Draft Work Programme 2016-2017

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

Version of 1/04/2015

IMPORTANT NOTICE:

This draft Work Programme 2016-2017 for Societal Challenge 5 has been elaborated on the basis of the scoping paper 2016-2017 and on discussions with the Programme Committee configuration for Societal Challenges 5 during and following their meeting on 24 February 2015. The drafting process has benefitted from the inputs received in response to an open consultation held in summer 2014 and an open call for ideas for demonstration/pilot projects held in winter 2014/2015. The present document does not at this stage cover all relevant aspects and remains subject to change. Information such as indicative budget envelopes will be provided at later stage.

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Contribution to cross-cutting call: "Industry 2020 in the Circular Economy"

[For contributions from other Horizon 2020 parts, see separate document for information.]

Introduction: *[N.B. this introduction is a draft and will be fine-tuned in collaboration with the other services contributing to the cross-cutting call and should not be considered finalised.]*

This focus area will be at the heart of how Horizon 2020 contributes to sustainably boosting economic growth and renewing Europe's industrial capacities in a world of finite resources.

There are synergies to be reaped from working across different pillars of Horizon 2020 in tapping new sources of green growth and maximising the uptake of new opportunities by industry, including SMEs. Investment, job creation and consolidating Europe's global green leadership will be enhanced by adopting a systemic approach to eco-innovation.

For the purpose of this work programme, systemic innovation is understood as innovation that aims at responding to a societal challenge by obtaining a systems-wide transformation through affecting the system's economic, social and environmental dimensions as well as their interconnections. This implies a trans-disciplinary perspective that integrates technology, business models and economic organisation, finance, governance and regulation as well as skills and social innovation. Systemic innovation therefore calls for the adoption of a challenge-driven, solutions-oriented research and innovation strategy that crosses disciplinary boundaries and involves co-creation of knowledge and co-delivery of outcomes with economic, industrial and research actors, public authorities and/or civil society.

Actions under this call aim to demonstrate the economic and environmental feasibility of the circular economy approach and its potential to give a strong impetus to the EU's re-industrialisation. Actions will support the goals outlined in the Communications 'Towards a circular economy: A zero waste programme for Europe'[1] and 'European Industrial Renaissance'[2]. They follow up the European Council conclusions of March and June 2014, in particular the Council's call for a systemic approach to cleantech.

The circular economy is an economy in which production and consumption are organised in a way that the value of products, components, materials and resources is maintained or enhanced throughout the value chain and the life of the products. The circular economy decouples the creation of wealth and jobs from the consumption of resources (e.g. energy, water and primary raw materials), maximises resource productivity and minimises resource extraction and waste.

The objective of this [part of the] call is to foster economic, social and environmental prosperity – 'living well, within the limits of our planet' as set out in the EU's 7th Environmental Action Programme – by positioning Europe as a front runner in moving to a circular economy and society. The systemic approach to eco-innovation is intended to promote new modes of production and consumption, triggering a disruptive transformation for a resource efficient society.

Specific objectives include a reduction of costs and emissions, a more economic use of energy and resources, and a cascade use of materials. Pioneering new production and consumption

[1] COM(2014) 398 final, 2 July 2014
[2] COM(2014) 14 final, 22 January 2014

patterns and related technological and non-technological solutions will strengthen EU's position and that of its industry in new markets. Systemic solutions need to be examined, developed and demonstrated throughout value chains, while addressing all influencing factors: policy and framework conditions that affect business and finance models; industrial manufacturing and processing; eco-design of products including design for repair, disassembly and durability, energy efficiency; reduction of GHG emissions; new and efficient use of primary and secondary raw materials; green and innovative public procurement (GPP); management, governance, social innovation; and new forms of consumer behaviour. Strong multi-stakeholder involvement and the active contribution of social sciences and humanities disciplines will be essential.

The Public-Private Partnerships on Sustainable Process Industries (SPIRE PPP) and on Bio-Based Industries will contribute to the objectives of this call.

The innovation actions in this call are expected to offer particular opportunities to SMEs.

This call builds on and aligns with the European Innovation Partnerships (EIPs) on Water and on Raw Materials, the contractual Public-Private Partnerships (cPPP's) on Sustainable Process Industries (SPIRE PPP) and on Bio-Based Industries, the Bio-based Industries Joint Technology Initiative, the ERA-NET on Eco-innovation (ECO-INNOVERA), and the European Institute of Technology's Knowledge and Innovation Communities.

A novelty in Horizon 2020 is the Pilot on Open Research Data which aims to improve and maximise access to and re-use of research data generated by projects. Projects under the Societal Challenge 5 'Climate action, environment, resource efficiency and raw materials' Work Programme 2016-17 will by default participate in the Pilot on Open Research Data in Horizon 2020, except for topics SC5-15-2016/2017, SC5-16-2016/2017, SC5-17-2016/2017, SC5-18-2016/2017 and SC5-19-2017 in this call *[final name of the SC5 call will be added]*. Projects funded under the other calls of this Work Programme may participate in the Open Research Data Pilot in Horizon 2020 on a voluntary basis.

Projects have the possibility to opt out of the Pilot. Participation in the Pilot is not taken into account during the evaluation procedure. Proposals will not be evaluated favourably because they are part of the Pilot and will not be penalised for opting out of the Pilot.

A further new element in Horizon 2020 is the use of Data Management Plans (DMPs) detailing what data the project will generate, whether and how it will be exploited or made accessible for verification and re-use, and how it will be curated and preserved. The use of a DMP is required for projects participating in the Open Research Data Pilot. Other projects are invited to submit a DMP if relevant for their planned research. Only funded projects are required to submit a DMP.

Within the projects funded, where relevant, additional, complementary or follow-up funding should be sought, be it private or public, including from relevant regional/national schemes under the European Structural and Investment Funds (ESIF), in particular under the European Regional Development Fund (ERDF). To achieve this, projects could seek contact with ERDF managing authorities and with the authorities who developed the Research and Innovation Smart Specialisation Strategies (RIS3). The responsible regional/national authorities could then take an interest in the projects and their expected results. They could engage in the use and deployment of the novel solutions resulting from projects e.g. through pre-commercial public procurement or public procurement for innovative solutions. The project proposals could already indicate which

interested regions/countries or other partners have been pre-identified for contact during the project.

Proposals are invited against the following topics:

CIRC-1-2016/2017: Systemic, eco-innovative approaches for circular economy: large-scale demonstration projects

[N.B. previously topic 2]

Specific challenge: The increasing resources' constraints that EU is facing strongly condition its competitiveness and the quality of life of its citizens. Important gains in resource efficiency can be made by replacing current linear economic models with circular models of production and consumption. While relying on industrial leadership, the success of circular economy models will depend on adopting a systemic approach to eco-innovation that encompasses value and supply chains in their entirety and engages all actors involved in such chains. Such an approach entails foresight of the diverse impacts that transformative innovative solutions can have on economy, environment and society at large. Rebound effects of innovative practices can be thus addressed. Bringing production closer to end-users and customising the production and delivery of goods and associated services can boost new consumption patterns that add greater value and reduce over-production, waste and other negative environmental impacts. The involvement of end-users in designing circular economic models that better respond to their needs can enable the development of value-added solutions and act as a driver for Europe's re-industrialisation.

CIRC-1-2016: Design for circular value and supply chains

Scope: Through large scale demonstration projects businesses, including from processing and manufacturing industries and SMEs whether dealing with biotic and/or abiotic resources, are expected to test and showcase circular economy solutions based on re-design of value and supply chains, taking into account final users. Such solutions should entail the environmentally sustainable recovery and re-use of resources and energy flows, including by cross-sectorial symbiosis, within the overall process of bringing new products to the market.

The proposals should enable entrepreneurs, industries and researchers to collectively implement the innovative solutions in an appropriate geographical scale, which goes beyond the single production plant. They should develop new forms of organisation and governance within and across value and supply chain(s), considering where appropriate collaboration between public and private sectors.

Within the projects financed, additional, complementary or follow-up funding should be sought, be it private or public, so as to achieve a more effective implementation and deployment at larger scale and scope of the innovative solutions addressed. Additional funding sources could include relevant regional/national schemes under the European Structural and Investment Funds (ESIF), such as under the European Regional Development Fund (ERDF). In the latter case, contacts could be established with the funds managing body during the duration of the projects. In case of relevance for the Research and Innovation Smart Specialisation Strategies, the project proposals could already indicate which interested regions/countries have been pre-identified.

In cases of technological innovation, TRL 5-7 are to be aimed for[8]. The EU Environmental Technology Verification (ETV) pilot programme[9] could be used to verify the performance of innovative technologies at higher TRLs.

Expected impact:

The testing and demonstration of circular models for governing and designing value and supply chains, within cross sectorial, collaborative systemic approaches is expected to make measurable contributions:

- to substantially improve the efficient use of resources in Europe in the medium term;
- to reduce the generation of residual waste, by applying the principles of the waste hierarchy (as set in the Waste Framework Directive[10]).
- to create new business opportunities for industry and SMEs in EU, including in manufacturing, and improving European competitiveness in the market for eco-innovative solutions;
- to demonstrate the economic, social, and environmental sustainability of the proposed approaches, including the assessment of possible rebound effects, on the basis of a life cycle thinking and assessment, in line with the recommendations and reference data from the European Platform on Life Cycle Assessment[11];
- to provide knowledge and evidence in support of improving framework conditions (such as access to finance or the regulatory framework) that enable a broader transition to the circular economy in the EU.

CIRC-1-2017: Systemic services for the circular economy

Scope: To demonstrate through large scale projects the economic and environmental feasibility of circular economic business models that underpin new services based on performance/functionality rather than ownership, and on mass customisation, including through supporting demand side measures. Proposals should adopt a systemic eco-innovative approach addressing all forms of innovation, combining technological, organisational, societal, cultural and behavioural innovation, and strengthening the participation of civil society. Such an approach can foster new forms of collaboration between end-users, producers and researchers. In particular proposals should consider ways of supporting co-creation by experimenting and demonstrating new business models along with end-users, taking in consideration their needs, including gender dimension, thus enabling the development of value adding solutions. Business models that foster new services and consumption and production patterns will require support to end-users in the transition to the

[8] http://ec.europa.eu/research/participants/portal/doc/call/h2020/common/1617621-part_19_general_annexes_v.2.0_en.pdf

[9] http://iet.jrc.ec.europa.eu/etv/

[10] Directive 2008/98/EC

[11] Data should be disseminated through nodes in the Life Cycle Data Network and studies through the Resource Directory (for further information refer to http://eplca.jrc.ec.europa.eu)

circular economy by raising awareness and knowledge sharing activities on circular economy models.

Within the projects funded, additional, complementary or follow-up funding should be sought, be it private or public, so as to achieve a more effective implementation and deployment at larger scale and scope of the innovative solutions addressed. Additional funding sources could include relevant regional/national schemes under the European Structural and Investment Funds (ESIF), such as under the European Regional Development Fund (ERDF). In the latter case, contacts could be established with the funds managing body during the duration of the projects. In case of relevance for the Research and Innovation Smart Specialisation Strategies, the project proposals could already indicate which interested regions/countries have been pre-identified.

In cases of technological innovation, TRL 5-7 are to be aimed for[12]. The EU Environmental Technology Verification (ETV) pilot programme[13] could be used to verify the performance of innovative technologies at higher TRLs.

Expected impact:

Testing and demonstrating circular economic business models and services, including logistics and ICT capabilities, based on performance/functionality enhancement, is expected to measurably contribute to:

- create markets for new products/services (e.g. leasing or 'sharing' practices) which empower end-users in their choice for more sustainable consumption patterns, and require the implementation of innovative producer responsibility or other sectorial or cross-sectorial governance schemes;
- enable the development of new approaches for designing products/services that collectively consider end-users, brand owners, as well as entrepreneurs, and researchers;
- facilitate the inclusion of resource or materials criteria in designing products/services (e.g. durability, reparability and recyclability), thus contributing to an increase resource and energy efficiency in the whole life cycle of products;
- open new business opportunities for industry and SMEs in the EU, thus improving European competitiveness in the global market for eco-innovative solutions;
- demonstrate the economic, social, and environmental sustainability of proposed approaches, including the assessment of possible rebound effects, on the basis of life cycle thinking and assessment, in line with the recommendations and reference data from the European Platform on Life Cycle Assessment[14];
- provide knowledge and evidence in support of improving the framework conditions (such as access to finance or the regulatory or policy framework) that enable a broader transition to a circular economy in the EU.

Type of action: Innovation actions

[12] http://ec.europa.eu/research/participants/portal/doc/call/h2020/common/1617621-part_19_general_annexes_v.2.0_en.pdf

[13] http://iet.jrc.ec.europa.eu/etv/

[14] Data should be disseminated through nodes in the Life Cycle Data Network and studies through the Resource Directory (for further information refer to http://eplca.jrc.ec.europa.eu)

CIRC-2-2016/2017: Water in the context of the circular economy

[N.B. previously topic 1]

Introduction: The European water sector has a prominent position in economy and society, but it is very diverse and fragmented. It needs to revolutionise the way public and private actors work together so as to address water-related challenges and seize on opportunities strengthening a demand-driven approach. A systemic approach, incorporating both the physical structure of the system and the rules governing the operation, performance and interactions of its components, could address those issues in an integrated manner. Such an approach should go beyond the pursuit of wastewater treatment and reduction of water use to inspire technological, organisational and social innovation through the whole value chain of water (i.e. water as a resource, as a productive input and as a waste stream), moving towards a circular economy approach.

