of damage is essential to preserve their identity and economic, social and environmental functionality and to seamlessly transmit their historic value to new generations. However, interventions in historic cities and settlements are quite difficult and hence costly due to specific characteristics associated with heritage sites (such as artistic values, denser urban fabric, higher vulnerability of materials and structures, difficulty of accessing the damaged areas, high

⁶e.g. see the 2016 USGCRP scientific report for the White House on "Climate Impacts on Human Health"

symbolic values for communities involved, etc.). Knowledge- and evidence-based resilience enhancement and reconstruction approaches can significantly increase the cost-effectiveness of such operations while at the same time rendering the historic living environments more resilient to future environmental threats.

Scope: Actions should review and capitalise on existing experiences and good practices in Europe and globally, and illustrate how historic cities and settlements can be rendered more resilient and thus better prepared to face future disaster events. They should also investigate how the principle of 'building back safer' can be mainstreamed into sustainable reconstruction where damage and/or destruction has occurred, rendering reconstruction an opportunity to increase resilience. Furthermore, actions should:

- develop, deploy and validate tools, strategies and plans for disaster event preparedness and sustainable reconstruction;
- test and pilot novel cost-effective, resource and energy efficient solutions to enhance the resilience of buildings and whole historic city centres and settlements to climate change related events and other natural hazards, while at the same time fully respecting the historic value of the reconstructed places;
- provide science- and evidence-based guidelines to local authorities for carrying out sustainable reconstruction within a participatory context, while adopting new governance and finance models;
- develop models to predict direct and indirect impacts of climate, global and environmental change and related risks on historic cities and settlements.

The participation of social sciences and humanities disciplines such as architecture, archaeological sciences, cultural anthropology, law, economics, governance, planning, cultural and historical studies, is essential to properly address the complex challenges of this topic.

The Commission considers that proposals requesting a contribution from the EU of between EUR 5 million and EUR 6 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: The project results are expected to contribute to:

- cost-effective and science- and evidence-based schemes for enhancement of resilience to climate change and natural hazards, and reconstruction, of historic cities and settlements ;
- reduced vulnerability of historic cities and settlements to climate change and multiple hazards;
- use of new knowledge and tools (paradigms, blueprints and solutions including management plans, governance, participatory processes and technical models) by local authorities and communities for improved reconstruction of historic cities and settlements.

Type of action: Research and Innovation Action

Inter-relations between climate change, biodiversity and ecosystems

LC-CLA-06-2019: Climate change, biodiversity and ecosystems services: optimising mitigation and adaptation strategies

Specific Challenge: The Paris Agreement notes the importance of taking action to ensure the integrity of all ecosystems and the protection of biodiversity in the context of combatting climate change and adapting to its impacts. An improved understanding of the interactions and feedbacks between ecological processes and climate change is crucial to enhance ecosystem integrity and resilience, secure ecosystem functionality and the delivery of services, as well as enabling sound ecosystem-based mitigation and adaptation strategies.

Scope: Actions should further investigate at all relevant spatial and temporal scales the way that relevant biodiversity, ecosystems and ecosystem services are impacted by climate change and the interactions and feedbacks between biodiversity, ecosystems services and climate change. They should improve modelling capacity to predict future changes of the socio-climatic-ecological systems accounting for relevant impacts and interactions. Actions should develop tools and methodologies to assess vulnerability of biodiversity and ecosystems services to climate change and provide scientific guidance for the development of appropriate strategies and measures for biodiversity conservation and cost-effective ecosystems-based climate change adaptation and mitigation. The role of nature-based solutions in enhancing the efficiency and efficacy of the climate change adaptation and mitigation strategies should be assessed. Work should build on existing knowledge and contribute to long-term monitoring initiatives.

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged, in particular with CELAC⁷ countries.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 5 million to 7 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: The project results are expected to contribute to:

- improved understanding, monitoring, management and decision making for biodiversity conservation and ecosystem service provision and resilience under climate change;
- improved climate-change modelling capacity accounting for the interactions and feedbacks between biodiversity and the climate system;

⁷ Community of Latin American and Caribbean States

- a stronger evidence base to support management, decision making and design of systemic and effective nature-based solutions for adaptation and mitigation pathways;
- increased investment in nature-based solutions and ecosystem conservation and restoration to support climate change adaptation and mitigation strategies;
- underpinning the EU Nature Directives, EU Strategy on adaptation to climate change and the 2030 Agenda for Sustainable Development;
- protecting, restoring and enhancing natural capital in line with SDGs 13, 14 and 15 and the Convention on Biological Diversity (CBD) and the works of the Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services (IPBES).

Type of Action: Research and Innovation action

The Cryosphere

LC-CLA-07-2018: The changing cryosphere: uncertainties, risks and opportunities

Specific Challenge: Uncertainties associated with the stability of the large ice sheets of Antarctica (AIS) and Greenland (GrIS), and of mountain glaciers, make them uniquely vulnerable to both atmospheric warming and changes in ocean temperature and circulation, risking a significant future contribution to global sea levels. The 'Arctic amplification' of global warming is putting pressure on the ecosystems and communities of the region and impacting at global level as well. The Arctic's fragile natural and social ecosystems are under serious threat and additional human activities, linked to the new economic opportunities that are made possible by climate change, are putting additional pressure on them.

Scope: Actions should aim at developing innovative approaches to address only one of the following:

a) Actions should assess the processes controlling changes to global ice mass balance, including ice dynamics and surface components. Actions should assess the status of the cryosphere and report on how its changes are likely to affect future sea-levels. Actions should also analyse low-probability high-impact scenarios including those associated with ice-sheet collapses (sea-level fingerprints). Actions should also identify and assess the associated major risks to coastal communities, coastal ecosystems and critical infrastructure across the globe.

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

b) Actions should identify and analyse major threats and implications of changing biodiversity in the Arctic, the role of invasive species, and how vulnerable land and/or marine ecosystems are to combined human and natural influences. Actions should assess the ecosystems' responses to both

external and internal factors and how these responses are impacting on indigenous populations and local communities at socio-economic level. Actions should also identify adaptation strategies in relation to the changes in Arctic ecosystems.

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

c) Actions should assess the possibility of new economic activities – such as resource exploitation, shipping and tourism – and their ecological and socio-economic impacts in the Arctic Ocean and surrounding land masses. Actions should investigate key processes with high socio-economic impact and provide appropriate, solution-oriented adaptation and mitigation responses, as well as capacity building for sustainable livelihoods while considering – in a co-design approach – the needs, priorities and perspectives of indigenous populations, local communities and economic actors operating in the region.

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

d) Actions should support the translation of research outcomes into cold-climate technologies and services with commercial potential by assessing the sustainability of processes and technologies and by proposing guidelines and protocols to develop ‘Arctic standards’. Actions should address a wide range of technologies and services that have the potential to bring broad social and economic benefits within and beyond the Arctic region. Actions should also provide consistent requirements on how to design, build, install, and operate equipment and services to safely perform activities in the Arctic and to respond to emergencies.

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

For all of the above, in line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged, in particular with countries that took part in the first Arctic Science Ministerial of 28 September 2016.

Expected impact: The project results are expected to contribute to:

- the support of the implementation and the new integrated EU policy for the Arctic (JOIN(2016) 21 final);
- the IPCC assessments and to the Copernicus Climate Change (C3S) services;
- improving the predictability of poorly represented processes; the sustainable management of cold region ecosystems and thus support the provision of ecosystem services and natural resources for improved societal well-being;

- enhancing the engagement of and the interaction with residents from local communities and indigenous societies.

Type of action: a), b) and c) Research and Innovation Action; d) Coordination and Support Action

Knowledge gaps

LC-CLA-08-2018: Addressing knowledge gaps in climate science, in support of IPCC reports

Specific Challenge: Better understanding of the key processes controlling the climate-Earth system is fundamental in order to further improve climate projections, reduce uncertainty in climate sensitivity calculations, and assess more accurately the impacts of climate change related to the proximity, rate and reversibility of tipping points and the identification of safe operating spaces. Furthermore, future climate scenarios strongly benefit from paleo-reconstructions conducted in Polar Regions as they allow a better understanding of how the climate system worked, both regionally and globally, during abrupt climatic transitions and under warmer or colder than present day conditions.

Scope: Actions should address only one of the following:

a) Improving the understanding of key climate processes for reducing uncertainty in climate projections: Actions should aim at improving climate projections and constraining climate sensitivity estimates through better understanding of key processes, and associated feedbacks, affecting the climate–Earth system such as: cloud and aerosol processes and cloud-aerosol interactions, biochemical cycles and their evolution under a changing climate, ocean dynamics and circulation, dynamic interactions between atmosphere and ocean, and other relevant processes.

The Commission considers that proposals requesting a contribution from the EU of between EUR 6 million and EUR 8 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

b) Tipping points: Actions should address the need to better understand abrupt climate change, climate-related Earth system tipping elements and their tipping points, and associated impacts. The identification of safe operating spaces should be accompanied, where relevant, with long-term strategies for preventing or mitigating impacts. Actions should also advance the understanding of respective impacts and early warning indicators.

The Commission considers that proposals requesting a contribution from the EU of between EUR 6 million and EUR 8 million would allow this specific challenge to be addressed

appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

c) Ice-core drilling in East Antarctica: Actions should build on the outcomes of the Horizon 2020 project 'Beyond EPICA' (<http://www.beyondepica.eu>), and contribute to the European endeavour which aims to obtain a 1.5 million year old ice-core from East Antarctica. This will allow to better constrain the climate response to future GHG emissions and to unravel key linkages between the carbon cycle, ice sheets, the oceans and the atmosphere.

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged.

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

Expected impacts: The project results are expected to contribute to:

- supporting major international scientific assessments such as the IPCC;
- improved understanding of past and present climate change and improve its projections;
- improved understanding of the role of natural and anthropogenic forcing in the climate change context;
- providing added-value to decision and policy makers;
- sustaining Europe's leadership in climate science.

Type of Action: Research and Innovation Action

Call: "Greening the economy in line with the Sustainable Development Goals (SDGs)"

[Indicative budget information

Overall indicative budget for this call: 2018 EUR 211 million; 2019 EUR 264 million

Of which for the 'circular economy' focus area: 2018 EUR 130 million; 2019 EUR 115 million]

Mission statement of this call

[Narrative to be developed]

Connecting economic and environmental gains - the circular economy

[Narrative to be developed further, including a common introductory text for all WP parts contributing to the focus area "Connecting economic and environmental gains - the circular economy".]

Further development of a sustainable, resource efficient and competitive economy will require a transition to a more circular economic model, with products, processes and business models that are designed to maximise the value and utility of resources while at the same time reducing adverse health and environmental impacts. The Commission's Circular Economy Communication states that "support of R&I will be a major factor in encouraging the transition". R&I actions on the circular economy in this part of the call are closely linked to key EU priorities, including those addressing jobs, growth and investment, climate and energy, strengthened industrial base, and to global efforts on sustainable development.

In this part of the call, innovation actions, complemented by R&I actions, therefore aim to address the full range of product lifecycle stages, from production (including design) to consumption, waste management, and using secondary raw materials to complement primary raw materials. Potential risks, side-effects and regulatory challenges resulting from circular economy approaches will be duly considered. Priority areas include plastics, critical raw materials, construction and demolition, and water use and reuse. Research will also investigate the consequences of transition to the circular economy, in order to identify policies that can effectively support the transition and mitigate its potential adverse effects. Aspects such as public acceptance and collaborative economy models are considered. Greater integration of digital solutions in support of the circular economy will be essential.

Actions are expected to improve the efficiency and effectiveness of resource use, substantially reduce the generation of residual waste and thus reduce adverse environmental/climate effects. New business opportunities for enterprises, including SMEs, are expected. Acceleration of progress and stimulation of a global market is also pursued via international cooperation.

It should be noted that a number of topics in the following section of this call 'Raw Materials' also contribute to the circular economy.

Proposals are invited against the following topic(s):

CE-SC5-01-2018: Methods to remove hazardous substances and contaminants from end-of-life materials

Specific challenge: Reuse and recycling of many end-of-life materials continues to be low in the EU, while landfill and incineration rates remain high. The uptake and recyclability of end-of-life materials can be hampered by the presence of undesirable contaminants, additives and even substances of concern. The removal of such undesirable substances would improve the purity of the resulting secondary raw material and mitigate potential health and environmental concerns.

Scope: Actions are expected to develop innovative solutions for removing hazardous or otherwise undesirable substances from end-of-life materials. Actions are expected to provide evidence of the potential market impact that the proposed solutions could bring, including quantitative information on the size of the targeted market. The economic feasibility of the proposed solution should also be born in mind. Actions should be tackled by a multidisciplinary consortium, with significant participation of industry partners and recyclers. Participation of SMEs is desirable. Activities are expected to focus on Technology Readiness Levels 3 to 5.