CIRC-2-2016: Demonstrating the potential of efficient nutrient recovery from water

Specific challenge: With an increasing global demand for food, feed and fibre, the demand for nutrients is growing. Although increasing food production necessitates a higher application of nutrients, current fertilisation practices use resources inefficiently. At the same time accumulation of nutrients is causing major environmental problems, but the EU legislation aims more to regulate nutrient emission to the environment than encourage a transition to an efficient nutrient recovery and recycling. Water is the most used carrier of nutrients and, at the same time, an important resource itself. Water treatment management models and technologies have the potential to create new business opportunities for an extensive nutrient recovery and contribute to the circular economy. However, an extensive implementation of integrated nutrient recovery, technologies and the use of the recovered nutrients at European level is still lacking.

Scope: The objective of this topic is to implement large scale demonstration projects to tap the potential of nutrient recovery and the use of these nutrients at European scale. Projects should bring together various recovery technologies implemented separately in various water using sectors (i.e. industrial, agriculture, and municipal) with a view of enhancing transfer of knowledge and scaling up at a regional scale. Treatment schemes should be optimised to allow better recovery rates and material qualities adapted to the local needs and capacities. A life-cycle approach should be used together with environmental and health risk assessment methodologies. New business models exploiting resources in the most valuable and useable possible form, such as using centralised/decentralised approaches, separation at sources, water-energy nexus, industrial symbiosis, local circular economy, integration with agro-food systems, and helping to close the nutrient cycle should be also implemented and tested. Relevant legal, societal and market challenges governing nutrient recovery and the market for fertilisers should be addressed in an integrated manner. The end-users, farmers and consumers, need to be involved in the projects, informing them about applicability and safety of the recovered products, the importance of nutrient recovery efforts and ensuring the involvement of the demand side to increase market success. Participation of industrial partners from relevant sectors is considered essential and active participation of SMEs is encouraged.

This topic supports the implementation of the EIP Water, addressing several priority areas such as water reuse and recycling and water and wastewater treatment, including recovery of resources. It also supports the implementation of the SPIRE PPP Roadmap.

In cases of technological innovation, TRL 5-7 should be achieved.

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 impacts: Projects are expected to:

- decrease dependency of primary nutrient resources and secure supply at European level;
- increase the use of fertilisers based on nutrients recovered from waste water by 25% in Europe;
- reduce the environmental impacts of nutrients;
- close the water and nutrients cycles in the whole production and consumption value chain;
- create new green jobs and industries around nutrient recovery, including exports.
- improve the policy and market conditions in Europe and globally for large scale deployment of innovative solutions.

CIRC-2-2017: Towards the next generation of water systems and services– large scale demonstration projects

Specific Challenge: Nowadays, water services aim mainly to save water and to improve its quality. However, water becomes more and more a scarce resource as a result of urbanisation, increased competition between various uses, economic sectors and extreme weather events. To deal effectively with these pressures, there is a need for improving water systems by considering the whole water-use production chain and by identifying solutions that enhance both the economic and environmental performance of the system. These innovative solutions should be in line with the objectives of the circular economy, contributing to the challenges of a depletion of raw materials (e.g. through the recovery of resources from waste water) and climate change (reducing energy needs or producing energy) and should be demonstrated at large scale. It is necessary to ensure involvement of all relevant stakeholders, to show the potential of using systemic eco-innovative approaches in water, to overcome related barriers and bottlenecks and to create new opportunities for jobs and growth in various regions and rivers basins

Scope: The objective of this topic is to demonstrate innovative solutions at a large scale (i.e regions and/or river basins), in line with EIP Water priorities and to support the implementation of the Water Framework Directive. Proposals should focus on developing the urban water services of the future, going beyond water supply sustainability. They should integrate, for instance, the management of water resources and the provision of water services, expanding the re-use of treated waste water and the use of desalinated water (where appropriate), ensuring carbon neutral water services, and closing the water cycle by increasing the efficiency of

wastewater treatment plants, including the recovery of energy and the re-use of chemicals and nutrients.

Projects should build on experience already gained in areas where integration of various aspects of water management and other economic and social activities is already taking place at different levels, with replication potential in other areas of Europe or at wider scale, thus demonstrating a real added-value at EU level. Successful projects should engage all relevant stakeholders, especially user communities, at an early stage in the co-creation process, bringing together technology push and application pull. Participation of industrial partners from relevant sectors is considered essential and the active participation of SMEs is encouraged. The application of new business models and new value chains is encouraged. In this context, relevant socio-economic issues, in particular, regulatory/governance issues, social behaviour and acceptability should be addressed and, therefore, the participation of social sciences and humanities disciplines such as political sciences, economics, governance, business studies is also encouraged. To enhance the systemic approach and the transformation of water services toward a more circular economy approach, digital technologies and ICT tools should be also considered. Activities aiming at facilitating the market uptake of innovative solutions, including standardisation, should also be addressed.

Within the projects funded, additional, complementary or follow-up funding should be sought, be it private or public, so as to achieve a more effective implementation and deployment at larger scale and scope of the innovative solutions addressed. Additional funding sources could include relevant regional/national schemes under the European Structural and Investment Funds (ESIF), such as under the European Regional Development Fund (ERDF). In the latter case, contacts could be established with the funds managing body during the duration of the projects. In case of relevance for the Research and Innovation Smart Specialisation Strategies, the project proposals could already indicate which interested regions/countries have been pre-identified.

In cases of technological innovation, TRL 5-7 should be achieved.

The Commission considers that proposals requesting a contribution from the EU of a 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: Projects are expected to lead to:

- significant reduction of the current water and energy consumption at regional and/or river basin scale by closing the cycles of material, water and energy, using alternative water sources and supporting the transition towards smart water services;
- interconnectivity between the water system and other economic and social sectors;
- increased public involvement in water management;
- increased citizen satisfaction with water services;
- replication of new business models in other areas and replication of models for synergies between appropriate funding instruments at regional, national or European level;
- closing of the infrastructure and investment gap in the water service sector;
- creation of new markets in the short and medium term.

Type of action: Innovation actions

CIRC-3-2016: Smart Specialisation for systemic eco-innovation/circular economy

Specific challenge: Regions are key players in the transition to a circular economy and can together create circular economy value chains with critical mass. However, knowledge of each other's strengths and the available resources and services is often limited. Developing joint strategies, built on complementarities and respective strengths, can therefore be valuable for better realising their individual and combined potential.

Scope: The purpose is to align European regions' Smart Specialisation strategies in support of the transition towards the circular economy. A systemic approach should be adopted that seeks connections between sectors, value chains, markets, natural resources and relevant societal actors. The project should establish a coherent EU reference framework enabling and encouraging regions to establish operational synergies between R&I investments and the European Structural and Investment Funds leading to market uptake and replication of innovative solutions.

Participants must be regional authorities and/or regional/local structures responsible for the implementation of Smart Specialisation strategies.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 million and EUR 1.5 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: Realisation of complementary smart specialisation strategies of a sufficient number of regions, identifying all of the following elements:

- concrete sectors or areas to specialize in by region within a European reference framework for the circular economy;
- investment needs per region and sector/area to develop the specialization of involved regions;
- operational actions to connect the activities of the identified sectors/areas of all involved regions.

Such complementary smart specialisation strategies should lead to a measurable transition towards a circular economy within the identified sectors/areas, in the regions involved. The transition can be measured in, for example: application of new business models; application of adjusted value or production chains; application of new product and/or service design; or 30% increase in resource efficiency.

Type of action: Coordination and support action

CIRC-4-2016: New models and economic incentives for circular economy business

Specific challenge: The circular economy holds high potential to contribute to sustainable economic growth and resource efficiency. To capitalise on this potential, appropriate business

models are required that can respond to the specific characteristics of the circular economy, in particular in terms of altering value chains, consumption patterns, producer-consumer relationships and financing needs. Smart, data-driven ICT environments will enable a new generation of business models that maximise performance and added value to the customer, for example through sharing, leasing, remanufacturing and new forms of cooperative or social enterprises.

Such business models and improved knowledge thereof need to be developed and disseminated to enable entrepreneurs, industries, and business sectors to make the transition towards the circular economy.[15]

Scope: Proposals should improve knowledge on circular economy and its underpinning economics, leading to further development and future implementation of business models that facilitate the transition towards a circular economy. These research activities should be based on an initial identification of drivers and barriers of concrete cases of already successfully applied circular economy business models or selected sectors which have high potential for a transition to the circular economy. The selected cases or sectors should be sufficient in number to derive generic recommendations at EU level and relevant to support Europe's re-industrialization, and the Commission's initiatives in the field of Industry 2020, Internet of Things, the Digital Single Market and Resource Efficiency.

The research activities should be carried out in cooperation between business and higher economic education schools and representatives from industries and businesses that are active in the selected cases and areas, as well as other relevant actors or stakeholders.

Proposals should consider a systemic approach in business models, applying technological, social, financial, governance and regulatory innovation and embedding a strong focus on design and interaction between all actors in the value chain. It should promote a practice of co-design and replication of new business models that creates a continuous dynamic of increasing the added value per unit of resource used.

The activities should take into account and coordinate with, where appropriate, other EU initiatives in the field such as the research and education programs of the relevant Knowledge and Innovation Communities (KICs) of the European Institute for Innovation & Technology (EIT) – namely the Climate-KIC, the EIT Raw Materials and the upcoming KIC on Added-value manufacturing (to be launched in 2016).

The Commission considers that proposals requesting a contribution from the EU of a range 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: Support to Europe's transition towards a circular economy through:

- testing and improving circular economy business models based on the multidisciplinary research outcomes on drivers and barriers;

[15] This action is in line with the roadmap of actions suggested by the 'Group of Experts on a systemic approach to eco-innovation to achieve a circular economy' (established in the context of Societal Challenge 5 'Climate action, environment, resource efficiency and raw materials' of the Horizon 2020 Work Programme for 2014-2015) and will contribute to the actions of 'Promoting science education and training in Europe'.

- drafting recommendations to support future implementation or replication of developed circular economy business models; with a robust underpinning in economics and methodologies to assess their sustainability;
- establishing a practice of co-design and replication of new circular economy business models;
- enhanced exchange of information, experience, and best practice on circular economy business models between academics and practitioners, leading to better application and replication of applied research outcomes;
- increased application of the principles of the circular economy in the curricula of business schools targeting business and finance executives as well as policy-makers.

Type of action: Research and Innovation Action

CONDITIONS FOR THIS CALL

[part concerning SC5 topics]

Opening date(s)[16]: XX/XX/2015 for 2016 topics

XX/XX/2016 for 2017 topics

Deadline(s)[17]:

CIRC-3-2016	XX/XX/2016 at 17.00.00 Brussels time	
CIRC-1-2016, CIRC-2-2016, CIRC-4-2016	First stage XX/XX/2016 at 17.00.00 Brussels time	Second stage XX/XX/2016 at 17.00.00 Brussels time
CIRC-1-2017, CIRC-2-2017	First stage XX/XX/2017 at 17.00.00 Brussels time	Second stage XX/XX/2017 at 17.00.00 Brussels time

Overall indicative budget: EUR XX.00 million from the 2016 budget[18], and EUR XX.00 million from the 2017 budget [19]

[16] The Director-General responsible may decide to open the call up to one month prior to or after the envisaged date of opening.

[17] The Director-General responsible may delay this deadline by up to two months.

[18] of which EUR 84.5 million from the societal challenge 'Climate action, environment, resource efficiency and raw materials', EUR XX.00 million from the societal challenge 'Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy' and EUR XX.00 million from Leadership in 'Nanotechnologies, advanced materials, biotechnology and advanced manufacturing and processing'.

[19] of which EUR 70.00 million from the societal challenge 'Climate action, environment, resource efficiency and raw materials', and EUR XX.00 million from the societal challenge 'Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy' and EUR XX.00 million from Leadership in 'Nanotechnologies, advanced materials, biotechnology and advanced manufacturing and processing'

Topics	2016 EUR million	2017 EUR million
CIRC-3-2016	1.5	
CIRC-4-2016	3.00	
CIRC-1-2016/2017, CIRC-2-2016/2017	80.00	70.00

Eligibility and admissibility conditions: The conditions are described in parts B and C of the General Annexes to the work programme, with the following exceptions:

CIRC-3-2016, CIRC-4-2016	Up to one project per topic shall be funded.
CIRC-3-2016	Participants must be regional authorities and/or regional/local structures responsible for the implementation of Smart Specialisation strategies

Evaluation criteria, scoring and threshold: The criteria, scoring and threshold are described in part H of the General Annexes to the work programme.

Evaluation procedure: The procedure for setting a priority order for proposals with the same score is given in part H of the General Annexes.

The full evaluation procedure is described in the relevant guide[20] published on the Participant Portal.

Indicative timetable for evaluation and grant agreement:

	Information on the outcome of the evaluation (*single or first stage*)	Information on the outcome of the evaluation (*second stage)*	Indicative date for the signing of grant agreements	
CIRC-3-2016, CIRC-5-2016	Maximum 5 months from the final date for submission		Maximum 8 months from the final date for submission	

[20] See: http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/pse/h2020-guide-pse_en.pdf

CIRC-1-2016/2017, CIRC-2-2016/2017	Maximum 3 months from the final date for submission	Maximum 5 months from the final date for submission	Maximum 8 months from the final date for submission (second stage)	

Consortium agreements: In line with the Rules for Participation, participants in Research and Innovation Actions or in Innovation Actions are required to conclude a consortium agreement prior to grant agreement.

Contribution to cross-cutting call: 'Blue Growth – demonstrating an ocean of opportunities'

[For contributions from other Horizon 2020 parts, see separate document for information.]

[N.B. this introduction is a draft which will be fine-tuned in the coming days in collaboration with the other services contributing to the call, and should not be considered finalised. Final numbering of topics will depend on the overall structure of the call.]

The Arctic dimension

The Arctic is an area of growing strategic importance as the climate changes and economic development accelerates in the Arctic region. The region is particularly affected by global warming: snow-coverage, ice-sheets and sea-ice have been decreasing in the last decades and permanently frozen ground is thawing. This causes significant geo-political and geo-economic consequences, including opening up of new transport routes and previously inaccessible natural resources. In addition to new socio-economic opportunities and local environmental challenges and threats, change in the Arctic has global consequences such as sea-level rise, changing weather patterns and more extreme weather events, with socio-economic impact on the EU. For those changes where managing of natural resources and public policy are involved, it is also important to identify potential thresholds affecting the ability of Arctic ecosystems and society to adapt and transform.

In this context, the European Union has an important role to play in supporting successful Arctic cooperation and helping to meet the challenges now facing the region[21]. This is also why the Council and the European Parliament have asked in 2014 the Commission and EEAS to present proposals for the further development of an integrated and coherent Arctic Policy by December 2015. Following a public consultation that was carried out by the Commission at the end of 2014, EU-led research and innovation has been identified by respondents as a key driver for the future sustainable development of the Arctic region.

Furthermore, the Transatlantic Ocean Research Alliance established between the EU, the USA and Canada through the Galway declaration in May 2013 addresses the Arctic together with the Atlantic Ocean. The research and innovation areas that follow should contribute to this strategic trilateral cooperation.

Proposals are invited against the following topics:

Topic 1: Unified integrated Arctic Observing System (2016)

Specific challenge: The Arctic is the theatre of profound transformation. Climate change is deeply impacting on the sea-ice extension and thickness, on ice-sheet melting, on permafrost thawing, and on marine and land ecosystems. These changes are bringing with them both risks and opportunities, and an integrated and multi-disciplinary Arctic observing system is becoming essential for studying, forecasting and assessing changes supporting the sustainable development

[21] Council conclusions of 12 May 2014 on developing a European Union Policy towards the Arctic Region

of the region. The improvement of current assessment and prediction capabilities of Arctic environmental change requires the provision of data on a number of key variables of Arctic meteorology, climate, oceanography, and pollution. Monitoring and improved understanding of the Arctic climate system and its teleconnections, as well as ecosystem change and socio-economic impacts on offshore operations, new shipping routes, mining activities, tourism etc. are important prerequisites for effective assessments of climate change adaptation and mitigation strategies in the Arctic and elsewhere.

Scope: The "Unified Arctic Observation system" should close critical gaps with innovative solutions, as well as improve the integration and inter-operability of existing observation systems. The activity shall be based on co-operation between the existing European and International infrastructures (in-situ and remote incl. space-based) and the numerical prediction communities, with active participation from relevant stakeholder groups. The action should, in line with the strategy for EU international cooperation in research and innovation (COM(2012)497), contribute to implementing the Transatlantic Ocean Research Alliance, the Sustaining Arctic Observation Networks (SAON) and the Cold Region Initiative of the Group on Earth Observation (GEO), and also support additional activities implemented through the Transatlantic Ocean Research Alliance.

The action should connect with the relevant Copernicus and European Space Agency (ESA) programmes and infrastructure in order to maximise the synergies among the European efforts to deliver the Integrated Arctic Observing System. In particular, strong coordination with the on-going Horizon 2020 project aiming at the development of an Integrated Atlantic Ocean Observation System should be sought[22].

The activity shall support and promote integrated use of Arctic land, ocean, ice and atmosphere observations from Europe, US, Canada and other international partners. Community-based observing programmes that draw on indigenous and local knowledge should be included and form the basis for participatory research and capacity-building within Arctic communities. The action should ensure data interoperability through internationally recognised standardisation and quality assurance/quality control (QA/QC) processes, promote database integration and allow free and open access to all data and data products, and should contribute through novel technology development to fill out in-situ observational gaps.

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 each from the USA and from Canada. International cooperation with partners from other Arctic and non-Arctic third countries would add further value.

The Commission considers that proposals requesting a contribution from the EU in the order 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's results are expected to:

- increase temporal and geographic coverage of observational data in the Arctic;
- support standardization and improve inter-operability of Arctic observational data.

[22] AlantOS, www.atlantos-h2020.eu/

- improve the integration of space-based and in-situ Arctic observations into process and climate models and forecast systems;
- long-term improvement of Arctic observation systems and related services.
- integrate with existing pan-arctic monitoring networks by building additional capacity and adding monitoring parameters to current programs;
- reduce cost of data collection in support of Arctic-related economic and societal activities;
- lead to better-informed decisions and better-documented processes within key sectors (e.g. shipping, tourism, fishing);
- support international assessments of global challenges such as climate change, scarceness of natural resources and global scale hazards;
- enhance the societal and economic role of the Arctic region and support the EU strategy for the Arctic and related maritime and environmental policies;
- contribute to the GEO Cold Region Initiative and to the Transatlantic Ocean Research Alliance;
- contribute to the Sustaining Arctic Observation Networks (SAON) process;
- contribute to the WMO Programme Year of Polar Prediction (YOPP).

Type of action: Research and innovation actions

Topic 2: Impact of Arctic changes on the weather and climate of the Northern Hemisphere (2016)

Specific challenge: The Arctic climate is changing more rapidly than in any other region. There is evidence that these changes strongly affect ecosystems, people and societies living inside and outside of the Arctic, including Europe and North America. A better representation of processes specific for the Arctic (e.g. related to sea-ice formation and melting) in weather and climate models is required to better constrain the role of the Arctic in the global climate system. In connection with improved observations in the Arctic (Topic 1) this is necessary to improve weather and climate prediction in the Northern hemisphere. These services are essential for managing the risks to infrastructure, agriculture, and other aspects of society across Europe.

Scope: Proposals should develop innovative approaches to improved descriptions and modelling of the mechanisms, processes and feedbacks affecting Arctic climate change and its impacts on the weather and climate of the Northern hemisphere. The assessment of the performance of state-of-the-art models in simulating key processes, and the linkages between polar and lower latitudes through well-evaluated coordinated model experiments, are critical to ensure that improved knowledge leads to advanced climate models and predictions.

Actions should also explore the potential that an improved Arctic observing system – subject of another topic in this Call – would have on the accuracy of weather and climate forecasts in the Northern Hemisphere including Europe and North America. The activities should contribute to the programme of the Year of Polar Prediction (YOPP) and provide input to the improvement of short- to medium-term predictions of the Copernicus Climate Change services (C3S).

Proposals should include a work-package to cluster with other projects financed under this topic and – if possible – also under other parts of Horizon 2020, and build on those funded under earlier calls. Proposals should develop relevant forms of communication with the EU (and possible national) services to adequately disperse results that could be used for policy action.

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), actions will contribute to implementing the Transatlantic Ocean Research Alliance.

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 each from the USA and from Canada. International cooperation with partners from other Arctic and non-Arctic third countries is also strongly encouraged.

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's results are expected to:

- enhance predictive capacity of the weather and climate of the Northern hemisphere, and allow better forecast of extreme weather phenomena;
- improve the capacity of response to the impact of climatic change on the environment and human activities in the Arctic, both in the short and longer term;
- improve the capacity of climate models to represent Arctic warming and its impact on regional and global atmospheric and oceanic circulation;
    - contribute to a robust and reliable forecasting framework that can help meteorological and climate services to deliver better predictions, including at sub-seasonal and seasonal time scales;
    - enhance stakeholders' capacity to adapt to climate change;
    - contribute to better servicing of economic sectors which rely on improved forecasting capacity (e.g. shipping, mining);
    - contribute to the Year of Polar Prediction (YOPP) and IPCC scientific assessments, and to the Copernicus Climate Change (C3S) services.

Type of action: Research and innovation actions

TOPIC 3: This topic is presented with two possible options, showing both positive and negative elements.

In Option 1 the subject is left intentionally broad. The positive aspect is that this fosters a bottom-up approach and the submission of potentially ground-breaking ideas. The potential risk is to receive proposals which partially overlap with already funded actions, with - consequently – a limited impact.

In Option 2 the subject is more detailed and focused on the thawing of permafrost and coastal erosion. Narrowing down the subject has the advantage of providing a more defined framework to consortia to develop their proposals in a field where European research is leading, while it has the disadvantage of not considering other challenges which may be equally important in the Arctic change context.

Topic 3, OPTION 1: Climate impacts on Arctic ecosystems, resources, and new economic activities (2017)

[N.B. still under discussion which version of topic 3 will be retained]

Specific challenge: The 'Arctic amplification' of global warming has led to major and quantifiable changes across the region. Examples include the melting of ice-sheets and glaciers, the thawing of permafrost, the decreasing extent of sea-ice and the warming and acidification of the Arctic Ocean. These rapid changes put considerable stress on ecosystems and have, as well, an important socio-economic impact. Additional human activities linked to new shipping lanes opening up, previously inaccessible natural resources becoming accessible, and moving fish stock are putting added pressure on the Arctic ecosystems, and represent both risks and opportunities for indigenous populations, local communities and economic actors.

Scope: Proposals should develop an innovative approach to assess the ecological and socio-economic impact of climate change and of new economic activities within the Arctic Ocean and surrounding landmasses on ecosystems, living resources and society. The needs, priorities and perspectives of indigenous populations, local communities and the economic actors operating in the region need to be considered in a context of economically, environmentally and socially sustainable development. Actions should address key processes with high socio-economic impact and provide solution-oriented and appropriate adaptation and mitigation responses, as well as support capacity-building for sustainable livelihoods. Innovative actions should go beyond the current state-of-the-art and support synergies among European and national actions. Appropriate consideration should be given to the geo-political and geo-strategic framework.

Projects should include a work-package to cluster with other projects financed under this topic and – if relevant – also under other parts of Horizon 2020. Proposals should develop relevant forms of communication for EU (and possible national) services to adequately disperse results that could be used for policy action. In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), actions will contribute to implementing the Transatlantic Ocean Research Alliance.

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 each from the USA and from Canada. International cooperation with partners from other Arctic and non-Arctic third countries is also strongly encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 4 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's results are expected to: enhance the capacity to model and predict the socio-economic impact of key processes of change in the Arctic,

- improve the predictability of poorly represented processes;
- contribute to the sustainable management of Arctic ecosystems and thus support the provision of ecosystem services and natural resources for improved societal well-being;
- promote sustainable economic Arctic opportunities arising from climate change and support the leverage of regional (EU) funds into these opportunities;
- contribute to the mapping of areas of potential economic and social development;
- support the competitiveness of European industry, particularly SMEs, engaging in sustainable development of the Arctic;
- enhance the engagement of and interaction with residents from Arctic communities and indigenous societies and develop a legacy of collaborative community involvement with scientific, economic, and societal actors and stakeholders.

Type of action: Research and innovation actions

Topic 3, OPTION 2: Climate impacts on Arctic permafrost, with a focus on coastal areas, and its socio-economic impact (2017)

[N.B. still under discussion which version of topic 3 will be retained]

Specific challenge: Arctic permafrost contains twice as much carbon as the atmosphere, stored in the upper metres of the ground. Thawing of permafrost may trigger the release of this carbon and its transformation in greenhouse gases, reinforcing global warming ('permafrost carbon feedback'). Permafrost coasts make up 34% of the coasts of the world. Assessing the lateral transfer of material including organic matter from land to sea and its fate on the Arctic shelves is one of the most pressing challenges for understanding the impact of permafrost thawing on climate change and its direct implications for indigenous populations and local communities. The upper shelf environment itself is largely under-investigated and processes of accumulation and/or subsea permafrost degradation are not accounted for in global climate and Earth system models..

Scope: The action should model and assess the impact of permafrost thawing on Arctic (natural and human) coastal systems and its effect on availability/accessibility of resources and the growth of new economic activities, considering the needs of indigenous populations, local communities and the economic actors operating in this vulnerable region, in a context of economically, environmentally and socially sustainable development. Actions should address key processes of environmental change and develop appropriate adaptation and mitigation responses with an emphasis on permafrost at the interface between land and water. Actions should put emphasis on partnerships and should co-design research with residents from Arctic coastal communities and with economic actors.

Proposals should develop relevant forms of communication for EU (and possible national) services to adequately disperse results that could be used for policy action.

Trans-disciplinary and participatory approaches, including social sciences and humanities, in the process are considered necessary.

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), actions will contribute to implementing the Transatlantic Ocean Research Alliance.

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 each from the USA and from Canada. International cooperation with partners from other Arctic and non-Arctic third countries is also strongly 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 impact:

The project's results are expected to:

- enhance the capacity to model permafrost thawing, sub-sea and on land, identify and reduce uncertainties, and quantify key processes not currently or poorly represented in predictive models;
- identify economically, environmentally and socially sustainable Arctic opportunities arising from climate change, and harness the potential of living resources within the global context of competing interests from different sectors and countries and contribute to the competitiveness of European industry and particularly SMEs;

promote the engagement of and interaction with residents from Arctic coastal communities and indigenous societies and develop a legacy of collaborative community involvement with scientific, economic, and societal actors and stakeholders. Type of action: Research and innovation actions

CONDITIONS FOR THIS CALL

[part concerning SC5 topics; numbering tbc when joint call finalised]

Opening date(s)[23]: XX/XX/2015 for 2016 topics

XX/XX/2016 for 2017 topics

Deadline(s)[24]:

Topic1-2016, Topic2-2016	XX/XX/2016 at 17.00.00 Brussels time	
Topic3-2017	XX/XX/2017 at 17.00.00 Brussels time	

Overall indicative budget: EUR XX.00 million from the 2016 budget[25], and EUR XX.00 million from the 2017 budget [26]

Topics	2016 EUR million	2017 EUR million
Topic1-2016, Topic2-2016, Topic3-2017	30.00	10.00

Eligibility and admissibility conditions: The conditions are described in parts B and C of the General Annexes to the work programme, with the following exceptions:

Topic1-2016, Topic2-2016, Topic3-2017	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 each from the USA and from Canada.