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 million and 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.

Expected impact: The project results are expected to contribute to:

- increased purity of secondary raw materials;
- an increased recycling rate for end-of-life materials;
- reduced landfill and incineration of end-of-life materials,
- reduced risk of retaining hazardous substances in recycled materials, where relevant;
- the Commission Strategy on Plastics in a Circular Economy⁸ and to the implementation of the SPIRE PPP Roadmap, where relevant;
- the future EU strategy for a non-toxic environment⁹, where relevant.

Type of action: Research and Innovation Action

⁸ currently in preparation

⁹ announced in the 7th Environment Action Programme

CE-SC5-02-2018: Independent testing programme on planned obsolescence

Specific challenge: Given resource constraints, lengthening the lifetime of products can play a major role in moving towards a circular economy. However, products may be intentionally or unintentionally designed in a way that causes premature breakdown or prevents upgradability. Identification of the factors that cause premature obsolescence is also important because making products more durable or easier to repair, upgrade or remanufacture can represent a key factor of competitiveness. A longer lifetime for products has the potential to generate new economic activities and offer societal and environmental benefits, while at the same time spurring on innovation in existing business models. An action to prepare an independent testing programme on planned obsolescence under Horizon 2020 is included in the EU Action Plan for the Circular Economy¹⁰.

Scope: Actions should aim to prepare an independent testing programme to help identify issues related to possible planned obsolescence. Actions should include a research component to identify key aspects to be tested and to validate the testing programme in several case studies. They should be tackled by a multi-disciplinary consortium, including representatives of relevant stakeholders such as researchers, consumer organisations, testing bodies and industry, and should provide for a mechanism that would enable inputs (e.g. examples of planned obsolescence or of testing methods) from a variety of stakeholders throughout the course of the project.

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 million and 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.

Expected impact: The project results are expected to contribute to:

- development of products designed for durability, repair and reuse;
- development of markets based on durability;
- reduced waste;
- reduced information asymmetry between producers and consumers regarding product durability;
- increased awareness and understanding of design solutions that may lead to premature obsolescence;
- the implementation of the EU Action Plan for the Circular Economy.

Type of action: Research and Innovation action

¹⁰ <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52015DC0614>

CE-SC5-03-2018: Demonstrating systemic urban development for circular and regenerative cities

Specific Challenge: Cities struggle in their transition to implement a full circular economy model and stimulate regenerative practices. There is a clear need for cities to become circular in order to alter urban consumption patterns, urban value chains and stimulate innovation, business opportunities, and job creation in both established and newly created sectors. There is a great need for new, more flexible systemic urban planning instruments to implement circular urban processes, making urban and peri-urban areas regenerative and facilitating their adaptation to emerging economic, social and environmental challenges.

Scope: Actions should demonstrate how cities can transition into circular cities by implementing circular innovation and stimulating regenerative practices in both urban and peri-urban areas. Urban makers, fab labs and start-ups should be actively involved to boost creativity and entrepreneurship for a more cost-effective and resource efficient management of the nexus between water, energy, food, ecosystem services, soil and biomass.

Actions should also develop and implement innovative urban planning instruments (i.e. dynamic 3D real time flexible geospatial data and planning tools) and innovative solutions for closing the loop across the nexus, while reducing material and resource flows across urban processes and stimulating sound management of trade-offs and synergies among sectors. They should develop and demonstrate decision-making instruments, methodologies and indicators to assess the impact of regenerative urban planning and management in terms of gains in efficiencies and effectiveness of use of resources and materials. These must help prioritise the implementation of urban space programming for circular initiatives. These initiatives should be geographically located close to residual resource streams to stimulate their uptake and integrated in mixed urban neighbourhoods. Innovative monitoring schemes and enabling digital solutions comprising networks of sensors, big data, observational programmes such as Copernicus and GEOSS, and citizens' observatories need to be developed to allow for the continuous monitoring and optimization of the "urban metabolism" processes and hence to allow for rapid management interventions where needed.

The participation of social sciences and humanities disciplines is crucial to properly address the complex challenges of this topic.

Funded projects are expected to establish long-term sustainable data platforms securing open, consistent data about the impacts of the deployed approaches and ensure interoperability of relevant data infrastructures for effective communication, public consultation, exchange of practices, sharing of experiences.

To ensure geographical diversity and coverage across the EU, consortia of the innovation actions under this part of the call must comprise at least 4 cities from different Member States¹⁰ that are committed to implement the proposed innovative actions/schemes during the project and assess their impacts and cost-efficiency in enhancing the circular and regenerative capacity of the cities.

To enhance the impact and promote upscaling and replication of these solutions, projects should engage in substantial networking and training actions to disseminate their experiences, knowledge and practices in deploying the schemes towards cities that are planning to design and implement such schemes in a successive phase beyond the project. To enhance impact Cooperation and synergies with the activities undertaken within the Covenant of Mayors initiative for Climate and Energy¹¹ initiative (supported by the EC) should be sought where appropriate.

Eligible costs: Up to 20 % of the total costs of construction and instalment of “infrastructure-targeted” interventions will be eligible for Horizon 2020 funding. Beneficiaries’ own resources and/or mobilisation and leverage of additional investments beyond Horizon 2020, be they private or public, should make up the remaining investment costs and should secure economic and financial sustainability for the execution of the project.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 10 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: The project results are expected to contribute to:

- reduced natural resource consumption in urban and peri-urban areas and environmental footprint of cities as well as enhanced regenerative and productive capacity of urban and peri-urban areas; specifically, increased repair maintenance, reuse (including sharing), remanufacturing and recycling of products and materials;
- increased urban resilience and climate-proofed urban planning through enhanced material re-use and recycling, and less dependence on natural resource influx;
- increased urban green jobs in the sharing economy and circular business models in urban areas;
- the implementation of SDG 12 on ensuring sustainable consumption and production patterns as well as SDG 11 to make cities inclusive, safe, resilient and sustainable;
- implementation of the EU Action Plan for the Circular Economy and the Habitat III New Urban Agenda's commitment to transition to a circular economy.

¹⁰This will be included as an eligibility criterion.

¹¹www.covenantofmayors.eu

Type of action: Innovation action

CE-SC5-04-2019: Building a water-smart economy and society

Specific Challenge: There is a growing demand for water from various economic activities and increasing stress on natural water sources. To secure water for our society, there is therefore a need to make available alternative water resources of various qualities, appropriate for different functions and multiple users, and to better exploit water resources and all the valuable substances that could be obtained through the wastewater treatment process. However, at the moment, innovations in this domain remain fragmented and/or only experimented at small scales; testing and deployment in operational environments and at scales suitable for encouraging wider uptake is still missing.

Scope: The objective of this topic is to demonstrate the feasibility of a 'water smart' economy and society in which all available water resources are managed in such a way as to avoid water scarcity and pollution, appropriately manage water related risks, and ensure that all valuable substances that could be obtained from waste water treatment processes or are embedded in used water streams are recovered.

Actions should address only one of the following:

a) Symbiosis between industry and water utilities. Actions should demonstrate resource-efficient solutions derived from the systemic exploitation of symbiotic inter-linkages between wastewater treatment in industry and by water utilities. These might address, for instance, the reuse of treated wastewater, use of substances or energy derived from wastewater treatment or demonstrate the concept of dynamic allocation of the right quality water for the right purpose. Innovative solutions do not need to be only technological, but may also encompass other types of innovation such as innovative governance or business models in industrial environments.

b) Large scale applications with various multiple water users and at various relevant scales. Actions should test and demonstrate systemic innovation in real life, large scale operational environments. Actions should address multiple water users (urban, rural and agriculture) and various relevant scales (regional/national/international) for: exploiting alternative water sources; stimulating efficient use, multiple use, recycling and reuse of water; recovery of energy and materials from water; managing water demand and efficient allocation; prevention of water pollution and degradation of the aquatic environment; and cost-effective management of water infrastructure. As far as possible, the innovative solutions should include all of the above-mentioned activities. Proposals should also consider: new marketing and financing concepts and strategies to maximise the multiple value of water and increase the attractiveness of the water sector for investors; new governance approaches and decision-making instruments for water managers; actions to support behavioural change and the public acceptance of the innovative solutions.

For both options, deployment of enabling digital solutions for the monitoring, control and optimisation of processes is also encouraged. Where technological innovation is concerned, TRL 5-7 should be achieved.

The Commission considers that proposals requesting a contribution from the EU of between EUR 10 million and 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.

Expected impacts: The project results are expected to contribute to:

- significantly reduced use of water from freshwater sources;
- improved recovery and use of resources (materials and water itself), including energy;
- significantly reduced greenhouse gas emissions;
- mobilisation of water-related investments and synergies with other funding instruments;
- the creation of new business opportunities and increased competitiveness of EU industries;
- supporting, as appropriate, the transition to a more circular economy at different scales, water security, enhanced resilience to climate change and achievement of the Sustainable Development Goals;
- the implementation of the objectives of the EIP Water and, where appropriate, supporting the implementation and evaluation of technology verification schemes, including the EU Environmental Technology Verification Pilot (ETV) programme.

Type of action: Innovation Actions

Raw materials

Raw materials are crucial for a strong European industrial base, an essential building block of the EU's growth and competitiveness. Projections indicate that future global resource use could double between 2010 and 2030¹³. Research and Innovation (R&I) for sustainable access to and use of primary and secondary raw materials will continue to play a fundamental role in maintaining the competitiveness of industry, facilitating the transition to a circular economy and developing low carbon technologies. However, the EU is confronted with a number of challenges along the entire raw materials value chain to secure a sustainable access to non-energy non-agricultural raw materials used for industrial purposes, including an increasing number of Critical Raw Materials (CRM).

¹³ Decoupling natural resource use and environmental impacts from economic growth. A Report of the Working Group on Decoupling to the International Resource Panel. UNEP.

The actions in the raw materials part of the Societal Challenge 5 are expected to contribute to the implementation of the Raw Materials policy¹⁴, the Strategic Implementation Plan¹⁵ of the European Innovation Partnership (EIP) on Raw Materials, the Circular Economy package and the Blue Growth Strategy. The actions are complementary to and synergetic with the new Knowledge and Innovation Community (KIC) on Raw materials¹⁶, selected under the Horizon 2020 call of the European Institute of Technology (EIT) in support of the objectives of the EIP on Raw Materials.

In the last period of Horizon 2020, the actions will cover the entire EU raw materials value chain, from sustainable exploration, extraction, processing to recycling. In an 'open innovation' approach, actors from the whole EU raw materials innovation chain will be involved, including researchers, industry, end-users, public authorities and civil society.

The main focus will be on meeting the targets of the EIP on Raw Materials. In the short to medium term, actions are expected to deliver innovative pilot plants demonstrating sustainable production of both primary and secondary raw materials, including CRM; breakthrough research concepts, as the basis of tomorrow's innovations, will also be tackled through smaller, lower-TRL actions. Actions will also contribute to building the EU knowledge base of primary and secondary raw materials (EC Raw Materials Information System – RMIS¹⁷) for solid decision making. Policy-related actions will aim at improving framework conditions for the sustainable development of and investment in innovative solutions in the EU. In the long term, actions should positively impact on: downstream industries' access to raw materials; employment in and competitiveness of the EU raw materials and related manufacturing industries, including SMEs; the environmental and social performance of primary and secondary raw materials producers; and improved public awareness, acceptance and trust. In an 'Open to the World' approach, international co-operation is encouraged in most actions.

Proposals are invited against the following topic(s):

CE-SC5-05-2018: New technologies for the enhanced recovery of by-products

Specific Challenge: The EU is highly dependent on raw materials that are crucial for a strong European industrial base, an essential building block of the EU's growth and competitiveness. Securing the sustainable access to raw materials, including metals, industrial minerals and construction raw materials, and particularly Critical Raw Materials (CRM), for the EU economy is of high importance. There is a need for innovative and sustainable raw materials production

¹⁴ Communication on the Raw Materials Initiative "Meeting our critical needs for growth and jobs in Europe" - COM(2008) 699 final, and Communication on commodity markets and raw materials - COM(2011) 25 final

¹⁵ <https://ec.europa.eu/eip/raw-materials/en/content/strategic-implementation-plan-sip-0>

¹⁶ <http://eit.europa.eu/eit-community/eit-raw-materials>

¹⁷ <https://ec.europa.eu/jrc/en/scientific-tool/raw-materials-information-system>

solutions at lower TRLs to increase the range and quality of raw materials recovered from primary and secondary resources.

This specific challenge is identified in the Priority Area 'Technologies for primary and secondary raw materials production' of the European Innovation Partnership (EIP) on Raw Materials.