[23] The Director-General responsible may decide to open the call up to one month prior to or after the envisaged date of opening.

[24] The Director-General responsible may delay this deadline by up to two months.

[25] of which EUR 30.00 million from the societal challenge 'Climate action, environment, resource efficiency and raw materials', EUR XX.00 million from the societal challenge 'Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy' and ….

[26] of which EUR 10.00 million from the societal challenge 'Climate action, environment, resource efficiency and raw materials', and EUR XX.00 million from the societal challenge 'Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy' and …

Evaluation criteria, scoring and threshold: The criteria, scoring and threshold are described in part H of the General Annexes to the work programme.

Evaluation procedure: The procedure for setting a priority order for proposals with the same score is given in part H of the General Annexes.

The full evaluation procedure is described in the relevant guide[27] published on the Participant Portal.

Indicative timetable for evaluation and grant agreement:

	Information on the outcome of the evaluation (*single or first stage*)	Information on the outcome of the evaluation (*second stage)*	Indicative date for the signing of grant agreements	
Topic1-2016, Topic2-2016, Topic3-2017	Maximum 5 months from the final date for submission		Maximum 8 months from the final date for submission	

Consortium agreements: In line with the Rules for Participation, participants in Research and Innovation Actions or in Innovation Actions are required to conclude a consortium agreement prior to grant agreement.

[27] See: http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/pse/h2020-guide-pse_en.pdf

Call on specific priority areas within Societal Challenge Climate action, environment, resource efficiency and raw materials *(final title tbc)*

Introduction: *[N.B. this introduction is a draft, will be fine-tuned and should not be considered finalised.]*

The objective of the Societal Challenge '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 eco-systems.

To achieve the greatest possible impact of the research and innovation activities in 2016-2017, this Societal Challenge will – for the areas on climate change, environment and resource efficiency – prioritise actions which take a systemic approach to promote a more resource efficient, greener and more competitive economy as a key part of smart, inclusive and sustainable growth, and to deliver on Horizon 2020's climate and sustainability goals and the objectives of the General Union Environment Action Programme to 2020[28].

Systemic innovation is understood as innovation that aims at responding to a societal challenge by obtaining a systems-wide transformation through affecting the system's economic, social and environmental dimensions as well as their interconnections. This implies a trans-disciplinary perspective that integrates technology, business models and economic organisation, finance, governance and regulation as well as skills and social innovation. Systemic innovation therefore calls for the adoption of a challenge-driven, solutions-oriented research and innovation strategy that crosses disciplinary boundaries and involves co-creation of knowledge and co-delivery of outcomes with economic, industrial and research actors, public authorities and/or civil society.

Within this systemic approach, the Societal Challenge 'Climate action, environment, resource efficiency and raw materials' will focus on research and innovation which unlocks private and public investment in future solutions for a resource efficient, climate smart economy with a sustainable supply of raw materials. There is a consistent need to demonstrate Europe's potential for systemic innovation and market uptake of technological and non-technological solutions through large-scale demonstration projects. A transformative agenda on this scale requires major changes in attitudes and behaviour patterns and the contribution of social sciences and humanities will be essential to inform successful solutions. Complementary research and innovation activities are organised around the demonstration projects. Societal Challenge 'Climate action, environment, resource efficiency and raw materials' will act as trailblazer for ensuring that the investment across the whole Horizon 2020 Framework Programme of 35% for climate action and 60% for sustainable development will deliver maximum impact for economic, environmental and social sustainability.

Given the transnational, global nature of the climate and the environment, and their scale and complexity, as well as of the raw materials supply chain, activities cover both EU level and beyond. Selected international co-operation activities aim to boost the effectiveness of the actions promoted, within a scale-and-scope approach, e.g.: support to GEO, the

[28] Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013

Rio+20/post2015 process, the IPCC and the Belmont Forum, thus contributing to the Commission's priority 'A Stronger Global Actor'. Third countries, regions and international partners of programmes have been selected in order to maximise the impact and accelerate progress.

The cross-cutting nature of the issues addressed by this Societal Challenge results in a number of R&I areas which can most effectively be developed jointly with other Horizon 2020 parts (Societal Challenges and Leadership in Enabling and Industrial Technologies, i.e. LEITs), and in complementarity with other programmes e.g. LIFE, the NCFF, the European Structural and Investment Funds (ESIF). Coherence and synergy with actions at national, regional or local levels, via the European Structural and Investment Funds and links to EU Presidencies, and with other initiatives such as Joint Programming Initiatives (JPIs) and the European Institute for Innovation and Technology's (EIT) KICs, is also reinforced.

Clustering of projects is promoted.

All activities funded by Societal Challenge 'Climate action, environment, resource efficiency and raw materials' 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)[29] and Copernicus (the European Earth Observation Programme)[30] data, products and information should be privileged[31]. 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 for ESA missions and Third Party Missions are available at http://eopi.esa.int).

A novelty in Horizon 2020 is the Pilot on Open Research Data which aims to improve and maximise access to and re-use of research data generated by projects. Projects under the Societal Challenge 5 'Climate action, environment, resource efficiency and raw materials' Work Programme 2016-17 will by default participate in the Pilot on Open Research Data in Horizon 2020, except for topics SC5-15-2016/2017, SC5-16-2016/2017, SC5-17-2016/2017, SC5-18-2016/2017 and SC5-19-2017 in this call *[final name of the SC5 call will be added*]. Projects funded under the other calls of this Work Programme may participate in the Open Research Data Pilot in Horizon 2020 on a voluntary basis.

[29] www.geoportal.org
[30] www.copernicus.eu
[31] The Copernicus 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 supplementing Regulation (EU) No 911/2010 of the European Parliament and of the Council on the European Earth monitoring programme (GMES), by establishing registration and licensing conditions for GMES users and defining criteria for restricting access to GMES dedicated data and GMES service information. This would include the data from the Copernicus space infrastructure (Sentinels missions). It includes as well, where affordable, additional space data purchased by the Copernicus programme necessary for the delivery of Copernicus Services, called Copernicus Contribution mission data, when the later can be of use for Horizon projects developing new Copernicus Services.

Projects have the possibility to opt out of the Pilot. Participation in the Pilot is not taken into account during the evaluation procedure. Proposals will not be evaluated favourably because they are part of the Pilot and will not be penalised for opting out of the Pilot.

A further new element in Horizon 2020 is the use of Data Management Plans (DMPs) detailing what data the project will generate, whether and how it will be exploited or made accessible for verification and re-use, and how it will be curated and preserved. The use of a DMP is required for projects participating in the Open Research Data Pilot. Other projects are invited to submit a DMP if relevant for their planned research. Only funded projects are required to submit a DMP.

Beneficiaries in projects participating in the Pilot on Open Research Data 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.

In addition to this call, activities relating to climate action, environment, resource efficiency and raw materials are also found in the calls relating to 'Industry 2020 in the Circular Economy', 'Blue growth – demonstrating and ocean of opportunities', 'Sustainable Food Security – Resilient Agri-food Chains' and 'Secure, clean and efficient energy' *[final name of SC3 call for geo-sciences topic to be confirmed]*.

Proposals are invited against the following topics:

Climate services

Introduction:

The objective is to build Europe's capacity to respond and to improve resilience to climate change by strengthening significantly the nascent global market for demand-driven climate services for both mitigation of and adaptation needs. The recent IPCC Fifth Assessment Report has shown very clearly that collective, urgent action is needed to keep the planet's climate within tolerable levels of warming. Keeping the world within the 2°C warming boundaries is estimated to cost between 0.04% and 0.14% of GDP per year during this century, but to create huge benefits. President Junker's commitment of leading 'the fight against global warming […] in line with the objective of limiting any temperature increase to a maximum of 2 degrees Celsius above preindustrial levels' calls for a transformation and deep decarbonisation of the whole economy, A 'forward-looking climate policy' implies the reduction of fossil fuel emissions by 80 to 95% by 2050 – and their complete phase-out by 2100 – and significant adaptation efforts.

In this overall context, there is increasing demand for translating the existing wealth of climate data and information into customised tools, products and information ('climate services'). These will then enable a more systemic approach to risk management, leading to climate-smart, strategic decisions at various levels for a range of end-users (businesses, the public sector, and individuals) and support EU mitigation and adaptation policies[32]. For example, tools combining climate variability analysis and energy demand projections can improve energy supply planning and guard against shortages during critical times; planners and engineers can use long-term

[32] See the Roadmap to 2050 COM/2013/0216 final

climate forecasts to decide where buildings or infrastructure should be sited as local flood risks change move, or to design bridges that will withstand changing flood and wind stress risks; health agencies can use tools combining seasonal rainfall forecasts with exposure and demographic information to assess risks of malaria or dengue fever epidemics and to take precautionary measures. The definition of 'Climate Services' that can be found in the European research and innovation Roadmap for Climate Services[33] states that this term covers *the transformation of climate-related data — together with other relevant information — into customised products such as projections, forecasts, information, trends, economic analysis, assessments (including technology assessment), counselling on best practices, development and evaluation of solutions and any other service in relation to climate that may be of use for the society at large*. The development of climate services will open broad market opportunities both to public and private operators to provide customised high-added-value services to a variety of users in relation to the risks and opportunities that climate change with its impacts may bring to business, administrations and citizens, and the development markets for climate services will make the EU a world leader in this sector and contribute to wealth and job creation. This action will also leverage the Copernicus Climate Change services by highlighting areas where improved Earth observation would provide greatest benefit.

Realising the full market potential implies challenges, to be tackled by specific research and innovation activities. In the first place, it requires defining and matching the demand of end-users, also through the development of adequate interfaces between suppliers and users, to enable the uptake of climate information and services in real decision-making processes.

A better understanding of the demand and supply sides of the market is therefore needed, as well as a thorough assessment of the barriers and constraints associated with the provision and use of climate services. Even more crucial in building the business case for climate services is to associate scientists, suppliers/purveyors and users with the process of developing and demonstrating the added value of climate service products for end-user communities/sectors (i.e. co-design and co-development). In this context, the European Commission undertook a call for ideas for demonstrators in the climates services domain, the results of which have been taken into account in shaping this call.

Addressing knowledge gaps to improve capabilities for predicting the evolution of climate and better estimating future possible impacts remains at the core of improving the quality of climate services. In this respect, the challenge is to ensure that scientific developments benefit from the feedback of users and operational services, and thereby deliver scientific improvements which enhance the relevance of services to end users.

SC5-1-2016/2017: The added value of climate services

Specific challenge:

Responding to the climate change challenge implies taking rapid and effective actions to reduce greenhouse gas emissions, while at the same time adapting to unavoidable changes that are

[33] http://europa.eu/sinapse/sinapse/index.cfm?&fuseaction=tools.attachment&CMTY_ID=0C46BEEC-C689-9F80-54C7DD45358D29FB&CMTY_CAL_ID=552E851C-E1C6-AFE7-C9A99A92D4104F7E&file=BC479F70-015F-17CE-3CFBAF139F2BF707.pdf&filename=A European research and innovation Roadmap for Climate Services.pdf&type=CMTY_CAL

already happening and that will occur. This requires climate-informed decision-making at all levels. The challenge is to minimise risks and costs and to seize opportunities.

Climate services (see introduction to this section of the call for a definition) have the potential to build the intelligence behind this transition, through the transformation of the wealth of data, information, model output and related methodologies into customised services and products that mainstream climate change into decisions and actions at all levels in public administrations and the private sector.

Bringing climate services to the market requires serving the demand of end-users and developing the business interface between suppliers and users of climate services.

The specific challenge of this action lies in the development of climate services concepts that are ready to be used, or show potential for future deployment, demonstrating the added value of using climate information and services by end-users in their operational decision-making.

Scope: Proposals should address only **one** of the following:

SC5-1-2016: Demonstration of climate services: In order to measure the added value of climate services for end-users, they must be 'user-centric'. As such, climate services need to be co-designed and co-developed through close interaction of suppliers/purveyors and users. This action will support the user-driven demonstration of climate services in sectors or business networks in which their deployment can already take place at the current state of knowledge, or with limited incremental efforts. Proposals therefore need to prove the maturity and sustainability of the concept, while also addressing the replicability and marketability of the proposed services.

The action funded must respond to a formulated need for climate services by end-users that are served by climate service suppliers or business intermediaries and the demonstration project must be co-designed and co-developed by these end-users. The core of the action should be the demonstration of climate services in relation to issues where climate-related intelligence can support tangible decision-making processes in the public or private domain.

Actions with the main objective of developing supply-driven methodologies, assessing knowledge gaps or pure networking activities will not be funded.

The added value of the climate service provided has to be measurable and should be validated by the end-users collaborating in the demonstration projects. The projects should communicate the added value of the services to relevant end-user communities that must be specified in the proposal. The action should also adequately address the barriers which currently hamper the full deployment of climate services in the given area and solutions to tackle these.