Scope: Actions should develop sustainable systemic solutions through industrially- and user-driven multidisciplinary consortia covering the relevant value chain of non-energy, non-agricultural raw materials.

Actions should develop solutions validated in lab or in industrially relevant environment, finishing at the level of Technology Readiness Levels (TRL) 3-5.

Actions should evaluate the potential by-products existing in primary or secondary raw materials (usually accompanying the major constituents at low concentrations) and should develop energy-, material- and cost-efficient new mineral processing and/or metallurgical technologies and processes to increase the selectivity and the recovery rates of valuable by-products, particularly Critical Raw Materials. The importance of the targeted sources of by-products for the EU economy should be duly demonstrated in the proposal. Recycling of end-of-life products is excluded from this topic.

All actions should contribute to building the EU knowledge base of primary and secondary raw materials (EC Raw Materials Information System – RMIS¹²).

Projects should include a task to cluster with other projects financed under this topic and – if possible – with other relevant projects in the field funded by Horizon 2020, in support of the EIP on Raw Materials.

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 million and EUR 7 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: Projects are expected to justify and provide evidence that they contribute to:

- achieving the objectives of the EIP on Raw Materials, particularly in terms of ensuring the sustainable supply of raw materials to the EU and improving supply conditions within the EU;
- pushing the EU to the forefront and improving the competitiveness and creation of new jobs in processing, refining, equipment manufacturing and downstream industries through

¹² <https://ec.europa.eu/jrc/en/scientific-tool/raw-materials-information-system>

generated know-how (planned patents, publications in high impact journals and joint public-private publications etc.);

- increased process selectivity, broader range and higher recovery rates of valuable raw materials, particularly Critical Raw Materials;
- unlocking substantial reserves of new or currently unexploited resources within the EU;
- increased economic performance in terms of higher material-, energy- and cost-efficiency and flexibility in minerals processing, metallurgical or recycling processes;
- improving the environmental performance of the operations, including a reduction in waste and emissions generation and a better recovery of resources from generated waste;
- improving the health and safety performance of the operations;
- the further development of RMIS, responding to the action in the Circular Economy Action Plan and the objectives of the Strategic Implementation Plan of the EIP on Raw Materials;
- improving awareness of relevant external stakeholders and general public across the EU about importance of raw materials for society, challenges related to their supply within the EU and about proposed solutions which could help to improve the acceptance and trust of society in a sustainable raw materials production in the EU.

Type of action: Research and Innovation action

CE-SC5-06-2018-2019: Raw materials innovation for the circular economy: sustainable processing, reuse, recycling and recovery schemes

Specific Challenge: The EU is highly dependent on raw materials that are crucial for a strong European industrial base, an essential building block of the EU's growth and competitiveness. Securing sustainable access to raw materials, including metals, industrial minerals, wood- and rubber-based, construction and forest-based raw materials, and particularly Critical Raw Materials (CRM), is of high importance for the EU economy. Complex primary and secondary resources contain many different raw materials. Their processing, reuse, recycling and recovery schemes are complex and imply different steps, ranging from collection, logistics, sorting and separation to cleaning, refining and purification of materials.

The challenge for industry is to scale up promising raw materials production technologies and to demonstrate that raw materials can be produced in an innovative and sustainable way in order to make sure that research and innovation end up on the market, to strengthen the competitiveness of the European raw materials industries, meet ambitious energy and climate 2030 targets and gain the trust of EU citizens in the raw materials sector.

This specific challenge addresses the development of "innovative pilot actions"¹³, which is one of the major targets of the European Innovation Partnership (EIP) on Raw Materials.

Scope: Actions should develop and demonstrate innovative pilots for the clean and sustainable production of non-energy, non-agricultural raw materials in the EU from primary and/or secondary sources finishing at Technology Readiness Levels (TRL) 6-7.

All actions should contribute to building the EU knowledge base of primary and secondary raw materials (EC Raw Materials Information System – RMIS¹⁴).

Projects should include a task to cluster with other projects financed under this topic and – if possible – with other relevant projects in the field funded by Horizon 2020, in support of the EIP on Raw Materials.

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 8 million and EUR 13 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Applying a circular economy approach throughout the entire value chain, actions for this multi-annual topic shall address only one of the following:

a) Sustainable processing and refining of primary and/or secondary raw materials: Actions should demonstrate new systems integrating relevant processing and refining technologies for better recovery of minerals and metals from low grade and/or complex ores, industrial or mining wastes at increased efficiency in terms of better yield and process selectivity, and better utilisation of resources, hence reducing wastes. The importance of the targeted raw materials and their sources for the EU should be demonstrated in the proposal. The solution proposed should be flexible enough to adapt to different or variable ore/secondary raw material grades and should be supported by efficient and robust process control. Recycling of end-of-life products is excluded from this option.

b) Recycling of raw materials from end-of-life products: Actions should develop and demonstrate novel solutions for a higher recycling and recovery of raw materials from end-of-life products such as waste electrical and electronic equipment (WEEE), wood-based panels, multi-material paper packaging or end-of-life tyres. These products can contain a multitude of minerals, metals, wood and wood-fibre, rubber, etc. (including Critical Raw Materials and other technology metals).

¹³ <https://ec.europa.eu/eip/raw-materials/en/content/strategic-implementation-plan-sip-0#Targets>

¹⁴ <https://ec.europa.eu/jrc/en/scientific-tool/raw-materials-information-system>

c) Recycling of raw materials from buildings: Actions should develop and demonstrate novel solutions for a higher recovery of raw materials from buildings. Actions should also develop a series of comparative case studies of construction and demolition waste (C&DW) management in deconstruction of buildings of representative size categories in countries with different types of end-of-life building stocks, showcasing the appropriate use of the following: the EU C&DW Management Protocol¹⁵, pre-demolition audit, smart demolition practices, using appropriate technical equipment, and sorting/processing and quality management of waste fractions such as metals, aggregates, concrete, bricks, plasterboard, glass, polymers and plastics and wood.

d) Advanced sorting systems for high-performance recycling of complex end-of-life products: Actions should develop and demonstrate innovative sorting systems enabling functional recycling of Critical Raw Materials, or other types of highly efficient recovery of metals, minerals or construction materials, from complex end-of-life products and scrap thereof. The advanced sorting systems should achieve very high throughput rates in order to allow their economically viable operation on the European market.

Expected Impact: Projects are expected to justify and provide evidence that they contribute to:

- achieving the targets of the EIP on Raw Materials, particularly in terms of innovative pilot actions on processing and/or recycling for the innovative production of raw materials;
- pushing the EU to the forefront in the area of raw materials recycling technologies and solutions through generated know-how (planned patents, publications in high impact journals and joint public-private publications etc.);
- improving economic viability and market potential that will be gained through the pilot, leading to expanding the business across the EU after the project is finished;
- creating added value and new jobs in raw materials producing, equipment manufacturing and/or downstream industries;
- for the recycling of end-of-life products, in the shorter term, increasing measurably the efficiency and effectiveness (range, yield and selectivity of recovered materials) of the exploitation of complex and heterogeneous secondary raw materials deposits ('urban mines') when compared to the state of the art;
- for C&DW, lead to wider application of smart demolition techniques, C&DW processing, quality assurance practices, traceability and standardization for secondary raw materials in the construction sector, thus improving the material and value recovery rate;
- unlocking a significant volume of various primary/secondary raw materials within the EU by giving economic viability to new or currently unexploited/underexploited resources within the EU, hence improving their 'circularity' in the economy;

¹⁵ <http://ec.europa.eu/DocsRoom/documents/20509/attachments/1/translations/en/renditions/native>

- improving the environmental performance, including better energy efficiency, a reduction in waste generation and a better recovery of resources from generated waste or a better recovery and recycling of resources from complex end-of-life products;
- improving the health and safety performance of operations;
- the further development of RMIS, responding to the action in the Circular economy Action Plan and the objectives of the Strategic Implementation Plan of the EIP on Raw Materials;
- improving awareness of relevant external stakeholders and the general public across the EU about the importance of raw materials for society, the challenges related to their supply within the EU and about proposed solutions which could help to improve the acceptance and trust of society in a sustainable raw materials production in the EU.

Type of action: Innovation Action

CE-SC5-07-2018-2019: Raw materials policy support actions for circular economy

Specific Challenge: The EU is highly dependent on raw materials that are crucial for a strong European industrial base, an essential building block of the EU's growth and competitiveness. In order to secure the sustainable access to primary and secondary raw materials, including metals, industrial minerals, construction raw materials, wood, and particularly Critical Raw Materials (CRMs) for the EU economy, there is a need to tackle a number of specific non-technological challenges at local, regional, national EU and global levels.

Illegal shipments of waste, both within the EU and to non-EU countries, and poor recycling have adverse effects on human health and the environment, create unfair competition for law abiding operators and give rise to the loss of valuable resources in the case of poor or no treatment. However, port authorities and enforcement authorities have limited resources to control the ever increasing amount of material shipped and this without blocking normal traffic. In addition, at the moment there is no distinction in customs codes between “new goods” and “second hand goods” which implies that illegal waste shipments are often disguised as “second hand goods”.

Currently, at most only one third of waste wood is recycled, the rest being landfilled or incinerated and there are great differences between Member States in wood recycling performance. Increasing production costs combined with stagnating product prices in recent years have put pressure on the profit margins of the EU woodworking industries, mostly dominated by SMEs. There is a need for higher resource efficiency and increased use of recycled wood in wood processing that can provide measurable improvements in company profitability.

Requirements for responsible sourcing in the raw materials value chain have recently been strengthened in one aspect by the forthcoming EU Conflict Minerals legislation. However, the need for the industry to engage in responsible sourcing and responsible business conduct and to perform relevant due diligence goes beyond legislative obligations – it is rooted in the growing expectations of consumers, civil society, governments and procurement managers (buyers). While it is very difficult for individual operators to meet such expectations due to the limited availability of the necessary information, downstream industries increasingly require all operators in their supply chain to address risks by performing due diligence. Responsible sourcing of raw materials is becoming a new business reality; in the short term it may offer a competitive advantage to frontrunners and in the long term, it could become a necessary "license to operate" and, given the global character of today's supply chains, it is also a way to be integrated in global supply chains.

Scope: All actions should contribute to building the EU knowledge base of primary and secondary raw materials (EC Raw Materials Information System – RMIS¹⁶).

Projects should include a task to cluster with other relevant projects in the field funded by Horizon 2020, in support of the EIP on Raw Materials.

Actions should address only one of the following:

a) Voluntary scheme for certification of treatment facilities for key types of wastes (2018)

Actions should comprise the development and launch of a voluntary scheme for certification of treatment facilities for key types of waste/recyclates containing significant amounts of Critical Raw Materials (e.g. electronic waste and/or waste batteries). The scheme should integrate measurable and verifiable minimum standards and a verification procedure based on traceability through the supply chain from collection to end-processing. Full compliance with applicable WTO rules and rules and principles of the Basel Convention shall be ensured.

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged.

The Commission considers that for this option, proposals requesting a contribution from the EU of up to EUR 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. Up to one action for this topic part shall be funded.

b) Resource efficiency in wood processing, recovery and recycling (2018)

Consortia should identify, assess and document existing practices in the EU Member States and possibly relevant third countries, and transfer good practices covering both issues: resource-efficient wood processing and wood waste recycling. Resource-efficient wood processing in the woodworking sector should improve companies' operational performance and hence the EU

¹⁶ <https://ec.europa.eu/jrc/en/scientific-tool/raw-materials-information-system>

sector's overall competitiveness. Quality-oriented and cost-efficient wood waste collection systems, sorting and recycling, and design solutions should facilitate increased wood recycling and increased product quality and market acceptance of recovered wood in new products. Actions should also assess trade-offs of wood waste use between material and energy based on life cycle assessments, taking into account EU regional differences and all pillars of sustainability. Proposals should include the participation of industrial SMEs, as far as possible.

The Commission considers that for this option, proposals requesting a contribution from the EU of up to EUR 3 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. Up to one action for this topic part shall be funded.

c) Responsible sourcing of raw materials in global value chains (2019)

Actions should create a global business and stakeholder platform for exchange of information and the promotion of responsible sourcing and responsible business conduct involving a network of international key experts and stakeholders. The aim is to engage governmental and corporate partners from the EU and third countries in developing a globally acceptable concept of a responsible sourcing in minerals and metals value chains.

The platform should develop ideas for creating incentives for responsible sourcing in raw materials value chains, strengthen EU outreach to third countries to promote the concept in intergovernmental forums and to establish responsible sourcing in EU business practice.

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged. Due to the specific challenge of this topic, in addition to the minimum number of participants set out in the General Annexes, proposals shall include at least one participant from non-EU, non-associated countries. Particularly, the participation of the partners from the advanced countries using raw materials is strongly encouraged.

The Commission considers that for this option proposals requesting a contribution from the EU of up to EUR 3 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: Projects are expected to justify and provide evidence that they contribute to:

a)

- achieving the objectives and the implementation of both the Raw Materials Initiative¹⁷ and the EIP on Raw Materials, in particular in terms of strengthening the enforcement of the Waste Shipment Regulation and improving access to critical raw materials (CRMs);

¹⁷http://ec.europa.eu/growth/sectors/raw-materials/policy-strategy/index_en.htm

- increased recovery rates in the EU as regards key types of waste/recyclates containing significant amounts of CRMs;
- in the longer term, reduced EU dependency on imports of CRMs;
- creating added value and new jobs in metallurgy, equipment manufacturing and/or downstream industries;
- improving the environmental (control of emissions, residues, effluents), health and safety performance of operations;

b)

- achieving the objectives and the implementation of the EU Forest Strategy¹⁸, Circular Economy Action Plan and the EIP on Raw Materials on resource efficient use of resources;
- improving knowledge and conditions for efficient wood processing when compared to the state of the art, resulting in increased competitiveness of the EU woodworking industries;
- increased wood waste recycling across the EU (including from furniture, construction and demolition, packaging, household) and increased acceptance in the use of secondary wood;
- better informed decision-making at EU, national and local levels in the private and public sectors on wood recycling and resource-efficiency; and improved knowledge of EU stakeholders about proposed solutions, including authorities involved in wood recycling;
- in the medium- and long-term, creating added value and new jobs and increasing the overall competitiveness of the EU woodworking industries and related value-chains through an uptake of resource- and energy-efficient solutions;

c)

- achieving the objectives of both the Raw Materials Initiative¹⁹ and the EIP on Raw Materials in terms of the access and responsible sourcing of critical raw materials (CRMs);
- improved awareness of consumers/corporates and improved perception of responsible sourcing as a source of competitive advantage through more responsible sourcing and responsible business conduct initiatives with regards to raw materials;
- increased visibility of responsible sourcing in global political agenda-setting and emergence of a globally accepted definition of responsible sourcing;
- further development of RMIS responding to the action in the Circular Economy Action Plan and objectives of the Strategic Implementation Plan of the EIP on Raw Materials.

Type of action: Coordination and Support action

¹⁸COM(2013)659

¹⁹http://ec.europa.eu/growth/sectors/raw-materials/policy-strategy/index_en.htm

SC5-08-2018-2019: New solutions for sustainable production of raw materials

Specific Challenge: The EU is highly dependent on raw materials that are crucial for a strong European industrial base, an essential building block of the EU's growth and competitiveness. Securing the sustainable access to raw materials, including metals, industrial minerals, forest-based and construction raw materials, and particularly Critical Raw Materials (CRM), for the EU economy is of high importance. However, the EU is confronted with a number of technological challenges along the entire raw materials production value chain of primary and secondary raw materials. There is also a need for very innovative and sustainable raw materials production solutions at lower TRLs to bring the raw materials field to the next digital generation.

This specific challenge is identified in the Priority Area 'Technologies for primary and secondary raw materials' production of the European Innovation Partnership (EIP) on Raw Materials.

Scope: All actions should develop sustainable solutions through industrially- and user-driven multidisciplinary consortia covering the relevant value chain of non-energy non-agricultural raw materials.

Actions should develop technological solutions validated in lab or in industrially relevant environment, finishing at the level of Technology Readiness Levels (TRL) 3-5.

All actions should contribute to building the EU knowledge base of primary and secondary raw materials (EC Raw Materials Information System – RMIS²⁰).

Projects should include a task to cluster with other projects financed under this topic and – if possible – with other relevant projects in the field funded by Horizon 2020, in support of the EIP on Raw Materials.

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged.

Actions shall address only one of the following:

a) Breakthrough concepts and solutions for sustainable exploration, mining and/or processing (2018): Actions should develop ground-breaking concepts and solutions for exploration, mining and/or processing to secure the sustainable access to raw materials for the EU in long term and gain the trust of the society in clean and safe production of raw materials. Recycling of end-of-life products is excluded from this topic.

b) Digital mine (2019): Actions should develop an Industrial Internet of Things (IIoT) platform to enhance the efficiency of mining operations by connecting cyber and physical systems and devices to extract valuable insights from their data, in order to improve the decision-making process and better address customer requirements, and to address health and safety aspects of the operations, environmental performance, increased automation, predictive maintenance, resource efficiency and real-time coordination of operations.

²⁰ <https://ec.europa.eu/jrc/en/scientific-tool/raw-materials-information-system>

c) Recovery of metals and minerals from sea resources (2019): Actions should develop new processes and technological solutions for recovery of minerals and metals from sea resources, including seawater brines, and/or the seabed (crusts, massive sulphides, heavy minerals), in a sustainable way addressing the challenges of industrial viability of the whole process, accessibility, and the environmental impacts. Actions should demonstrate in the case of minerals and metals dissolved in sea water technological feasibility of highly efficient and higher yield, recovery processes.

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 million and EUR 7 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: Projects are expected to justify and provide evidence that they contribute to:

a)

- achieving the objectives of the EIP on Raw Materials, particularly in terms of ensuring the sustainable supply of raw materials to the EU and improving supply conditions within the EU;
- pushing the EU to the forefront in the area of sustainable exploration, mining and/or processing technologies and solutions through generated know how (planned patents, publications in high impact journals and joint public-private publications etc.);
- creating a lower TRL technology base for radical innovations in the concerned sectors within next decades that would help unlocking substantial reserves of new or currently unexploited resources within the EU;
- in the longer term, improving the competitiveness of and creating added value and new jobs in raw materials producing, equipment manufacturing, information and communication technologies and/or downstream industries;
- the further development of RMIS, responding to the action in the Circular Economy Action Plan and the objectives of the Strategic Implementation Plan of the EIP on Raw Materials;
- improving awareness of relevant external stakeholders and general public across the EU about importance of raw materials for society, challenges related to their supply within the EU and about proposed solutions which could help to improve the acceptance and trust of society in a sustainable raw materials production in the EU;

b)

- achieving the objectives of the EIP on Raw Materials, particularly in terms of ensuring the sustainable supply of raw materials to the EU and improving supply conditions within the EU;

- pushing the EU to the forefront in the area of sustainable mining technologies and solutions through generated know-how (planned patents, publications in high impact journals²¹ and joint public-private publications etc.);
- unlocking substantial reserves of new or currently unexploited resources within the EU;
- improving the economic viability of small industrial mining operations;
- improving in the longer term the competitiveness of and creation of new jobs in mining and/or equipment manufacturing industries;
- safeguarding environmental stability and improving the health and safety performance of the operations;
- the further development of RMIS, responding to the action in the Circular Economy Action Plan and the objectives of the Strategic Implementation Plan of the EIP on Raw Materials;
- improving awareness of relevant external stakeholders and general public across the EU about importance of raw materials for society, challenges related to their supply within the EU and about proposed solutions which could help to improve the acceptance and trust of society in a sustainable raw materials production in the EU;

c)

- unlocking substantial reserves of new or currently unexploited minerals and metals resources within the EU;
- achieving the objectives of the EIP on Raw Materials, particularly in terms of ensuring the sustainable supply of raw materials to the EU and improving supply conditions within the EU;
- safeguarding environmental stability and improving the health and safety performance of the solutions provided;
- creating a lower TRL technology base for a radical change in the concerned sectors in the medium-long term;
- the further development of RMIS, responding to the action in the Circular Economy Action Plan and the objectives of the Strategic Implementation Plan of the EIP on Raw Materials;
- improving the awareness of relevant external stakeholders and the general public across the EU about the importance of raw materials for society, challenges related to their supply within the EU and about proposed solutions which could help to improve the acceptance and trust of society in a sustainable raw materials production.

Type of action: Research and Innovation action

²¹High impact journals are defined to be the top 10% (in terms of Scimago Journal Ranking (SJR) index) of all journals within a given scientific category (www.scimagojr.com).

SC5-09-2019: Raw materials innovation actions: exploration and Earth observation in support of mining

Specific Challenge: The EU is highly dependent on raw materials that are crucial for a strong European industrial base, an essential building block of the EU's growth and competitiveness. Securing the sustainable access to raw materials, including metals, industrial minerals and construction raw materials, and particularly Critical Raw Materials (CRM), for the EU economy is of high importance.

The challenge for industry is to scale up promising raw materials production technologies and to demonstrate that raw materials can be produced in an innovative and sustainable way in order to ensure that research and innovation end up on the market, to strengthen the competitiveness of the European raw materials industries, to meet the ambitious energy and climate 2030 targets and to gain the trust of EU citizens in the raw materials sector.

This specific challenge addressed the development of "innovative pilot actions"²² which is one of the major targets of the European Innovation Partnership (EIP) on Raw Materials.

Scope: Actions should develop innovative pilots demonstrating clean and sustainable production of non-energy non-agricultural raw materials in the EU from primary and/or secondary sources finishing at Technology Readiness Levels (TRL) 6-7.

All actions should contribute to building the EU knowledge base of primary and secondary raw materials (EC Raw Materials Information System – RMIS²³).

Projects should include a task to cluster with other projects financed under this topic and – if possible – with other relevant projects in the field funded by Horizon 2020, in support of the EIP on Raw Materials.

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged.

Actions should address only one of the following:

- a)** developing and demonstrating integrated exploration solutions focused on finding new deep deposits. They could benefit from any of the advanced geological-geochemical-geophysical-remote sensing integrated (and multi-method) approaches, 3D and 4D modelling, automation and robotisation. Solutions should cover and be tested in both mining green and brown field sites.
- b)** developing services and products based on Earth observation data for the extractive industries life cycle. The services and products should be built upon information and data made available by the Copernicus Programme, and other complementary Earth observation data. Services should

²² <https://ec.europa.eu/eip/raw-materials/en/content/strategic-implementation-plan-sip-0#Targets>

²³ <https://ec.europa.eu/jrc/en/scientific-tool/raw-materials-information-system>

be developed and tested for different phases of the mining life cycle: exploration, extraction, closure and post closure. Particular attention should be given to services for environmental monitoring (including metals dispersion) and safety and security monitoring associated with open pits (slopes stability/landslides risk), underground mining (subsidence) and mining waste disposal (tailings dams and dumps). Services to be developed should include the design and testing of early warning systems to prevent and mitigate risks associated with extraction and mining waste disposal.

The Commission considers that proposals requesting a contribution from the EU of between EUR 8 million and EUR 13 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: Projects are expected to justify and provide evidence that they contribute to:

- the objectives of the EIP on Raw Materials, particularly in terms of ensuring the sustainable supply of raw materials to the EU and improving supply conditions within the EU;
- pushing the EU to the forefront in the area of sustainable exploration technologies and solutions through generated know how (planned patents, publications in high impact journals and joint public-private publications etc.);
- increasing the reserves of various primary raw materials within the EU;
- reducing the exploration costs for the industry through new cost-effective exploration technologies, while safe-guarding long- and short-term environmental stability;
- in the longer term, improving the competitiveness of and creating added value and new jobs in raw materials producing, equipment manufacturing, information and communication technologies and/or downstream industries;
- where relevant (under option b), improved validation of global Copernicus land use and land cover products;
- improving environmental performance of the extractive industries;
- the further development of RMIS, responding to the action in the Circular Economy Action Plan and the objectives of the Strategic Implementation Plan of the EIP on Raw Materials;
- improving awareness of relevant external stakeholders and general public across the EU about importance of raw materials for society, challenges related to their supply within the EU and about proposed solutions which could help to improve the acceptance and trust of society in a sustainable raw materials production in the EU.

Type of Action: Innovation Action

Water for our environment, economy and society

[Mission statement to be developed further.]

Changes in water availability and the frequency of floods and droughts due to climate and other environmental changes, growing pollution trends and emerging contaminants in water, increased competition in water use for environmental protection, business continuity, energy, agricultural production and food security, and increasing urbanisation all require the development and implementation of robust, smart water management systems, tailored water-smart solutions and effective multi-sectoral governance models. Moreover the digital era, which is transforming all aspects of society, the economy, knowledge management, behavioural patterns and governance, should be harnessed in the development of systemic, innovative water solutions.

R&I in this part of the call therefore supports and aims to accelerate the implementation of EU water, resource efficiency and water-dependent industrial policies and initiatives. They also contribute to the EU's policies on the Energy Union, climate action and the digital economy, while strengthening international collaboration and partnerships on water-smart solutions, technologies and governance, and thereby also supporting Europe in achieving relevant commitments under the UN's 2030 Strategy for Sustainable Development.