Given the focus on demonstrating the added value of a proven concept, the projects should be capable of delivering final results in a relatively short time period (typically within a project duration of two to three years).

Within the projects funded, additional, complementary or follow-up funding can be sought, be it private or public. An example is the relevant regional/national schemes under the European Structural and Investment Funds (ESIF), in particular under the European Regional Development Fund (ERDF). The response to the Call for Ideas launched by the Commission in December 2014 showed a wide range of demonstration possibilities with estimated budgets between EUR

0.8 million to EUR 5 million. Based on this outcome, the Commission considers that proposals requesting a contribution from the EU of up to 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.

SC5-1-2017: From climate service concepts to piloting and proof-of-concept:

This action addresses areas where climate services show potential for being developed. Increasing the added value of climate services relies on matching the demand for services and the competences in the field. However, the availability of data, information and services does not always correspond to users' needs. A co-design process needs to be established for developing future applications in the most promising fields and for mobilising end-user communities where demonstration projects are not yet feasible. This action should co-design (involving both suppliers/purveyors and users) pilot applications that support the proof-of-concept phase of climate services with high added-value in potential markets. The action should create case studies with to address methodological issues, develop the user/provider interface, and test the relevance of climate services with a view to preparing demonstration projects with the end-user community at a later stage.

This action focuses on broad areas of application, having a European or global scope. Proposals should take into account and where possible build upon activities addressed by the ERA-NET on climate services opened in the Horizon 2020 Societal Challenge 5 2015 call.

Projects should include a work-package to cluster with other projects financed under this topic and – if possible – also under other parts of Horizon 2020.

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:

SC5-1-2016: The project's results are expected to:

- ensure rapid deployment and market uptake of climate services by demonstrating their added value;
- provide added-value for the decision-making process addressed by the project, in terms of effectiveness, value creation, optimised opportunities and minimised risks;
- increase the provision of climate services with added value to the end-users;
- foster market uptake of climate services
- concrete solutions to overcome barriers hampering deployment of climate services in the specific area of application.

SC5-1-2017: The project's results are expected to:

- provide added-value for the decision-making process addressed by the project, in terms of effectiveness, value creation, optimised opportunities and minimised risk;

- enhance the potential for market uptake of climate services demonstrated by addressing the added value;
- ensure the replicability of the methodological frameworks for value added climate services in potential end-user markets;
- promote a better informed and connected end-user community.

Type of action: **SC5-1-2016:** Innovation Actions

SC5-1-2017: Research and Innovation Actions

SC5-2-2017: Integrated European regional modelling and climate prediction system

Specific challenge: European decision makers and businesses currently lack access to a consistent and authoritative Europe-wide set of climate simulations at appropriate spatial and temporal scales upon which regional, national and local climate-related risk assessments, and climate change adaptation programmes and businesses could be built. There is high demand for and an urgent need to develop integrated multi-model ensemble climate predictions at European scale which can provide actionable climate information and assessments. This integrated climate prediction system should go hand in hand with coordinated regional modelling and observational studies to constitute a robust foundation for Europe-wide climate service activities. It should be based on user requirements and provide trustworthy and easily accessible climate information which can be utilised across Europe and beyond.

Scope: The main research objective of this action is to develop an innovative European regional ensemble climate prediction system based on a new generation of high-resolution climate models, covering timescales from seasons to decades initialised with observations. The action should conduct a series of multi-method and multi-model experiments in order to better capture uncertainties, and provide user-centred and demand-driven information which addresses user needs at various levels.

The system should focus on near term (~1-40 years) predictions, which is the time span most relevant for many decisions of businesses, for infrastructure and other planning.

The regional downscaling programme, an integral part of the multi-model ensemble system, should target Europe at the best technically achievable spatial resolution. Methodologies should be transferable to other geographical areas. Evaluation of model results against observations is considered essential.

Climate model data should be widely disseminated, and therefore need to be easily accessible and available in line with Copernicus Climate Change Service specifications.

Strong engagement with stakeholders and climate information end users, including public sector policy-makers, business organisations and customers representing specific market sectors is an essential requirement of this action.

International cooperation should be considered with countries having developed similar products, and with countries wishing to develop capacities.

The projects should liaise with other relevant projects under Horizon 2020.

The Commission considers that proposals requesting a contribution from the EU of between EUR 10 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: The unique ensemble of climate predictions should provide reference climate information from regional to local scale across Europe to assess the impacts and risks of climate variability and change as solid basis upon which investment decisions, spatial planning, policy and adaptation options can be built. More specifically projects the project's results are expected to:

- increase the credibility and usability of climate predictions, identification and characterisation of trends in regional climate extremes;
- provide an authoritative foundation of climate information to assess the impact of climate change;
- boost climate service market applications at European level for a variety of sectors, based on the new information;
- support the building of a climate resilient economy and strengthen civil protection;
- close gaps between 'top-down' climate prediction and 'bottom-up' climate impacts following user demands.

Type of action: Research and innovation actions

SC5-3-2016: Climate services market research

Specific challenge: Climate services are a specialised field, but have the potential to evolve into a promising market, able to scale up the cost-effectiveness of climate change adaptation and mitigation in Europe and beyond. In order to enable the growth of the climate services market, there is a need to better understand the nature and scope of both the demand and supply sides, and to assess constraints and opportunities, so as to identify the untapped potentials and enabling conditions for market development in Europe.

Scope: Actions should address **one** of the following sub-topics:

a) Defining the European and international climate service market characteristics and **foresight into market growth**: Proposals should develop a comprehensive analysis of users, their needs, constraints and capabilities, and a systematic assessment of European climate services providers/purveyors – operating at national, European and international levels – their business models and services provided. Based on this, the potential for market development should be assessed. This covers assessing the potential of including climate services in the decision-making process of perspective users (public administrations, business, individuals); translating users' needs into the required services, access and capabilities; assessing the divide between users' needs/perceived market potentials and services supplied, and identifying service and innovation gaps and responses.

b) **Climate services market barriers and enabling conditions:** Proposals should assess the constraints and enablers – of scientific, technical, legal and socioeconomic nature – for the uptake of climate services and the growth of the market, leading to identification of gaps and responses. Proposals should develop a comprehensive analysis including: the assessment of policy environments and supportive frameworks (e.g. incentives, voluntary schemes, and standards); the assessment of the implications of competition and synergies among different provision modes (public/private, EU/national/local level); the analysis of ethical, legal and intellectual property implications of provision and use of climate services, including the assessment of criteria and protocols for quality assurance and quality control.

For both sub-topics, based on appropriate surveys and analysis of case studies, proposals should develop best practices and recommendations for both climate services providers/purveyors and policy makers, with a view to growing the market and enhancing users' access to quality services.

Adequate involvement of, and outreach to, relevant stakeholders and multiplier organisations, as well as feedback and linkages to the relevant platforms and research and innovation actions in the field should be ensured. The topic calls for a strong trans-disciplinary approach. The participation of partners with a sound track record in market research is expected.

Projects with duration of maximum 2 years will be financed.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 1.5 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's results are expected to:

- ensure specific feedback from market research and foresight to research and innovation actors and service providers;
- facilitate the development of a new generation of highly-customised climate services, tailored on users' needs;
- enhance the relevance of climate services for user organisations;
- facilitate the creation of a supportive environment for business and market development;
- enhance access to and the reliability of climate services;
- strengthen and broaden the use of climate services to new sectors/users;

Type of action: Research and Innovation Actions

SC5-4-2017: Towards a robust and comprehensive greenhouse gas verification system

Specific challenge: According the IPCC's 5th Assessment Report, atmospheric concentrations of CO_2, CH_4 and N_2O have increased to levels unprecedented in at least the last 800 000 years. CO_2 alone has increased by 40% since pre-industrial times, primarily from fossil fuel emissions and also from net land use change emissions. Trust in any international agreement under UNFCCC

aimed at limiting global warming will depend on our ability to make accurate estimates of greenhouse gas emissions as well as provision of mitigation services allowing robust reporting and verification against independent data and analyses.

However, a better understanding of the carbon and nitrogen cycle in the earth-climate system remains one of the key knowledge gaps. It is therefore essential that we increase our capability to identify more accurately the stocks and fluxes of these important greenhouse gases and at the same time develop methods and technologies that will enable us within the next five to ten years to accurately estimate and also verify CO2, CH4 and N2O emissions from key sources.

Scope: Actions should quantify more accurately the stocks and fluxes of CO_2, CH_4, and N_2O in Europe at both regional and continental scales through improved descriptions of key processes and feedbacks, state-of-the art methodologies, models and tools and by exploiting observations from a wide range of monitoring networks (in-situ and satellite). Special attention should be given to independent verification of data reported in countries greenhouse gas inventories and to the improvement of the methods/approaches currently used for estimating greenhouse gas emissions (e.g. national inventories, tracer transport inversion using atmospheric and oceanic measurements, land-use measurements and models) and the development of widely accepted and scientifically robust methodologies, in order to decrease to acceptable levels uncertainties associated with emission estimates and better identify human-induced emissions. Furthermore, issues such as data standards, transfer of information and tools, replicability of methodologies and tools outside Europe (mainly in developing countries) should also be addressed.

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

- facilitate the development of an operationalised greenhouse gas monitoring, reporting and independent verification system
- improve the ability to monitor and verify greenhouse gas emissions under an international climate agreement by significantly decrease current uncertainties associated with greenhouse gas emission estimations;
- provide information on historic and projected stocks and fluxes of greenhouse gases in Europe over spatial and temporal scales consistent with those of current EU climate policy..
- provide input to key international programs and assessments (Global Carbon Project, IPCC, Future Earth).

Type of action: Research and Innovation Actions

SC5-5-2016: A 1.5 million year look into the past for improving climate predictions

Specific challenge: Ice cores contain unique and quantitative information about past climate forcing and responses and have provided essential evidence about mechanisms of climate change, underpinning our understanding of future climate change. To better constrain the climate response to future GHG emissions and unravel key linkages between the carbon cycle, ice sheets and atmospheric and ocean climate we need to extend the record/analysis back to the so called 'mid-Pleistocene transition', when the frequency of glacial cycles changed considerably in response to orbital perturbations. A realistic target is to acquire a new ice core from the Antarctic that will contain a record back to 1.5 million years (Myr), but a suitable site where such ice exists has not yet been identified and will require a significant integrated effort.

Scope: To support the preparation for new ice-drilling campaigns in Antarctica. To help screening suitable sites where future drilling could provide ice-core records, extending up to 1.5 million years into the past. To define the feasibility of acquiring a 1.5 Myr ice-core record and establish a technical and logistic roadmap for the development of an international drilling campaign. To develop the financial engineering and the framework for international cooperation necessary to support the future endeavour. 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 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's results are expected to:

- establish optimum candidate sites for the future acquisition of a 1.5 Myr ice-core record of global climate;
- foster, ensure and coordinate the commitment of Member States and international partners in the future drilling campaign;
- enable the deployment of the most innovative techniques, technologies and methodologies;
- provide leadership for the European ice-core community, including through interaction with the International Partnership in Ice Core Sciences (IPICS).

Type of action: Coordination and support action

Towards a low-carbon Europe

SC5-6-2016/2017: Pathways towards the decarbonisation and resilience of the European economy in the timeframe 2030-2050 and beyond

Specific challenge: The EU is committed to pursue policies which are consistent with the overall political objective of keeping the global mean temperature increase below 2°C. The EU has confirmed its target to achieve domestic emissions reduction of at least 40% by 2030. Furthermore, based on the 'Roadmap for moving to a low-carbon economy in 2050'[35], pursuing a deep decarbonisation pathway will require an 80-95% reduction of greenhouse gas emissions by 2050 (compared to 1990) and their complete phase-out by the end of the century. A socio-economic transformation of this scale will require a paradigm shift and will have massive spill-over effects across the whole of society, but with different distributional implications, benefits and costs across individual economic sectors and social groups. Political and economic decision-makers have to weigh uncertain impact chains against potentially devastating damage, immediate and medium-term engagement against long-term benefits, and the need for global mitigation efforts against differences in economic and political outlook on the international scene. It is therefore imperative to build a comprehensive evidence-based framework for research, business, investment and policy decision making, able to assess the socio-economic implications of and incentives for medium- to long-term decarbonisation pathways (including their associated costs, benefit and risks), the challenges of planning medium- to long-term technological transitions, as well as the adequacy of future global commitments for achieving long-term climate goals. Such a framework should be based on the co-design of pathways and scenarios with economic and societal actors and address relevant cross-sectorial perspectives (e.g. cities) of the decarbonisation of the European economy.

Scope: Inter-disciplinary approaches, including social sciences, in the process are considered necessary to address this specific challenge.

Projects should include a work-package to cluster with other projects financed under this topic and – if possible – also under other parts of Horizon 2020.

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

SC5-6a-2016: Managing technology transition: The decarbonisation of European society will require a series of gradual or rapid technology changes in different sectors such as power generation, transport, industry, agriculture, residential energy use. The massive deployment of new or existing low-carbon and smart technologies within a relatively short time represents an enormous challenge for innovators, regulators and investors, as well as for users and citizens. Proposals should explore and address the challenges of planning technological transition ahead of time and prioritising within and between different sectors in Europe, so as to support stringent mitigation policies and taking into account among other aspects the inertia in innovation systems and lock-in effects. Special emphasis should be given to non-technological factors and drivers influencing the development and deployment of low-carbon and smart technologies within the transformational requirements of the deep decarbonisation pathways for the timeframe 2030-2050 and beyond.