It should be noted that topic CE-SC5-04-2019 'Building a water-smart economy and society, and strengthening symbiosis between industry and water utilities' in this call also contributes to this priority.

[Cross-references will be added at a later date to SC5 support for the implementation of the PRIMA initiative (Partnership for Research and Innovation in the Mediterranean Area).]

Proposals are invited against the following topic(s):

SC5-10-2018: Digital solutions for water: fostering digitisation, smartening water systems

Specific challenge: Modern information and communication technologies (ICT) have provided today's society with a vast array of innovative capabilities to solve several challenges related to resource efficiency, climate change and sustainable development. Harnessing this technology within the water sector creates a more intelligent means of managing and protecting the planet's water resources and lays the foundation of a water-smart society. However, several challenges related to interoperability and standardisation, collection, protection and sharing of data between users, services and infrastructures, intelligent smart metering, integration with other systems, ICT governance and public awareness and acceptance, are hampering the potential of those technologies.

Scope: Actions should develop and test new robust systems, linking the physical and digital world in various water cycles and value chains to ensure tailored, water-smart solutions and to

exploit the value of data for the water sector. Actions should combine different type of advanced digital technologies, including mobile, clouds, artificial intelligence, sensors, open source software and analytics. Optimisation, prediction, diagnosis, microsystems, micro-/nano- sensors, modelling and visualisation tools, data management plans and real time monitoring for water quality and quantity, health issues and disaster risk management should be also considered. Actions should seek to bring together research and innovation players from the digital and physical spheres to address jointly challenges and opportunities, regulatory and legislative barriers and opportunities for investments in different application sectors. Activities are expected to focus on Technology Readiness Levels (TRLs) 5 to 7.

The Commission considers that proposals requesting a contribution from the EU 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.

Expected impact: The project results are expected to contribute to:

- the identification and use of ICT/water vocabularies and ontologies to foster the interoperability of decision support systems;
- increased real-time accuracy of knowledge for decision making on water-related risks and resource efficiency;
- reduced operational costs for water utilities, improved performance of water infrastructures, and enhanced access, interoperability and delivery of data acquisition in order to maximize the return on investments through reliability and transparency;
- enhanced public awareness with regards to water consumption and usage, and improved communication between water utilities and the public;
- market development of integrated ICT solutions and systems for smart water management, and opening up of a digital single market for water services.

Type of action: Innovation Actions

SC5-11-2019: EU-India water co-operation

Specific challenge: In recent years, India and Europe have collaborated extensively to enhance and enrich each other's knowledge and technological capacities to cope with increasing stress on water resources, due to huge gap between supply and demand, unaccounted water losses, overexploitation of available resources, increased production of wastewater and environmental degradation. Climate change and extreme water-related events (floods and droughts) add additional stress to water, environment and food safety and to water-dependent Indian economy.

In line with the Sustainable Development Goals (SDGs), there is a need to make this cooperation stronger and long-lasting.

Scope: The objective of this action is to develop new and/or adapt the most suitable existing innovative solutions for local conditions to combat the growing consequences of climate change for wastewater treatment integrated with the reuse of reclaimed water from various multiple freshwater sources and/or drinking water purification. Actions should address India's water challenges on quantity, allocation and increasing competition for water, quality, and water management, as well as, the high and widely varying pollution loads and extreme climate and hydrological conditions (monsoon floods). Actions addressing wastewater treatment should focus on sustainable use/reuse of water in rapidly expanding urban areas and may address the development of appropriate decentralised water treatment and wastewater treatment and recycling systems. Water and energy efficient processes, optimising use and maximising energy recovery from the wastewater treatment, reliable monitoring schemes to ensure safe water use and reuse together with simple and affordable operation and maintenance methods should be considered. Actions focusing on drinking water purification should address multiple contaminants or focus on the removal of specific classes of pollutants (e.g. pesticides, geogenic contaminants, etc). In both cases the involvement of relevant stakeholders, including industry partners, local authorities and communities, will be essential and a strong demonstration component involving EU knowledge and expertise transfer to facilitate future replication will be needed. Actions may also choose to address a combination of the above challenges at river basin scale. Activities are expected to focus on Technology Readiness Levels (TRL) 3 to 5.

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged, in particular with participants from India. It is expected that the Indian Department of Science and Technology (DST) will issue a complementary call to support Indian projects in this field and that the funded projects will cooperate closely. EU and other non-Indian participants should apply to this topic, while potential Indian partners should apply with a complementary proposal to the DST call. The two proposals will have to be coordinated. Proposals submitted under this topic should therefore clearly indicate how they envisage coordinating their activities with the complementary proposal submitted under the DST call.

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 million and 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.

Expected impact: The project results are expected to contribute to:

- improved wastewater treatment efficiency, combined with recovery and reuse of substances and treated water;

- increased performance of drinking water quality monitoring and improved drinking water quality;
- supporting the implementation of relevant SDGs, water diplomacy and the decarbonisation of the Indian water sector;
- the activities under the India-EU Water Partnership to support climate-resilient development and to implement adaptation and mitigation measures to combat climate change;
- supporting the Ganga Rejuvenation Initiative, fostering the emergence of quick-win business solutions based on EU best practices in the areas mentioned in the scope;
- creating a level playing field for eco-innovative companies;
- increasing competitiveness in the EU and beyond.

Type of action: Research and Innovation Action

Innovating cities for sustainability and resilience

[Narrative to be developed further] Cities are the home of complex, inter-dependent challenges related to resource depletion, climate change impacts, environmental degradation, pollution, health issues and social exclusion. The role of cities as key actors and incubators for innovative solutions that tackle these challenges has been acknowledged in the new Urban Agendas globally and for the EU. A systemic and cross-sectorial ‘urban ecosystem’ approach is needed to design and implement solutions to the multifaceted challenges.

Building on the overwhelming response by cities to the “Sustainable cities through nature-based solutions” 2016-2017 calls under the Cross-cutting activities (Focus Areas) on ‘Smart and Sustainable Cities’, this part of the work programme will continue to invest in actions to enhance the innovation capacity of cities to act as hubs of innovation in designing and implementing their transition pathways towards resilient, sustainable, low-carbon, resource efficient and inclusive cities with a reduced environmental footprint.

Complementary research and innovation actions and other supporting activities are also envisaged to strengthen EU-China cooperation on sustainable urbanisation and support the overall innovation capacity of the cities and assist them in designing and implementing transition pathways towards environmental, social, economic, institutional and cultural sustainability and resilience.

For the purposes of topics in this part of the call, the definition of a 'city' shall be understood according to the harmonised definition of a city established by the OECD and the European Commission, which can be found at: http://ec.europa.eu/regional_policy/sources/docgener/focus/2012_01_city.pdf)

Emphasis will be on nature-based solutions, which under the current EU research and innovation policy framework are defined as: “Living solutions inspired and supported by nature that simultaneously provide environmental, social and economic benefits and help to build resilience. These solutions bring more nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions.”

Therefore for the purpose of this call, nature-based solutions should be the outcome of a systemic intervention undertaken within a project to allow for a proper assessment of the impacts of these interventions against a well-defined baseline at the time of the proposal concerning the challenge to be addressed at the place of intervention.

Conditions valid for the Innovation Actions under this section of the call

In the innovation actions under this section, cities are invited to act as ‘living labs’ and engage all relevant stakeholders in open innovation trans-disciplinary and participatory approaches and co-creation processes to develop and implement systemic innovative solutions and approaches to address the specific challenges described under the corresponding topics and assess their impact and effectiveness in real-world conditions.

Solutions should encompass all forms of innovation, which includes technological, digital, social, institutional, financial, regulatory and governance.

The success potential of the actions will be assessed according to the ambition of the intervention and the innovative nature of the approach, including the co-creation process for its development and implementation, the financing, business and governance models.

Furthermore, actions should envisage resources for clustering with other relevant projects funded across Horizon 2020.

Partnerships should involve local and regional authorities, planners, enterprises, academics and local communities in a clearly defined structure with roles and responsibilities properly spelled out for all involved parties.

It should be noted that topic CE-SC5-03-2018 'Demonstrating systemic urban development for circular and regenerative cities' in this call also contributes to this priority.

Proposals are invited against the following topic(s):

SC5-12-2018: Strengthening international cooperation on sustainable urbanisation: nature-based solutions for restoration and rehabilitation of urban ecosystems

Specific Challenge: Unsustainable urbanization patterns, the expansion of urban areas or neglect have been the cause of the fragmentation, depletion and destruction of habitats, biodiversity loss and the degradation of ecosystems and their services. Enhancing connectivity between existing, modified and new ecosystems and restoring and rehabilitating them within cities and at the

urban-rural interface through nature-based solutions³⁰ is necessary to enhance their resilience and adaptive capacity to cope with climate and global changes and enable them to deliver their services for more liveable, healthier and resilient cities.

Scope: Actions should bring together European and – depending on the option chosen – Chinese or CELAC²⁴ research partners, government agencies and urban authorities, private sector and civil society with relevant expertise and competence within the corresponding cooperation framework and foster participatory engagement in urban restoration actions. Actions should, in accordance with the geographical orientation of the cooperation framework, review and capitalise upon existing experiences and good practices in Europe and China or CELAC and come up with tools, decision support systems, methodologies, strategies, guidelines, standards and approaches for the design, construction, deployment and monitoring of nature-based solutions and restoration and rehabilitation measures for urban ecosystems. The strategies and tools should be part of an integrated and ecologically coherent urban planning and city-making process that would secure a fair and equitable distribution of benefits from the restored urban ecology. Methodologies, schemes and indicators should be developed to allow for the assessment of the cost-effectiveness of the restoration measures, accounting for the totality of the benefits delivered by the restored ecosystems in terms of, for example, enhancing cities' climate-proofing and resilience, improving human health and well-being, and reducing cities' negative environmental footprint. Actions should also dedicate efforts to awareness raising, outreach activities and education of citizens and school children about the benefits of nature for their social, economic and cultural well-being.

Cooperation and synergies with the activities undertaken within the Covenant of Mayors initiative for Climate and Energy²⁵ initiative (supported by the EC) should be sought where appropriate.

Actions should address only one of the following options:

a) Strengthening EU-China collaboration

b) Strengthening EU-CELAC collaboration

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged. Due to the specific challenge of this topic, in addition to the minimum number of participants set out in the General Annexes, proposals addressing option a) shall include at least one three participants from China and proposals addressing option b) shall include at least three participants from CELAC countries.

³⁰ A definition is provided in the introductory text to this section.

²⁴ Community of Latin American and Caribbean States

²⁵ www.covenantofmayors.eu

The Commission considers that proposals requesting a contribution from the EU 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.

Expected impact: The project results are expected to contribute to:

- restored and functioning urban ecosystems with an enhanced capacity to deliver their services, and enhanced ecological integrity in the cities;
- increased evidence base on and awareness of the efficacy of nature-based solutions;
- establishing a business and investment case for nature-based solutions;
- guidelines for cost effective urban ecosystem restoration and ecological rehabilitation measures and new planning approaches and methods;
- improved urban liveability, public health and well-being.

Type of action: Research and Innovation action

SC5-13-2019: Visionary and integrated solutions to improve well-being and health in cities

Specific Challenge: Up to 70% of the world's population is estimated to be living in urban areas by 2050. Urbanisation affects well-being and human health through factors such as exposure to pollutants, climate change related disasters, stressors and diseases, lack of physical activity, degraded ecosystems and erosion of natural capital. Public spaces have a crucial role for urban interaction and systemic urban innovation and they need to be managed sustainably and equitably to ensure that the way citizens produce, consume, commute and interact within the urban fabric has a positive impact on their health and quality of life and reduces the environmental footprint of the cities. A knowledge and evidence-based systemic integration of social, digital and nature-based innovation in the design policy, development and governance of public space has a tremendous potential to transform these spaces into accessible, safe, inclusive and high quality green areas that increase well-being and health and deliver a fair and equitable distribution of the associated benefits.

Scope: Actions should develop and deploy visionary and integrated solutions at the intersection of social, digital and nature-based innovation to increase citizens' health and well-being in cities. New governance and monitoring methods should stimulate the uptake of these solutions in existing adaptation plans and strategies with the aim of supporting communities in reducing their exposure to climate-related risks, air pollution, and social stresses and tensions, including the negative effects gentrification. The integration of the solutions into the urban design and planning should promote equitable access for all to public spaces as well as to sustainable urban mobility patterns.

Actions should assess and update existing legal frameworks in order to regulate and maintain public spaces and foster participatory and inclusive land readjustment. They should engage

interactions and exchanges between different players from the design disciplines and other relevant disciplines (such as urban ecology, geography and behavioural science) in urban design labs to develop design guidelines and innovative ways of implementing urban spatial quality. Innovative bottom-up financing mechanisms and new governance and business models to govern the urban commons and enhance citizens' engagement, co-creation and co-ownership of public spaces should also be investigated and recommended.

Innovative digital solutions comprising behavioural games, networks of sensors, GIS-mapping, big data, observational programmes such as Copernicus and GEOSS, and citizens' observatories need to be set up to allow for a proper assessment of the health and wellbeing benefits of the implemented solutions.

The involvement of social sciences and humanities disciplines such as psychology, economics, anthropology, behavioural science, architecture or design studies, is essential to properly assess the role of social innovation in transforming public spaces.

To ensure geographical diversity and coverage across the EU, consortia of the innovation actions under this part of the call must comprise at least 4 cities from different Member States³³ that are committed to implement the proposed innovative actions/schemes during the project and assess their impacts and cost-efficiency in improving health and wellbeing in the cities.

To enhance the impact and promote upscaling and replication of these solutions, projects should engage in substantial networking and training actions to disseminate their experiences, knowledge and practices in deploying the schemes towards cities that are planning to design and implement such schemes in a successive phase beyond the project. To enhance impact cooperation and synergies with the activities undertaken within the Covenant of Mayors initiative for Climate and Energy³⁴ initiative (supported by the EC) should be sought where appropriate.

Funded projects are expected to establish long-term sustainable data platforms securing open, consistent data about the impacts of the deployed approaches and ensure interoperability of relevant data infrastructures for effective communication, public consultation, exchange of practices, sharing of experiences.

Eligible costs: Up to 20 % of the total costs of construction and instalment of the nature-based solutions and other public space interventions will be eligible for Horizon 2020 funding. Beneficiaries' own resources and/or mobilisation and leverage of additional investments beyond Horizon 2020, be they private or public, should make up the remaining investment costs and should secure economic and financial sustainability for the execution of the project.

³³ This will be included as an eligibility criterion.

³⁴ www.covenantofmayors.eu

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 10 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: The project results are expected to contribute to:

- upscaling of high quality, multifunctional, green spaces and commons in cities (i.e. therapy gardens, urban living rooms, creative streets, city farms) with active involvement of citizens in line with social and environmental justice principles, able to enhance health, well-being and social cohesion while ensuring 'the right to the city' as specified in the Habitat III New Urban Agenda;
- promotion of European cities as world ambassadors of sustainable lifestyles in line with the Sustainable Development Goals (SDGs), in particular SDG 3 "Ensure healthy lives and promote well-being for all at all ages" and SDG 11.7, and with the New Urban Agenda to provide universal access to safe, inclusive and accessible, green and public spaces through nature-based solutions;
- integration of health and well-being indicators into the Climate Change Adaptation Strategies for European cities;
- cost-effective adaptive management through innovative monitoring systems for nature-based solutions in public spaces and financing models for sustainably maintaining them;
- promotion of innovative public-private-people partnerships (PPPPs) in the transformation of public spaces.

Type of action: Innovation Action

Protecting and leveraging the value of our natural and cultural assets: Earth observation

[Short narrative to be developed further.] The Commission, together with the Member States and other European GEO nations associated to Horizon 2020, is committed to implement GEOSS in line with the new GEO Strategic Plan 2016-2025. The capacity to observe the planet is evolving rapidly, leading to higher volumes of and more diverse data flows from private and public operators (including from citizens). R&I actions in this call therefore aim to capitalize on these trends in collaboration with the Copernicus programme to stimulate growth and jobs in Europe in the context of the digital economy (open innovation) and to support the implementation of EU space policy and the 2030 agenda for sustainable development. Actions in this call target the following priorities:

- i) supporting a regional GEOSS flagship initiative for Europe of high strategic value to the EU regarding its international commitments to the 2030 Agenda for Sustainable Development

ii) preparing the establishment of a European Commercial sector partnership in view of a closer collaboration between the Commercial sector and GEO and its main contributor Copernicus for the development and uptake of relevant R&I activities

iii) delivering EO services of the future by exploiting GEOSS, Copernicus and other available EO data and by addressing the full innovation chain from innovative ideas to pre-commercial deployment, focusing on developing and demonstrating innovative mass market applications for businesses and citizens.

[N.B. Cross-references will be added at a later stage to other WP parts with EO topics e.g. LEIT-Space.]

Proposals are invited against the following topic(s):

SC5-14-2018: Strengthening the benefits for Europe of the Global Earth Observation System of Systems (GEOSS) - GEOSS for Europe

Specific Challenge: There is a pressing need to create enabling conditions in Europe to accelerate the exploitation of open Earth observation (EO) shared by the GEO community for the benefit of European society. The challenge is to deliver data and information to support monitoring and prediction capacity as well as providing appropriate indicators where necessary to meet the aspirations reflected in the goals and targets of the 2030 Agenda for Sustainable Development.

Scope: Actions should support the development of a European GEOSS initiative, in collaboration with the European EO programme Copernicus and in compliance with INSPIRE developments and best practices. The initiative should advance the implementation of the GEOSS Data Management Principles across Europe, leverage European national EO resources within GEOSS, and demonstrate the effective use of GEOSS resources as a contribution to relevant Sustainable Development Goals through their integration with administrative and socio-economic data.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 15 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: The project results are expected to contribute to:

- improved EU contribution to the implementation of the Sustainable Development Goals (SDGs);
- stronger European exploitation of and benefits of GEOSS;
- strongly increased availability and accessibility of useful European EO datasets through GEOSS;

- provision of open source tools and best practices for data managers (INSPIRE-compliant) supporting effective implementation of GEOSS Data Management Principles;
- increased implementation of data quality control, licensing, curation and preservation techniques within GEOSS;
- significant advances in the visualisation of uncertainties and semantic annotation related to data sets, and increased use of emerging techniques such as model web and linked data;
- strengthened EU national contributions to the implementation of GEOSS.

Type of Action: Research and Innovation Action

SC5-15-2019: Development of commercial activities and services through the use of GEOSS and Copernicus data

Specific Challenge: Both GEOSS (Global Earth Observation System of Systems) and its key European contributor, Copernicus, offer a tremendous innovation opportunity for the EU in the domain of Earth Observation (EO) as these initiatives enable long term access to a broad range of observational datasets, opening new avenues for the delivery of innovative environmental products and services. These data sources provide new opportunities for business sectors in Europe to deliver information and products that are vital inputs to help decision makers, industry and citizens adapt to changes occurring at different paces and affecting the Earth systems.

However, those opportunities for the development of a new market of EO services and products cannot be fully exploited without a stronger involvement of commercial sector actors in both the GEO and Copernicus initiatives.

Scope: Actions should address only one of the following:

a) Coordination of European innovators in the domain of Earth observation: Actions should foster the development and implementation of a collaborative and integrated European research and innovation strategy for mass market applications based on space and non-space Earth observations. The action will support an industry-led stakeholder research and innovation forum in the domain of Earth observation in close collaboration with GEO and Copernicus, driving for innovation, knowledge transfer and European competitiveness.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 1 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Up to one project will be funded under this part of the topic.

b) Designing Earth observation services and products of the future, building on GEOSS and Copernicus assets: Actions should bring together public and private partners to deliver

solutions that contribute to the development of new markets of products and services integrating Earth observation (EO) data and information with other data sources. Solutions should incorporate assimilation techniques and interoperability best practices, automation, systemization and integrated web-based services, and bring them into an operational market environment, bridging the gap between demonstration and service provision.

The Commission considers that proposals requesting a contribution from the EU from between EUR 3 million and EUR 4 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: The project results are expected to contribute to:

- effective engagement of the European commercial sector within GEOSS;
- increased uptake of GEOSS and Copernicus data and services by mobilising the most dynamic actors of the European commercial sector;
- demonstrated capability and reliability of novel EO products and services through the whole value chain;
- new EO mass market developments and increased cross-domain exploitation of EO data.

Type of action: a) Coordination and Support Action b) Innovation Action

Protecting and leveraging the value of our natural and cultural assets: Nature-based solutions, disaster risk reduction and natural capital accounting

[Short narrative to be developed further, based on the relevant part of the SC5 scoping paper.]

R&I actions under this section of the call will underpin efforts in specific fields such as multi-hazard risk management and cascading impacts, as well as early-warning systems, forecasting, monitoring and reporting capabilities for geo-hazards (such as earthquakes). They will also bring insights into optimal use of biodiversity and ecosystems functioning to enhance the performance of nature-based solutions (NBS). In addition, actions will be launched in the field of natural capital accounting and its operationalisation and use at business and governance levels (e.g. decision making tools) to complement GDP.

Under the current EU research and innovation policy framework, nature-based solutions are defined as: “Living solutions inspired and supported by nature that simultaneously provide environmental, social and economic benefits and help to build resilience. These solutions bring more nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions.”

It should be noted that topic LC-CLA-06-2019 'Climate change, biodiversity and ecosystems interactions: optimising mitigation and adaptation strategies' in this call also contributes to this priority.

Proposals are invited against the following topic(s):

SC5-16-2018: Towards operational forecasting of earthquakes and early warning capacity for more resilient cities

Specific Challenge: To help mitigate the risks related to earthquakes, citizens need additional protection that goes beyond building codes and retrofitting actions. Early warning and operational earthquake forecasting under development need to be seen in a Europe-wide perspective, building on improved, dense, robust and high quality seismic networks and new processing tools and activities. The practical applications and use of short-term forecasting, early warning methods, time dependent physical and systemic vulnerability estimates and rapid loss assessment for earthquake risk reduction are still far from being operational. Strong European and international scientific collaboration³⁵ is needed to make substantial progress in the domain.

Scope: Actions should aim for an effective real time seismic risk reduction capacity, improving the present forecasting and testing capabilities and providing complete information for operational decision making to respond to stakeholder needs. Actions should also explore how to move from single model probabilistic hazard forecasting to 'ensemble' models for short-term risk

³⁵ e.g. with USA, New Zealand, Japan, Chile, Mexico

forecasting to allow decision-making based on more complete information. They should further understanding of what is happening during the precursory changes of a damaging earthquake.

A new generation of early warning systems to mitigate the impact of earthquakes on societies and infrastructures should be elaborated, integrating innovative technologies and/or networks with social network data and capable of building workflows for an accurate and reliable quantification of ground shaking during or soon after the earthquake occurrence. Fundamental and applied multi-disciplinary research should aim to build an integrated early warning “structure”, with decisional systems combining local and regional information that could trigger automatic safety actions for mitigating the impact of earthquakes impact on infrastructure and the population.

Furthermore, actions should develop effective methods and clear structures to improve dialogue, exchange and timely communication of scientific results and mitigation information between the relevant actors, authorities and public officials at the relevant steps. Actions should capitalise on knowledge acquired in previous and ongoing initiatives such as GEO Supersites/observational networks and EPOS, and ensure compatibility and appropriate liaising with these initiatives.

The Commission considers that proposals requesting a contribution from the EU of between EUR 6 million and EUR 8 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: The project results are expected to contribute to:

- real time seismic risk reduction capacity;
- improved short-term forecasting, real-time operational forecasting and fast, reliable alerts and information;
- facilitated elaboration of sound and rational risk reduction plans to manage low-probability/high-impact events;
- improved preparedness due to more effective two-way communication on forecasts, early warning and uncertainties for users and the public;
- the capacity to tangibly reduce human and economic losses.

Type of action: Research and Innovation Action

SC5-17-2018: Valuing nature: mainstreaming natural capital in EU Member State and business decision-making

Specific challenge: A broad range of economic activities are dependent upon natural capital, but natural assets are not unlimited. However, many ecosystem services and benefits to society and business, such as food provision, air and water filtration, pollination, or climate regulation, are

not visible because they are not priced on markets and hence not currently accounted for in socio-economic decision-making. Incorporating natural capital – and especially ecosystems – into national accounting systems as well as policy and business practices is needed to promote more resource efficient and sustainable choices, and to support smart, sustainable and inclusive growth.

Further to the work and progress and international level, important results have been achieved at EU level under the initiative on Mapping and Assessment of Ecosystems and Services (MAES)²⁶, as well as on categorising ecosystem services through the Common International Classification of Ecosystem Services (CICES). In addition, the KIP-INCA project²⁷ aims to design and implement an integrated accounting system for ecosystems and their services in the EU. KIP-INCA aims to develop a comprehensive set of EU-level natural capital accounts.

Scope: Actions should address only one of the following:

a) Valuing nature: developing and implementing natural capital and ecosystem accounts in EU Member States: Actions should develop and implement natural capital and ecosystem accounts in Member States or Associated Countries, according to the SEEA-EEA recommendations, CICES and the methodological work and guidance of KIP-INCA. They should further refine and implement in practice European/international guidance standards in European countries, leading to their replicability.