[35] COM (2011) 112, 8 March 2011

Proposals should also explore the inter-linkages between large-scale deployment of low-carbon technologies and intra-EU and international trade, energy security, job creation and the competitiveness of the European economy, as well as the necessary policy interactions across different governance levels (EU, national and sub-national).

Finally, proposals should address the socio-economic implications of deep decarbonisation, including their consequences on supply chains and production of goods (e.g. agriculture, industry, feedstock, raw material availability), and identify necessary changes in investment patterns, financial mechanisms and regulatory incentives in order to achieve both sustainable economic growth and ambitious low-carbon goals.

SC5-6b-2016: Assessment of the global mitigation efforts in the perspective of the long-term climate goal: The Parties of the United Nations Framework Convention on Climate Change (UNFCCC) agreed to limit the rise of global mean temperature to 2°C compared to pre-industrial levels, in order to prevent dangerous anthropogenic (i.e. human-caused) interference with the climate system. The 21st Conference of Parties of the UNFCCC, known as COP21, which will be held in December 2015 in Paris, will mark a milestone in the course of international efforts to engage on global climate action consistent with the 2°C target.

Proposals should analyse the adequacy of the outcomes of COP21 and the pledges of major emitting countries in view of the long-term climate goal. The proposal should also address the available pathways and necessary level of commitments that will be needed to be on track with the Convention's objectives. Furthermore, this analysis should address both political and macro-economic aspects (e.g. global and regional carbon markets), as well as the repercussions of the (lack of) international efforts on the European decarbonisation and broader objectives, particularly in view of industrial competitiveness, economic growth, international trade, public finance and cross-border capital flows.

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 substantially contribute to global greenhouse gas emissions.

Proposals should include partners from (non-European) high-, middle- and/or low-income countries.

SC5-6c-2017: The risks and costs of climate change for Europe: Climate change can induce large – or eventually extremely large – environmental and socio-economic damage. Defining and quantifying complex impact chains, including non-market damage, as well as related risks, costs and economic gains (e.g. growth, welfare benefits) constitute a prerequisite of policy-making. In this constantly evolving research area, efforts must continue to further develop modelling tools and formulate more detailed and downscaled projections. Proposals should build on the latest results of climate science, with special regard to the IPCC's 5th Assessment Report, and contribute to the evolution of methodologies which can assess the economic value of climate (in)action. This improved methodology should then be applied to the economic valuation of climate-induced damage and to the estimation of the macro-economic impact of climate action in the EU at various levels (regions, countries, economic sectors), including on growth and employment, within the 2030-2050 timeframe and beyond, considering as well low-probability,

high-impact scenarios.. Proposals should focus their analysis in Europe, but take into consideration the global context of climate change. This assessment work should explore the likelihood and distribution of impacts and costs across different European regions (and/or countries) and economic sectors, including co-benefits, adverse side-effects and welfare benefits of climate action.

Expected impact: Project results are expected to:

SC5-6a-2016:

- foster the design and implementation of cost-effective medium to long-term technological transitions, consistent with decarbonisation pathways and economic development in Europe and beyond;
- provide a medium to long-term vision on low carbon technological development and deployment in Europe, within the context of a global economy;
- foster greater transparency of models, methods and tools;
- contribute to major international scientific assessments (e.g. IPCC);
- enhance the science-decision making interface, though stakeholder engagement and public outreach.

SC5-6b-2016:

- provide a thorough analysis of the adequateness, potential and barriers of international mitigation efforts in the perspective of the long-term climate target, and their repercussions for EU goals and policies;
- identify most pressing areas for policy action at European or national/regional level;
- contribute to major international scientific assessments (e.g. IPCC);
- enhance scientific cooperation with third countries.

SC5-6c-2017:

- provide more accurate and downscaled economic valuation of climate-induced impacts and risks in Europe;
- decrease uncertainties concerning the estimation of the economic impact of climate action in the EU, within the 2030-2050 timeframe and beyond;
- foster greater transparency of models, methods and tools;
- identify most pressing areas for policy action at regional, national, European and international level;
- contribute to major international scientific assessments (e.g. IPCC).

Type of action: Research and innovation actions

SC5-7-2017: Coordinating and supporting research and innovation actions on the decarbonisation of the EU economy

Specific challenge: There is a constant need for strengthening the information flow and enhancing the exchange of experiences on on-going and future European and international research and innovation activities concerning low-carbon transition scenarios, as well as for maintaining continuous dialogue between the scientific community, other stakeholder groups and policy-makers in order to better support EU policy processes targeting the decarbonisation of Europe's economy between 2030 and 2050 and beyond.

Scope: This action should create a network of leading scientists and relevant research projects in the field of EU decarbonisation strategies, contributing to the definition of robust scientific statements and coverage of knowledge gaps. The action will support the work of a panel of personalities, expected to be established by the European Commission, with the aim to stir the actions under Horizon 2020 in the area of deep decarbonisation pathways. It should also establish links – from an early stage in the project – with stakeholder groups and policy-makers at EU, national and sub-national level, in order to inform policy and business processes and set up feedback loops. The project should include foresight analysis on emerging issues, produce sectoral and macro-economic synthesis and recommendation papers on current and emerging policy-relevant issues, and engage in active communication and dissemination of results. This action will have to be implemented in close cooperation with the European Commission's Directorate General for Research and Innovation in order to allow for constant alignment with and support for new policy initiatives.

The Commission considers that proposals requesting a contribution from the EU of between EUR 2.5 million and 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: This action will enhance the coordination of European and Member State research and innovation actions on decarbonisation pathways and scenarios. It will inform policy and business processes in a comprehensive way and within a cross sectoral perspective, on the latest scientific findings and recommendations for managing a low-carbon transition at macro-economic or sectoral level. It will introduce and develop further the notion of cost-effectiveness, resulting from better medium-to-longer term planning and coordination

Type of action: Coordination and support actions

Nature-based solutions for sustainable cities and territorial resilience

Introduction:

Human societies are facing a broad range of challenges: climate change, unsustainable urbanisation, natural disasters, threats to food security, biodiversity loss, degradation of natural capital and ecosystem services, or water quality and scarcity. Action in urban, rural and natural areas is urgent.

In particular, cities and urban communities have to cope with additional issues such as poor air quality, heat island effects, increased flood risks (also from soil sealing), increased frequency/severity of extreme events (floods, droughts, storms, heat waves, etc.), social tensions and marginalisation. These challenges have serious impacts on human health, quality of life and well-being, particularly among the less privileged social classes.

The objective of this part of the call is to position Europe as world leader in innovation through nature based solutions to simultaneously improve economic (new products, services, mobilization of new investments), social (jobs, well-being, community solidarity and health) and environmental (preservation and restoration of biodiversity, ecosystems and ecosystem services, sustainable land use and spatial planning, land take and soil sealing, as well as reduced air pollution and noise) resilience of cities, rural and natural areas by taking into account the wider system.

Nature-based solutions are inspired or supported by nature and simultaneously provide environmental, social and economic benefits. Nature-based solutions, such as green and unsealed surfaces in cities, green roofs, and salt marshes and dunes for coastal protection, use the properties and functions of ecosystems to provide water regulation, flood risk protection, climate change adaptation, etc. They are designed to bring more nature and natural features and processes into cities, landscapes and seascapes, through locally adapted and systemic interventions. They are cost-effective, locally attuned, resource efficient, multi-purpose, multi-functional and multi-beneficial[36]. These key features of nature-based solutions make them different from 'grey' infrastructure, such as artificial river banks, dikes, etc. Despite numerous convincing examples of the cost-effectiveness and longer-term social, economic and ecological benefits of these solutions, at present the evidence is fragmented, which has prevented their wider deployment.

The analysis of the proposals submitted to the call for ideas launched in December 2014 showed a strong support for greening / renaturing cities as solutions for urban regeneration and change of life styles in Europe. Stakeholders supported green development initiatives, enhancement of urban socio-economic resilience and climate change adaptation particularly with respect to flooding and heat stress. The main areas of innovation that emerged from the call were flood water management, brownfield remediation, urban renewal and farming, interventions in derelict urban sites to improve energy efficiency as well as social innovation and cohesion, urban governance, methods for eco-system service mapping/ analysing/ planning and management including ICT-based tools and data collection. Several proposals addressed also the need for a systemic approach,

[36] For instance, nature-based solutions to enhance surface water retention from storm water or flooding can also enhance biodiversity, improve air quality, mitigate heat island effects, provide health and recreational benefits and improve the general attractiveness of the city for citizens and businesses.

multi-stakeholder involvement, better funding mechanisms, and partnerships and strategies to overcome regulatory obstacles.

EU-wide evidence and a European reference framework about the cost-effectiveness of nature-based solutions to address societal challenges would contribute to create a global market, supporting both supply and demand, mobilise new investment strategies and promote their large-scale deployment.

The outcomes of the Horizon 2020 Expert Group on nature-based solutions have also fully been taken into account in prioritising the challenges addressed through the deployment of nature-based solutions and the knowledge gaps for which further evidence is necessary.

Sustainable cities through nature-based solutions

For topics SC5-8-2016 and SC5-8-2017 the following conditions prevail:

Innovation actions supported under this area will be implemented via large-scale demonstration projects. A 'front-runners' and 'followers' cities[37] approach will be adapted to facilitate the rapid exploitation and replication of the solutions.

The 'front-runners' are cities that are committed to invest, develop, deploy and test innovative nature-based solutions at pilot scale (district level) to address the specific challenges identified under each of the topics below. They will provide evidence on their efficacy in addressing the challenges, and their cost-effectiveness compared to alternative options.

The 'followers' are participating cities sharing similar societal challenges as the front-runners. They commit to develop, whilst proactively seeking advice, assistance and mentoring from the front-runners, an urban plan that replicates the demonstrated solutions, “customised” to their particular context, and developed in a participatory, trans-disciplinary and multi-stakeholders way. This urban plan is a contractual obligation and should therefore be delivered by the end of the project. Followers shall have privileged contacts with the project partners and access to the know-how and outcomes of the project. They shall participate in the definition of user requirements and the design of the methodology for transferring solutions, data, etc. To maximise the benefits of the activities, processes and solutions for a broader community beyond the limits of the project, 'front-runner' cities should also engage in further networking and knowledge-sharing efforts (as 'coaching cities') with cities beyond those directly involved in the project.

Replication critically depends on the early and active involvement of follower cities in the project, the effective and continuous knowledge transfer, mentoring and support (e.g. through staff exchanges) from the front-runner cities.

[37] Cities of all sizes (large, medium and small or even neighborhoods) are eligible. The criterion for the selection of the area of intervention should be the size of the impact that such an intervention will make, the potential for up scaling/replicating the tested solutions to larger scales and testing social, economic and governance innovation enabling a systemic design and implementation of the nature based solutions (e. g. adapting multi-stakeholder and trans-disciplinary approaches in co-designing, co-developing and co-implementing the solutions).

Proposals shall establish a well-defined “baseline” regarding the challenges in participating cities. This is a prerequisite to enable a credible assessment of the impact (both benefits and co-benefits) of the deployed solutions. Solutions proposed should be innovative, untested (first of a kind) and replicable. They should have a systemic impact at the scale of intervention.

The success potential of the proposal will be assessed according to (i) the innovative character of the nature-based solutions deployed and of the processes envisaged to co-design, co-develop and co-implement the solutions and urban planning; (ii) the long-term commitment, both political and financial, of the competent authorities that would guarantee the project implementation independently of possible changes in the urban political context during the project; (iii) the guarantee of sustainable financing through mobilisation and leveraging of investments, and the deployment of appropriate business and replication models; (iv) the setting-up of robust monitoring schemes to measure the interventions impacts against the baseline situation; (v) the sound documentation and dissemination of results; (vi) the engagement of the 'front-runners' in mentoring, advising and transferring knowledge to the ‘followers’, which shall pro-actively seek such support from the front-runners; and (vi) the innovation, replicability, standardisation and market potential of the proposed solutions, financing and business models and protocols.

For an effective involvement, planning, decision-making and implementation processes, partnerships should involve competent local, city and regional authorities, community groups, enterprises, academics and local communities in a clearly defined structure with roles and responsibilities properly spelled out for all involved parties. Social sciences and humanities are deemed essential in steering these processes.

To maximise benefits at European level, each project must involve at least 2 front-runner cities and 3 follower cities from different Member States and/or Associated States.

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged. To this end, participation of 'follower' cities from non-EU countries would enhance the potential for international replication, including in the context of the EU-China Sustainable Urbanisation Partnership and the EU-China Innovation Dialogue. This would contribute to the creation of a global market for nature-based solutions.

Because of the substantial investments that might be necessary for the instalment of the nature-based solutions, additional, complementary and follow-up funding, private or public should be sought. This includes financing from regional/national schemes under the European Structural and Investment Funds (ESIF) – in particular under the European Regional Development Fund (ERDF). To this end, projects could seek contact with ERDF managing authorities and with the authorities who developed the Research and Innovation Smart Specialisation Strategies (RIS3). The responsible regional/national authorities could then take an interest in the projects and their expected results and thus engage in the sharing of the investments needed for the successful implementation of the project. They could also engage in making optimal use and deployment of the novel solutions resulting from projects e.g. in other cities facing similar challenges, or through (pre-commercial) public procurement for innovative solutions. The project proposals could already indicate which interested regions/countries or other partners have been pre-identified.

SC-8-2016: Demonstrating innovative nature-based solutions for climate and water resilience in cities

Specific challenge: Cities account for 72% of European population, 75% of global energy consumption and 80% of greenhouse gas emissions generated by human activity. Cities are one of the major contributors to climate change, to which impacts they are extremely vulnerable. Moreover, growing urban populations, pollution and economic activities place water resources under severe stress, exacerbating demand whilst affecting the quality and quantity of supply. Climate change mitigation and adaptation and the sustainable management of water resources are therefore key challenges for the cities in Europe and beyond.

Fragmented evidence exists that nature-based solutions can significantly enhance the climate change and water resilience of cities, while also delivering ancillary benefits: carbon sequestration, mitigation of heat island effects, natural cooling and heating, recreation due to dual use spaces, mitigate soil sealing effects, enhance soil, water quality and air quality, mitigate noise pollution, habitat creation, ecosystem restoration, filtering of pollutants, etc. The challenge is to provide a robust, EU-wide evidence and develop a European reference framework on nature-based solutions for regional and local city authorities, communities, enterprises and other stakeholders about the benefits, cost-effectiveness and economic viability of these solutions to enhance climate and water resilience in cities and thus promote their large scale deployment and the creation of a global market.

The introduction to this part of the call complements the text of this topic and provides essential details. To ensure complete understanding of the issues to be addressed, it is advisable to read it carefully.

Scope: Actions should develop and deploy, via large-scale demonstrations, novel nature-based solutions to enhance climate change resilience and water resources management for cities and enable their replication and up-scaling. They shall adopt a 'front-runner' and 'follower' cities approach – as described in the introduction to this section. This topic covers only the challenges associated with climate change adaptation and mitigation, and sustainable urban water management that can be addressed through the deployment of nature-based solutions, and not through other technologies.

Projects should aim to:

- develop, deploy (at district level), demonstrate and upscale in the 'front-runner' cities, as 'living laboratories', innovative, systemic and yet locally attuned nature-based solutions to enhance climate change and water resources resilience in the cities. Solutions should be co-designed, co-developed and co-implemented in a trans-disciplinary, multi-stakeholder and participatory context and systemically embedded in an integrated urban and land use planning;
- assist 'follower' cities with climate change and various types of water challenges through provision of expertise, advice and capacity building in the development, within the duration of the project, of a sustainable urban planning to successfully replicate nature-based solutions to improve water efficiency, reduce water demand and contribute to climate change mitigation and adaptation. The ‘follower’ cities should engage in pro-

actively seeking such assistance. The urban planning should be delivered by the end of the project;

- develop integrated protocols and schemes for monitoring the performance and impact of solutions for a period of at least 2 years within the life of the project. Longer term monitoring will give an added value to the proposal;
- develop methodologies to assess benefits, co-benefits (such as enhancement of biodiversity, natural capital, human well-being and health, etc.) and negative impacts that deployment of nature-based solutions could entail, for an accurate assessment of their overall cost-effectiveness and performance in improving resilience to climate change and water-related challenges in the cities;
- develop methodologies for replication and up-scaling as well as of the approach for their systemic integration in the urban and land use planning;
- identify barriers related to policy/regulatory frameworks of relevance to these solutions and propose ways to overcome them;
- gather data and information on relevant behavioural patterns, gender differences and cultural norms to be addressed for the acceptance and deployment of nature-based solutions;
- collect, synthesise and systematically document information and provide evidence on practices and lessons learnt regarding the deployment, cost-effectiveness (including benefits and co-benefits) and performance of nature-based solutions and make this evidence base readily accessible to a EU-wide community of relevant stakeholders using appropriate digital technologies, ICT and innovative communication strategies and tools;
- establish long-term sustainable data platforms securing open, consistent performance measurements and interoperability of data infrastructures to ensure effective communication, public consultation, exchange of practices and sharing of experiences and a continuous building up of the 'knowledge portfolio'.

Proposals shall address **all** of the above points.

Resources should be envisaged for clustering the projects financed under the "Sustainable urbanisation through nature-based solutions" part of this call and, if possible, under other relevant parts of Horizon 2020. Trans-disciplinary and community-based approaches including social sciences, arts and humanities in the design and deployment process of the solutions is considered necessary.

As illustrated by proposals responding to the call for ideas, the Commission considers that proposals requesting a contribution from the EU of at least 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: Projects are expected to contribute to:

- the emergence, deployment and EU leadership of a of a European reference framework on nature-based solutions and a new global market (offer and demand) for nature-based solutions in cities;

- create economic opportunities, new products, services, protocols and standards, leverage of investments, reduced regulative and administrative barriers, and new local green jobs;
- create, by 2020, healthier and greener European cities, with increased climate change (e.g. reduced flood risks, mitigated heat stress) and water resilience thanks to the implementation of nature-based solutions, with better living conditions for all, increased green infrastructure and biodiversity, improved air and water quality, reduced noise and health costs, improved mobility conditions, opportunities for urban farming and increased social cohesion;
- more effective policy making and better informed decision making across Europe based on EU-wide evidence base regarding efficacy, efficiency and comparative advantages of a range of tested, well documented, up-scalable and marketable nature-based solutions to enhance water and climate change resilience allowing for their more transparent comparisons against alternative (no nature-based) options; a broad choice of nature-based options fit for diverse urban contexts at the disposal of city authorities, planners and stakeholders;
- involve and empower citizens, with an enhanced ownership of the solutions through systemic, participatory, trans-disciplinary and multi-stakeholder consultation processes for co-design, co-development and co-implementation of visionary urban planning, innovative governance, business and financing models and investments strategies;
- increase the awareness-raising of the benefits of re-naturing cities, development of skills and creation of 'communities of practice';
- create global market opportunities through replication of approaches and solutions in non-EU countries, including in the context of the EU-China platform;
- enhance the implementation of EU environmental policies, such as the EU Water Framework Directive, 7th Environment Action Programme, EU Biodiversity Strategy to 2020, EU Climate Change Adaptation Strategy, "Blueprint to safeguard Europe's waters" and "Communication on Green Infrastructures", and of sustainable development goals and UN conventions in the fields of biodiversity, soil and land management, disaster risk reduction.

Type of action: Innovation actions

SC5-8-2017: Nature-based solutions for inclusive urban regeneration (including regeneration of deprived districts and neglected or abandoned areas)

Specific challenge: Mass urbanisation presents one of the most urgent challenges of the 21st century. Rapidly developing and changing industrial activities, uncontrolled urban sprawl, large, concentrated and often culturally diverse populations have created numerous complex social and health problems. Issues like derelict industrial sites, dis-functioning urban areas, increased criminality, social exclusion, inequalities, marginalisation, poverty and degraded urban environments have very strong impacts on the quality of life, wellbeing and security of citizens. There is a need to address these social problems, particularly within large disadvantaged communities.

There is convincing but fragmented evidence that nature-based solutions, co-designed and co-developed in a multi-stakeholder and participatory context and integrated in innovative urban design and planning, can reshape the built environment and enhance the inclusivity, equitability and liveability of the cities, regenerate deprived districts, improve mental and physical health and quality of life for the citizens, reduce urban violence, and decrease social tensions through better social cohesion particularly for the most vulnerable groups e.g. children, elderly and people of low socioeconomic status. The challenge is to provide a robust, EU-wide evidence to the regional and local authorities, communities, enterprises and other stakeholders about the multiple benefits, cost-effectiveness and economic viability of these solutions for inclusive urban regeneration in the cities and thus promote their large scale deployment and the creation of a global market.

The introduction to this part of the call complements the text of this topic and provides essential details. To ensure complete understanding of the issues to be addressed, it is advisable to read carefully.

Scope: Actions should develop and deploy, via large-scale demonstrations, novel nature-based solutions for urban regeneration – including regeneration of deprived districts and neglected or abandoned areas at district level. Projects shall adopt a 'front-runner' and 'follower' cities approach (see also introductory text) in order to enable their replication and up-scaling. They shall test to what extent nature-based solutions reduce crime and security costs, enhance human health, wellbeing and social cohesion,

The role of social innovation, and hence the participation of social sciences and humanities disciplines such as law, economics, political science, architecture or design studies, is particularly important to properly address the complex challenges of this topic.

Projects should aim to:

- develop, deploy at district level, demonstrate and upscale in the 'front-runner' cities as 'living laboratories' innovative, systemic and yet locally attuned nature-based solutions for inclusive urban regeneration (including through regeneration of deprived districts and neglected or abandoned areas in the cities). Solutions should be co-designed, co-developed and co-implemented in a trans-disciplinary, multi-stakeholder and participatory context and systemically embedded in an integrated urban and land use planning;
- assist 'follower' cities through provision of expertise, advice and capacity building in the development, within the duration of the project, of a sustainable urban planning to successfully replicate nature-based solutions for inclusive urban regeneration (including through regeneration of their deprived districts or abandoned areas in the cities), reduced crime and security costs, enhanced human health, wellbeing and social cohesion. The ‘follower’ cities should engage in pro-actively seeking such assistance from the ‘front-runners’. This urban planning is a deliverable of the project;
- develop integrated protocol and monitoring schemes for monitoring performance and impact of solutions for a period of at least 2 years within the life of the project. Longer term monitoring commitment beyond the end of the project will give an added value to the proposal;
- develop methodologies to assess both benefits and co-benefits (e.g. enhancement of biodiversity and natural capital, reduction of noise and air pollution, etc.), including potential

negative impacts that deployment of nature-based solutions could entail, so that they can all be accounted for in the assessment of their overall cost-effectiveness and performance; develop methodologies for replication and up-scaling of the solutions as well as of the approach for their systemic integration in the urban and land use planning;

- identify and assess barriers related to policy/regulatory frameworks of relevance to these solutions and propose ways to overcome them;
- gather data on the affordability of nature-based solutions in deprived districts, collecting information on how factors such as gender, age, disability and culture interact with the deployment of such solutions;
- collect, synthesise and systematically document information and evidence on practices and lessons learnt regarding the deployment and performance of nature-based solutions and make this evidence base readily accessible to a EU-wide community of relevant stakeholders using appropriate digital technologies, ICT and innovative communication strategies and tools;
- establish long-term sustainable data platforms securing open, consistent data and performance measurements and interoperability of data infrastructures to ensure effective communication, public consultation, exchange of practices and sharing of experiences and a continuous building up of the 'knowledge portfolio'.

Proposals shall address **all** of the above points.

Resources should be envisaged for clustering the projects financed under the "Sustainable urbanization through nature-based solutions" part of this call and – if possible – also under other relevant parts of Horizon 2020. Trans-disciplinary, participatory and community-based approaches including social sciences, arts and humanities in the design and deployment of the solutions process are considered necessary.

The Commission considers that proposals requesting a contribution from the EU of at least 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: Projects are expected to contribute to:

- in the mid-term, EU leadership of a new global market (offer and demand) for nature-based solutions in cities in Europe and worldwide, new economic opportunities, new products, services, protocols and standards, leverage of investments, reduced regulative and administrative barriers, and new local green jobs;
- healthier and greener regenerated (including deprived districts and neglected or abandoned areas**)** European cities by 2020 due to the implementation of nature-based solutions with better living conditions for all, reduced crime and security costs, increased green infrastructure and biodiversity, improved air and water quality, enhanced human health and wellbeing, reduced health costs, improved mobility conditions, opportunities for urban farming and increased social cohesion;
- more effective policy making and better informed decision making across Europe based on EU-wide evidence base regarding efficacy, efficiency and comparative advantages of a range of tested, well documented, up-scalable and marketable nature-based solutions for inclusive

urban regeneration (including regeneration of deprived districts and neglected or abandoned areas**)** allowing for their more transparent comparisons against alternative (no nature-based) options; a broad choice of nature-based options fit for diverse urban contexts at the disposal of city authorities, planners and stakeholders;

- effective involvement, citizens empowerment and enhanced ownership of the solutions through systemic, participatory, trans-disciplinary and multi-stakeholder consultation processes for co-design, co-development and co-implementation of visionary urban planning, innovative governance, business and financing models and investments strategies;
- awareness-raising of the benefits of re-naturing cities and creation of 'communities of practice';
- increased international cooperation and global market opportunities through replication of approaches and solutions in non-EU countries, including in the context of the EU-China platform;
- enhanced implementation of EU environmental policies, such as EU Water Framework Directive, 7th Environment Action Programme, EU Biodiversity Strategy to 2020, EU Climate Change Adaptation Strategy, "Blueprint to safeguard Europe's waters" and "Communication on Green Infrastructures and of sustainable development goals and UN conventions in the fields of biodiversity, soil and land management, disaster risk reduction.

Type of action: Innovation actions

SC5-9-2016: New governance, business, financing models & economic impact assessment tools for sustainable cities with nature-based solutions (urban re-naturing)

Specific challenge: To promote their sustainability, vitality and competitiveness and secure healthy and liveable environments to their citizens, cities need to adopt a systemic and trans-disciplinary approach in developing solutions to address the numerous and complex urban challenges. Re-naturing cities can provide solutions to these challenges because they have proven to be multi-purpose and multi-beneficial. To enable the systemic integration of these solutions into a sustainable urban planning, new governance, business, financing models and partnerships are needed to enable leverage of investments, synergies between private and public actions and trans-disciplinary decision making. Solutions have to be co-designed, co-developed and co-implemented by all stakeholders and societal actors to secure a collective ownership and buy-in.