Actions should exploit available larger scale data and link them to the EU layer for more detailed analysis, and experiment with different solutions for biophysical accounts and their valuation and monetisation. The natural capital and ecosystem services accounts developed should be published for use of different stakeholders and for different policy and business applications.

Based on the methodological work and guidance of KIP-INCA, actions should involve organisations both from Member States/Associated Countries that are more advanced with natural capital and ecosystem services accounts and from those that are only just starting to deal with such accounts. More experienced participants should primarily share their experience with, provide advice to and mentor less experienced participants, to enable them to rapidly implement and mainstream the methodologies. In addition, more experienced participants may choose to also develop further their own natural capital and ecosystem accounts (for instance, testing new valuation approaches and methods).

Actions will require the participation or strong commitment from public authorities in charge of natural capital and ecosystem services accounts (for example, Ministries or Environment Agencies), as well as National Statistical Offices or other statistical authorities²⁸.

²⁶ http://ec.europa.eu/environment/nature/knowledge/ecosystem_assessment/index_en.htm

²⁷ http://ec.europa.eu/environment/nature/capital_accounting/index_en.htm

²⁸ http://ec.europa.eu/eurostat/documents/747709/753176/List_ONAs_FR_14092016/4b8becf5-5923-46c3-a208-4423830aaf87

Actions should exploit the experience of KIP-INCA partners, such as:

- the European Environment Agency (EEA) that has piloted land and water accounts;
- the JRC and its experience on modelling ecosystem services;
- FP7 and Horizon 2020 projects like OPERAs, OpenNESS²⁹, ESMERALDA³⁰; SWOS³¹ or ECOPOTENTIAL³².
- DG Environment (DG ENV) on policy orientations, implications and take-up

Actions also require coordination and consistency with the ongoing works of MAES and of KIP-INCA.

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

b) Operationalization of natural capital accounting in business decisions: Actions should take stock of the work undertaken by ongoing initiatives, such as European and national platforms on business and biodiversity and the Natural Capital Protocol and should establish a “Valuing Nature Programme and Network”. The network should bring together work being undertaken by business in relation to natural capital and come up with optimal solutions for operationalizing and mainstreaming natural capital, including nature-based solutions, in companies' decision making frameworks and business models. It should engage key stakeholders from business, government, the knowledge and research community and civil society in open source collaboration to shape the future of business perception of the value of nature as a business opportunity and as a means of reducing economic risks and fostering sustainable businesses. This will also incentivise business investments in nature-based solutions. There is a need to stimulate early adoption, since potential first-movers may be risk-averse. This can be mitigated through life-long learning, training and guidance, and by demonstrating the benefits at corporate level.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 2 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: The project results are expected to contribute to:

²⁹ <http://operas-project.eu>; <http://www.openness-project.eu/>

³⁰ <http://esmeralda-project.eu/>

³¹ <http://swos-service.eu/>

³² www.ecopotential-project.eu

- developing and implementing natural capital and ecosystem accounts at national and/or regional level, consistent with the SEEA-EEA recommendations, CICES and the methodological work and guidance of KIP-INCA;
- increased awareness, recognition and mainstreaming of the wider value of natural capital and nature-based solutions in Member States'/Associated Countries' public and private sector decision making;
- building a community of practice through an EU network of networks of businesses, administrations and academia to address valuing nature and related business opportunities;
- linking of the macro-economic and micro-economic perspective on natural capital;
- natural capital, including nature-based solutions, operationalized and mainstreamed in companies' decision making frameworks and business models;
- adoption of the Natural Capital Protocol at corporate level.

Type of action: Coordination and Support Action

Protecting and leveraging the value of our natural and cultural assets: Heritage alive

In line with the SDGs on cultural heritage, recent Commission Communications³³ and related Council conclusions and EP reports, and building on the positive response to 2016-2017 calls under the corresponding SC5 cultural heritage related topics, this section of the work programme provides further opportunities to position cultural heritage at the centre of sustainable development and demonstrate, quantify and unlock its potential as a strategic living resource and driver for economic growth and job creation, social cohesion and environmental sustainability, thus underpinning the 2018 Year of Cultural Heritage.

All innovation actions under this section of the call should focus on demonstrating innovative heritage led and targeted approaches, strategies and services, that are co-created, co-implemented and co-assessed by all relevant stakeholders in 'living labs' through open innovation processes. Actions should provide evidence on the multiple (social, educational, economic, cultural and environmental) benefits of these interventions. To enhance the overall innovation potential of the approaches, the actions should also address new business, financing and participatory governance models that will promote collective management, foster, among other things, citizens' engagement, responsibility and ownership of cultural heritage, and mobilise

³³ Commission Communication *Towards an integrated approach to cultural heritage for Europe* (COM(2014) 477) - July 2014; Joint Communication of the High Representative of the Union for Foreign Affairs and Security Policy and the Commission, *Towards an EU strategy for international cultural relations* (JOIN(2016) 29 final) - June 2016; Commission *Proposal for a decision of the European Parliament and of the Council on a European Year of Cultural Heritage* (COM(2016) 543) - August 2016

investments. Optimal integration of natural and cultural heritage should be sought, where appropriate, to capitalise on synergies and balance trade-offs.

Projects funded under this section of the call are expected to establish long-term sustainable data platforms securing open, consistent data about the multi-dimensional impacts of the deployed approaches and ensure interoperability of relevant data infrastructures for effective communication, public consultation, exchange of practices, sharing of experiences and a continuous building up of the 'knowledge portfolio' through future activities under Horizon 2020 and beyond. Furthermore, they should envisage resources for clustering with other projects funded under the same topic and section of this call as well as other projects relating to cultural heritage funded under previous or future calls of Horizon 2020's Societal Challenge 5.

Partnerships should involve local and regional authorities, planners, enterprises, academics and local communities in a clearly defined structure with roles and responsibilities properly spelled out for all involved parties.

It should be noted that topic 'LC-CLA-05-2018: Resilience and sustainable reconstruction of historic settlements to cope with climate change and hazard events' in this call also contributes to this priority.

Proposals are invited against the following topic(s):

SC5-18-2018: International network to promote cultural heritage innovation and diplomacy

Specific Challenge: Over the years, Europe has developed world-renowned knowledge, expertise, practices, skills and technologies to protect, conserve, manage, enhance and leverage value from its rich and diverse cultural heritage. Cultural heritage not only provides people with a sense of identity and belonging, it also brings a large innovation potential to a number of economic sectors such as tourism, cultural industries, urban planning, regional planning, arts and design. It can also contribute to improving the EU's relations with other regions. There is scope for further leveraging the value of these European assets through an international network that fosters continuous dialogue, interaction and sharing of experiences between research, policy, business, society and cultural institutions, including NGOs and CSOs, and citizens, to promote heritage-led innovation for sustainable development. Such a network can provide expertise and assistance to other countries where cultural heritage is still an underestimated resource and/or is at risk or under threat for various reasons (e.g. lack of awareness, economic crisis, conflicts etc.).

Scope: Actions should capitalise on EU expertise and establish an international network to:

- review and document the most up-to-date knowledge and innovative solutions regarding governance and business models, tools, technologies (i.e. drones, satellites, nanomaterials, ICT etc.), methods for cultural heritage at risk;

- facilitate dialogue and sharing of experience, knowledge, expertise and practices between relevant stakeholders, such as business (including SMEs), society, researchers, policy-makers, public and private organisations, investors, experts and innovators on heritage-led innovation actions, successful business models, mobilisation of resources and solutions to protect, preserve and promote the use of the innovation potential of cultural heritage, especially the one under risk;
- identify specific domains and priorities where further research and innovation is needed;
- identify and promote successful business models and best practices, analyse potential regulatory, economic and technical barriers and propose concrete ways to overcome them at the EU and international level;
- develop relevant material and explore ways to leverage cultural heritage potential for diplomacy to improve EU relationships with other parts of the world, as well as undertake capacity building activities and assist countries whose heritage is at risk to manage and protect it properly.

Furthermore, capacity building and awareness raising activities about innovative solutions and approaches to promote the potential of cultural heritage as an investment opportunity with multiple benefits for the economy, society and environment rather than a cost factor should be undertaken to sensitise competent authorities, stakeholders and society at large and hence reduce the risk of abandonment, decay, destruction or loss.

The network should also involve institutions, organisations and relevant stakeholders from a broad range of EU Member States as well as EU Neighbourhood countries.

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is strongly encouraged, in particular with EU Neighbourhood countries and with countries in which cultural heritage assets are under threat.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 3 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: The project results are expected to contribute to:

- strategic and sustained dialogue between cultural heritage stakeholders, science, policy, business, society and international organisations;
- the emergence of a global market for heritage-led sustainable innovation, through EU-wide evidence and increased awareness among investors, practitioners and the public;
- development of a flexible EU approach to manage, enhance and safeguard cultural heritage under risk in other regions and its mainstreaming through the EU external relations policy framework;

- improved effectiveness of EU external relations and improved collaboration with UN agencies;
- supporting the new EU Strategy for International Cultural Relations.

Type of action: Coordination and Support Action

SC5-19-2018: Transforming historic cities and cultural landscapes into hubs of entrepreneurship and social and cultural integration

Specific Challenge: Over the past decades there has been a trend for historic environments in cities and cultural landscapes to lose their traditional economic activities and industries. This has led to abandonment and decay of urban, industrial and rural heritage. Emerging social, economic and technological trends (e.g. migration, re-industrialisation waves) are posing new challenges but also offering unexpected opportunities for such historical areas.

Thanks to their symbolic and cultural value, historic areas have the potential to be transformed into hubs of entrepreneurship, creativity⁴⁴, innovation and social and cultural integration. Evidence-based intelligent leveraging of the value of historic and cultural assets can support bottom-up actions, the setting up of cultural and creative industries³⁴, including in the area of digital technologies, as well as small scale advanced manufacturing (e.g. customized goods often made locally with advanced materials). It can also support the integration of different cultures and values brought about by newcomers, migrants and different population groups.

Scope: Actions should demonstrate how historic cities and cultural landscapes can be re-activated and re-vitalised through innovative entrepreneurship (e.g. cultural and creative industries, digital technologies, small scale advanced manufacturing), city-makers movements and the integration of new population groups, while respecting the historic heritage environments.

Actions should therefore develop and demonstrate:

- new paradigms, up-scalable and adaptable city and landscape plans and strategies, including social innovation and participatory approaches involving local populations, newcomers, local creatives and makers, research centres, universities etc.;
- innovative and replicable solutions for the adaptive re-use of urban, rural and /or industrial heritage;
- innovative business, governance and financing models to overcome legal and financing constraints in the re-vitalisation process.

⁴⁴ Building on the EU-funded European Creative Hubs Network: <http://creativehubs.eu/>

³⁴ The EP adopted in November 2016 a Report on Creative and Cultural Industries, asking for support to creative and cultural sector in H2020 and a joint scheme between H2020 and Creative Europe Programme.

The Commission considers that proposals requesting a contribution from the EU of between EUR 7 million and EUR 8 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: The project results are expected to contribute to:

- providing evidence and blueprints for economic revitalisation, enhanced well-being and quality of life, and social cohesion (integrating different social groups, preventing social conflicts between different cultures) in European historic cities and cultural landscapes, while preventing their abandonment and neglect;
- boosting innovation, creativity, entrepreneurship and reindustrialization of historic cities and cultural landscapes;
- promotion of cross-sector collaboration, creation of new jobs and skills in cultural and creative sectors and innovative manufacturing linked to historic heritage.

Type of action: Innovation Action

[SC5-20-2019: Placeholder for ERA-NET Cofund action(s)]

[N.B. One or more ERA-NET Cofund topic(s) will be added to this draft Work Programme at a later stage, following discussion with the SC5 Programme Committee configuration on a longlist of proposed actions and selection of the final topic title(s), according to the guidelines for WP2018-2020.]

Other actions (not implemented by calls for proposals)

[N.B. the text in this part still needs to be developed more fully]

1. IPCC secretariat

The Commission will pay a contribution on behalf of the EU to the IPCC secretariat (hosted by the World Meteorological Organisation in Geneva, Switzerland) with the aim of supporting the preparation of the next IPCC Assessment Report and facilitating the participation of scientists from the EU and from developing countries in this process. The action will also support the organisation of IPCC high-level dissemination events in Europe, targeting policy makers and other relevant stakeholders, in order to provide timely, high-quality and policy-relevant information and strengthen the science-policy dialogue on climate change.

Type of Action: Grant to identified beneficiary - Coordination and support action

2. IPBES secretariat

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem services (IPBES) is a science-policy interface on biodiversity and ecosystem services that aims at building capacity for and strengthen the use of science in policymaking. The European Union has been instrumental in the set-up of IPBES [but has currently only the status as an observer to it. It is currently seeking the status as enhanced observer with the wider perspective to become full member of IPBES.] *[Text to be updated in accordance with ongoing negotiations in Council.]*

[Once the enhanced observer status acquired,] the Commission will pay a contribution on behalf of the EU to the IPBES secretariat with the aim of supporting the IPBES mechanism to synthesize, review, assess and critically evaluate relevant information and knowledge on biodiversity and ecosystem services, generated worldwide by governments, academia, scientific organizations, non-governmental organizations and indigenous communities.

Type of Action: Grant to identified beneficiary - Coordination and support action

3. GEO subscription

As a full member of GEO the Commission will pay a contribution on behalf of the EU to the GEO Trust Fund, which is the budgetary structure agreed by the GEO members to fund the GEO secretariat (hosted by the World Meteorological Organisation in Geneva, Switzerland), to ensure the implementation of the Global Earth Observation System of Systems (GEOSS) according to its annual work plan and the continuity of the leadership and participation of the EU in GEO.

Type of Action: Subscription

4. Arctic Science Ministerial – Germany, October 2018

The White House hosted the first-ever Arctic Science Ministerial in 2016. Science Ministers from 25 governments, the European Union, and representatives from Arctic Indigenous peoples' organizations gathered to discuss collective efforts to increase the pace of international scientific collaboration in the Arctic. The format of the Arctic Science Ministerial proved to be very appropriate to advance in sustaining research and observation programmes, with the required support from governments. The European Commission will support the organisation of the Second Arctic Science Ministerial in 2018, in cooperation with the German Government. The 2018 Arctic Science Ministerial will be the first edition to be held in the EU and will be preceded by a scientific session on the latest achievements in relation with the thematic areas that will be the subject of the Ministerial discussion, where also advances on the flagship projects presented at the 2016 Arctic Science Ministerial will be presented. The release of a new Joint Statement shall be one of the main objectives of the Ministerial meeting. The EC contribution will also support the participation of representatives from Arctic Indigenous peoples' organizations. Co-funding from the German Government and from other sponsors should be detailed in the proposal.

Type of action: Grant to identified beneficiary – Coordination and support action

5. Support actions for raw materials policy (JRC)

Technical assistance supporting the monitoring and evaluation of the European Innovation Partnership (EIP) on Raw Materials;

This action shall cover the delivery of the following items:

- the EIP Annual Monitoring Report on "Raw Materials Commitments",
- the preparatory work and the finalisation of the EIP Strategic Implementation Plan (SIP) Implementation Document 2017 (e.g. involving stakeholder consultation/meetings, via a Europe-wide questionnaire),
- the preparatory work (e.g. data extraction, development of new indicators) and the finalisation of the Raw Materials Scoreboard 2017 (e.g. involving stakeholder consultation/meetings),
- the completion of the third EIP Call for commitments (preparation of the call and analysis of proposals),
- integrating and developing the elements of the EU Raw materials Knowledge base in the Raw materials Information System.

Type of Action: Provision of technical/scientific services by the Joint Research Centre

6. Support actions for raw materials policy (public procurement)

The secretariat supporting the implementation of the European Innovation Partnership (EIP) on Raw Materials;

This action shall ensure constant and high quality support to the European Innovation Partnership (EIP) on Raw Materials. Particularly, it will provide secretariat services to handle the different EIP groups (i.e. High-level Steering Group and Sherpa group and the meetings of operational groups) by ensuring:

- the EIP daily logistics,
- the logistics of the EIP meetings (EIP groups and High Level annual conference),
- minutes taking,
- communication and visibility activities (e.g. EIP website moderation and content update, social network contributions, EIP newsletter).

The secretariat will be the contact point for stakeholders.

Type of action: Public procurement

7. Support actions for raw materials and circular economy policy (JRC/public procurement)

Technical assistance supporting the implementation of raw materials-related actions included in the Circular Economy Action Plan of the European Commission (COM(2015) 614).

Type of Action: Provision of technical/scientific services

8. Assessment of multi-stakeholder design platforms for urban spatial quality

Map and assess existing initiatives, knowledge, guidelines and innovative ways of implementing urban spatial quality through multi-stakeholder design platforms. Organise face-to-face multi-stakeholder workshops in order to connect all relevant players in the field and stimulate the development of a pan-European sustainable network of active urban design labs in Europe and beyond.

Develop an online platform to promote exchange and dissemination of knowledge and innovation between the stakeholders on interdisciplinary design lab-sessions, research by design, training activities, publications, urban atlases, online databases and other information platforms.

Stimulate the establishment of a European reference framework on innovative urban spatial policy through the network of urban design labs in European cities;

Type of action: Public procurement (one contract to be procured either by call for tender or use of existing framework contract)

Indicative timetable: First Quarter 2018

9. Public-private-people partnerships to finance sustainable cities

Assess innovative public-private-people partnerships to finance sustainable cities. Create a living repository on existing financing instruments such as green bonds, social impact bonds, land-value capture and revolving loan funds. Test such financing instruments against innovative bottom-up, citizen-led business models and financing tools. Measure how well finance is meeting those needs of sustainable cities and map solutions to transform the city ecosystem.

Type of action: Public procurement (one contract to be procured either by call for tender or use of existing framework contract)

Indicative timetable: First Quarter 2019

10. Educational innovation around nature-based solutions

Actions should develop innovative educational programmes and materials to raise awareness on NBS and their social, economic and environmental benefits among children, young people and their families in an interdisciplinary, problem-based learning approach, combining the use of ICT, audio-visual productions and social media with real-life experiences with local NBS.

Type of Action: Public Procurement (contracts to be procured either by call for tender or use of existing framework contracts)

Indicative timetable: 2nd Quarter 2018

11. Support to confirmed Presidency event (conference) in Austria: [title of event]

[Action to be refined after discussions with the MS concerned]

Scope: Events of major strategic nature, well focused and with the participation of a broad spectrum of stakeholders are of outmost importance for assessing past activities, identifying policy options and priorities, and planning future actions.

The European Commission will support the organisation of an event (conference) in the second half of 2018, in cooperation with the Austrian government, holding the EU Presidency of the European Union at the time.

The conference should address an issue of major relevance to Societal Challenge 5, with innovation at the core of the event. It should aim to create better synergy between initiatives launched by the Commission and by the Member States, to the benefit of the overall coherence of actions within the field of research and innovation in the areas covered by Societal Challenge

5. An appropriate balance should be present in the proposed action, encompassing environmental, economic and social elements and points of view.

Participation of non-EU actors is possible. Outreach activities may be included, such as a press programme or events dedicated to the wider public or schools. To avoid limiting the impact of this kind of event, the subject should not overlap with that of other Presidency events already undertaken or foreseen during the period 2016-2020.

The commitment of the national authorities to support the event both from a political point of view and with resources is a pre-requisite to submit a proposal. Proposals should be supported by the competent Minister, evidenced in a letter included in the proposal. In order to ensure high political and strategic relevance, the active involvement of the competent national authority/authorities will be positively reflected in the evaluation.

In agreement with the Commission services, projects should ensure appropriate flexibility so as to respond in real time to potentially fast-changing policy scenarios.

The event is expected to result in: improved visibility, in particular in Austria, of the areas covered by Societal Challenge 5; identification of policy options and priorities via review and assessment of developments, and sharing of information and comparison of points of views; and efficient networking of various stakeholders and support to their activities, e.g. natural scientists, social scientists, businesses, investors, local authorities, environmental organisations, museums and schools.

Type of Action: Grant to identified beneficiary - Coordination and support actions

The standard evaluation criteria, thresholds, weighting for award criteria and the maximum rate of co-financing for this type of action are provided in General Annexes D and H of the work programme.

12, 13, 14 & 15. [Placeholder] Support to confirmed Presidency event (conference) in Romania/Finland/Croatia/Germany: [title of event]

[Text to be developed as for action 11 above, after discussions with MS concerned]

16. External expertise

This action will support the use of appointed independent experts for the monitoring of running projects, where appropriate.

Type of Action: Expert Contracts

17. Horizon prize - Solutions to combat ghost nets

Specific Challenge: Abandoned, lost and otherwise discarded fishing gear resulting from a variety of commercial and recreational fishing activities is a significant source of sea-based and freshwater marine litter with one of the highest negative impacts on the environment and the biota. Compared to other sources of marine litter, these so-called ghost nets create multiple severe environmental, socioeconomic and safety hazards, including killing or injuring wildlife trapped in the nets; damage to fragile habitats such as coral reefs; degradation to secondary micro-plastics; economic losses to the fishing sector due to continuous ghost fishing of commercial stocks; and navigation hazards that can cause accidents.

Scope: This inducement prize aims to mobilize private & public actors to develop solutions to prevent, mitigate, reduce, remove and recycle lost and abandoned fishing gear from the commercial, recreational and aquaculture sectors in order to improve the status of the marine and freshwater ecosystems, and it should focus on the:

- (i) development and implementation of measures and tools to prevent and mitigate ghost nets (e.g., application of alternative materials and new technologies including improved gear marking, tracking and reporting mechanisms for quick retrieval as well as mapping of snagging sites) accompanied by the
- (ii) development and/or improved application of tools/strategies to locate ghost nets;
- (iii) development of guidance/tools and best practices for environmentally sound retrieval of ghost nets;
- (iv) development of adequate storage and management system at the port for collected ghost nets and the use of innovative recycling processes;
- (v) preparation of awareness raising materials and activities to involve stakeholders.

Developed solutions for the marine environment (saltwater), which can be transferred to freshwater systems, are particularly desired.

The specific rules of the contest will be published in 2017 by the European Commission, which will directly launch and manage the contest and award the prize based on the judgement of independent experts.

Expected Impact: It is expected that the winner has developed a proven integral solution to address the problem of ghost nets comprising of prevention, mitigation and remedial measures, systems and tools including awareness raising. The developed solution should be replicable and scalable in other areas and is expected to result in: (i) reduction of ghost nets in the intervention area and improvement of the environmental status, (ii) prevention and reduction of further ghost fishing (iii) availability of environmentally sound retrieval systems (iv) improved knowledge and increased awareness raising e.g. through the provision of training materials for the fishing sector.

Type of action: Inducement prize

ANNEX

Indicative list of topics for WP2020:

Call: "Building a low-carbon, climate resilient future: climate action in support of the Paris Agreement"

[Overall indicative budget for this call EUR 192 million]

1. Decarbonisation: Achieving long-term climate goals and sustainable development (achieving climate and SDG goals, and lifestyle/consumption changes for deep decarbonisation pathways) (RIA); Innovative nature-based solutions for carbon neutral cities and improved air quality (IA)
2. Adaptation and climate services: Advancing Climate Services (improving S2D forecasting, and prototypes of climate services) (RIA); Climate resilience of coastal cities (RIA); Pre-commercial procurement of solutions for climate change resilience (PCP)
3. Inter-relations between climate change, biodiversity, ecosystems and water: Understanding water-energy-food nexus and streamlining water-related policies (RIA); Nature based solutions for forest fires risk reduction and multi-hazard risk management in the E.U. (RIA)
4. The Cryosphere: Polar climate systems (RIA)
5. Knowledge gaps: Developing the next generation of Earth System Models (RIA)
6. Earth Observation: GEOSS observations supporting the EU in its international commitment in the domain of climate change (RIA); Supporting the GEOSS Cold Regions Initiative (RIA)

Call: "Greening the economy in line with the Sustainable Development Goals (SDGs)"

[Overall indicative budget for this call: EUR 165 million]

[Of which for the 'circular economy' focus area: EUR 81 million]

- Connecting economic and environmental gains - the circular economy

1. Improving the recovery and recycling of materials from composite and multi-layer products (RIA)
2. Understanding the transition to circular economy and its implications (RIA)

- Raw materials

1. Raw materials Innovation for Circular economy (IA)
2. Raw materials policy support actions for Circular economy: Expert network on Critical Raw Materials (CSA)

3. Raw materials Innovation actions: Mining pilots; Pilots on substitution of Critical Raw Materials (IA)
4. Sustainable management in extractive industries (CSA)

- Innovating cities for sustainability and resilience

1. Enhanced natural treatment solutions for water security and ecological quality of water in cities (China & CELAC) (RIA)

N.B. One or more ERA-NET Cofund topic(s) may be added to this draft Work Programme 2020 and indicative budget envelopes at a later stage, following discussion with the SC5 Programme Committee configuration on a longlist of proposed actions and selection of the final topic title(s), according to the guidelines for WP2018-2020.

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