Scope: Actions should:

- map and analyse existing experiences and practices and recommend innovative business models, financing mechanisms (e.g. crowd funding) and governance arrangements to develop socially acceptable urban 're-naturing' planning through participatory, multi-stakeholder and trans-disciplinary way, involving also local communities, empowering citizens and allowing for an equitable distribution of costs and benefits at different scales and trade-offs, resolution models, new forms of partnerships (e.g. public-private) and strategies for mobilising new investments and creating new business opportunities;
- develop and validate analytical frameworks and methodologies, tools, protocols, standards, indicators and matrixes to: characterize nature-based solutions; assess their cost-effectiveness

(accounting for both benefits, co-benefits and possible negative impacts) as compared to alternative combinations of green/grey/hybrid solutions; identify their limits under different conditions and assess confidence intervals, performance thresholds and corresponding uncertainties;

- develop and validate decision-support tools, models, management strategies, guidelines and recommendations that would allow for their replicability and scalability and to assist the urban re-naturing design process related to issues such as placement, distribution and type of greening, distance and size-dependence of the effects of green areas, geometry etc.;
- identify cultural, social, economic, institutional, legal, regulatory and administrative barriers, incentives/disincentives fostering/discouraging the implementation of nature-based solutions and bottlenecks at city, regional, national and EU level, including aspects such as citizens' perceptions and willingness to pay to conserve/enhance urban green space, for re-naturing cities to enhance their economic, social and environmental resilience, and recommend ways to overcome them.

Proposals shall address **all** of the above points.

The role of social innovation, and hence the participation of social sciences and humanities, is particularly important to properly address the complex challenges of this topic. Resources should be envisaged for clustering the projects financed under the "Sustainable urbanization through nature-based solutions" part of this call and – if possible – under other parts of Horizon 2020.

The Commission considers that proposals requesting a contribution from the EU of around EUR 7.5 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: Projects are expected to contribute to:

- develop enhanced strategies, new institutional and governance arrangements and new finance and business models, fostering multi-stakeholder involvement, citizens' engagement and empowerment, leveraging both public and private funding of nature-based solutions in cities;
- kick-start of a collective learning process to foster creative and visionary urban design in re-naturing cities, securing an equitable distribution of the multiple benefits that city re-naturing entails to various stakeholders and citizens at different scales;
- develop an integrated evidence base and a European reference framework on nature-based solutions, in order to create a global market; new business opportunities, growth and jobs, and a green economy;
- optimise the policy and regulatory and administrative frameworks;
- shift in public and private investments from conventional to nature-based or effective combinations of nature/grey/hybrid solutions to urban challenges.

Type of action: Research and innovation actions

SC5-10-2017: Large-scale demonstrators on nature-based solutions for hydro-meteorological risk reduction

Specific challenge: Economic damage costs from extreme hydro-meteorological events (floods, droughts, storm surges, landslides) are increasing throughout Europe. Further investment in traditional, engineering solutions for risk prevention is no longer possible in several cases, due to the very high costs, and to the limited flexibility offered by such solutions to cope with extreme events of higher frequency and intensity. Nature-based solutions can be flexible, multi-beneficial alternatives to traditional engineering, but an adequate proof-of-concept for their upscaling and replication is lacking.

Scope: Actions should aim to build territorial, socio-economic and ecological resilience and coherence in rural and natural areas to cope with climate change, natural hazards and ecosystem degradation. The emphasis is on addressing both long-term and short-term climate related risks and threats to ecosystems in particularly sensitive rural and natural areas, including coastal ones, through enhanced governance capacities using ecosystem management and nature-based solutions. This will promote the integration of ecosystem-based approaches in land use planning and landscaping in a cost-effective and optimal way that links the reduction of risks with local and regional sustainable development objectives and contribute to the development of an integrated evidence base and a European reference framework on nature-based solutions.

Projects shall develop and deploy via large-scale demonstration projects novel nature-based solutions for hydro-meteorological risk reduction at watershed/landscape level and enable their replication and up-scaling. Projects should aim to:

- develop, demonstrate and deploy innovative systemic and yet locally attuned nature-based solutions, including green and blue infrastructure and ecosystem-based management approaches, in rural and natural areas, including coastal areas, for hydro-meteorological risk reduction. Solutions should be incorporated in an integrated design concept for land management and planning and be co-designed in a trans-disciplinary multi-stakeholder and participatory context with due consideration to and integration of social and cultural aspects. Trans-disciplinary and participatory approaches in the design and deployment process of the solutions are considered necessary. In this respect the contribution of social sciences, arts and humanities in this process is considered necessary.
- develop a comprehensive framework for the comparison of green and blue/grey/hybrid hydro-meteorological risk prevention and reduction solutions, taking into account wider land use and adaptation to the effects of climate change and methodologies to support widespread deployment in different contexts, considering impacts on landscape, local communities and cultural acceptance as well as co-benefits such as biodiversity conservation/enhancement, more sustainable local livelihoods, human health and well-being, climate change mitigation, etc.;
- identify and assess barriers related to their social and cultural acceptance and policy regulatory frameworks and propose ways to overcome them;

- develop methodologies enabling the replication and up-scaling of nature-based solutions in different contexts, including replication of innovative investment strategies, governance and business models;
- collect, synthesise and systematically document information to provide a consolidated evidence-base on co-development processes, performance standards, cost-effectiveness, operational requirements, life cycle costs and the multiple benefits of nature-based solutions as economically, socially, culturally and environmentally viable alternatives for hydro-meteorological risk reduction and climate change adaptation at watershed/landscape level. Methodologies and evidence should be made readily accessible to an EU-wide community of competent authorities, planners, practitioners, enterprises, citizens and other stakeholders through innovative communication strategies. Relevant options, such as pan-European web-based repositories, should be included to ensure appropriate performance monitoring and assessment in the longer term (i.e. following project completion) for the large-scale demonstrators.

Proposals shall address **all** of the above points.

Projects should include a work-package to cluster with other projects funded under this topic and – if possible – also relevant topics funded under other parts of Horizon 2020.

Because of the substantial investments that might be necessary for the instalment of the nature-based solutions, additional, complementary or follow-up funding should be sought, be it private or public, including from relevant regional/national schemes under the European Structural and Investment Funds (ESIF), in particular under the European Regional Development Fund (ERDF). To this end, projects could seek contact with ERDF managing authorities and with the authorities who developed the Research and Innovation Smart Specialisation Strategies (RIS3). The responsible regional/national authorities could then take an interest in the projects and their expected results and thus engage in the sharing of the investments needed for the successful implementation of the project. They could engage in the use and deployment of the novel solutions resulting from projects e.g. in other areas facing similar hydro-meteorological risks, or through pre-commercial public procurement or public procurement for innovative solutions. Cooperation and synergies with similar international demonstration activities on nature-based solutions for hydro-meteorological risk reduction, funded under different financial arrangements or programmes, is also encouraged to facilitate mutual learning, sharing of experience, networking and follow-up. The project proposals could already indicate which interested regions/countries or other partners have been pre-identified for contact during the project.

The Commission considers that proposals requesting a contribution from the EU of at least 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 impact:

- the EU being recognised as a leader in nature-based solutions for disaster risk reduction.
- mainstreaming of nature-based solutions in territorial policies due to the stimulation of a new culture for 'land use planning' for hydro-meteorological risk reduction, which integrates nature-based solutions in dialogue and collaboration with the relevant societal and economic actors and to the provision of guiding and performance assessment tools and best practices

for nature-based solutions, assisting designers and managers in their decision making processes for reducing hydro-meteorological risks;

- enhanced market demand for nature-based solutions, due to the development of protocols and standards for the design, operation and maintenance, and performance monitoring of nature-based solutions, considering also the potentialities and limits of the solutions under different circumstances and conditions;
- improved disaster risk management, due to enhanced capacity for providing quantitative assessments of nature-based solutions for disaster risk reduction and climate change adaptation and for measuring their broader economic, societal and environmental benefits;
- reduced human and financial costs due to better and more flexible disaster risk management with nature-based solutions;
- enhanced implementation of EU policies for disaster risk prevention and reduction and for climate change adaptation[39], as well as of international frameworks, such as the Sendai Framework for Disaster Risk Reduction 2015-2030.

Type of action: Innovation actions

SC5-11-2016: Insurance value of ecosystems

Specific challenge: There is an increasing trend worldwide in the occurrence and severity of disasters. This trend will be further aggravated by global changes, including environmental and climate change ones. As a result, individual households, industry, private investors and public authorities are finding themselves increasingly exposed to changing and multiple risks. Ecosystems, through the provision of their services, can provide more holistic solutions to disaster risk reduction by simultaneously mitigating the impacts of hazards, enhancing social, economic and environmental resilience, and reducing the exposure and vulnerability of communities, businesses, properties and other economic assets.

To promote the uptake of ecosystem-based approaches for disaster risk reduction, theoretical and empirical exploration of the concept of insurance value of the ecosystems – the value of the sustained capacity of ecosystems to reduce or eliminate risks to human society and economic activities caused by global change or natural hazards – and methodologies for operationalising the concept are needed.

The insurance value of ecosystems comprises both an estimate of reduced risk, due to the physical presence of an ecosystem, and capacity to sustain risk reduction (resilience of the system) under global change. The insurance value of ecosystems has so far been overlooked in research and practice: e.g. socio-economic approaches to estimating insurance value are poorly developed, methodologies for quantifying and qualifying the insurance value of ecosystems are still in their infancy, and relevant institutional and economic incentives to protect, enhance or restore this insurance potential are lacking.

[39] An EU Strategy on adaptation to climate change, COM (2013) 216.

Nature-based solutions, by means of their proper insurance capacity, provide cost-effective solutions to disaster risk management and reduction, but can also be used for protection, restoration, conservation of ecosystems and thus enhancing the insurance value of the latter.

Scope: There is need for trans-disciplinary research on the insurance value of ecosystems, involving legal, economic and financial expertise, to derive relevant quantitative assessments and propose ways through which such concepts can be practically used, for instance to provide incentives for promoting nature-based solutions in risk management agendas. Trans-disciplinary and participatory approaches including social sciences, arts and humanities in the process are therefore considered necessary.

Actions should assess the potential of the insurance value of ecosystems and operationalize it in the design, development and implementation of risk reduction strategies. Proposals should aim to:

- develop methodologies and conceptual frameworks for assessing and monetising the insurance value of nature and to integrate this into the disaster risk management agenda. Analyse the qualitative and quantitative components and features of ecosystems, including urban, needed to sustain the insurance capacity of ecosystems. Provide evidence of the effectiveness of preventing further (ecosystem) degradation and of implementing nature-based solutions to protect, enhance and restore the insurance value of ecosystems, and for the potential of scaling-up from local to regional or other larger geographic scales;
- establish truly comprehensive participatory processes that engage all relevant stakeholders, e.g. individuals, industry, private investors, financial institutions and insurance companies and/or public authorities, in the evaluation, development and implementation of the insurance value of ecosystems taking account of the cultural dimension of the insurance value of ecosystems and people's perceptions of risks and insurance;
- develop and validate reliable and evidence-based methodologies to quantify short-term and long-term costs, benefits and co-benefits, at different scenarios, of increasing insurance capacity of ecosystems;
- provide EU standardised data, methodologies and models for quantifying insurance value by translating risk reduction capacity into (monetary and non-monetary) value for different actors;
- develop and validate innovative financial frameworks and incentives and recommend changes to legal and/or regulatory frameworks for maintaining and/or enhancing the insurance capacity of ecosystems.

Proposals shall address **all** of the above points.

Projects should include a work-package to cluster with other projects financed under this topic and – if possible – also under other parts of Horizon 2020.

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: Projects are expected to :

- provide a robust scientific underpinning on the quantification, qualification and valuation of the insurance value of ecosystems to enable its full operationalization;
- integrate ecosystems insurance value into conventional insurance policies, leading to lower premiums for land and property insurance policies and decreased public costs for risk management and reduction;
- develop new public and private sector insurance models for resilience;
- increased participation and commitment of insurance companies to maintain or enhance the insurance capacity of ecosystems through innovative business models;
- deploy multi-purpose and flexible, nature-based solutions by contributing to the development of policies that maintain or enhance the insurance capacity of ecosystems
- create new business models that involve insurance companies in restoration activities;
- enhance natural capital;
- create business opportunities and a market for the preservation, restoration and protection of ecosystems and natural capital;
- contribute to the objectives and the review of the EU Adaptation Strategy [40], particularly on what concerns the promotion of insurance and other financial products for resilient investment and business decisions, taking also into consideration the options presented at the Green paper on the insurance of natural and man-made disasters[41].

Type of action: Research and Innovation actions

SC5-12-2016: Multi-stakeholder dialogue platform to promote innovation with nature to address societal challenges

Specific challenge:

To promote innovation with nature, speed up market up-taking of nature-based solutions for solving societal challenges, enhance Europe's competitiveness and contribute to job creation and economic growth, there is a need to maintain and strengthen the evidence base for policy making, as well as business and investment decisions, on nature-based solutions to societal challenges through a multi-stakeholder dialogue that includes multi-disciplinary scientific expertise, policy, business and society, including NGOs, CSOs, and citizens as appropriate.

Scope: There is a need to develop an integrated evidence base and a European reference framework on nature-based solutions, foster better use of available knowledge to reach a high-level deployment of nature-based solutions to coordinate research and innovation on nature-based solutions within Europe and beyond. This can be best achieved through an EU innovation platform that would ensure strategic, effective and sustained dialogue between science, policy,

[40] An EU Strategy on adaptation to climate change, COM (2013) 216.
[41] Green paper on the insurance of natural and man-made disasters, COM (2013) 213

business and society to foster the co-design, testing and deployment of large-scale demonstration of improved and innovative nature-based solutions to societal challenges taking due account of the projects to be funded under the "Nature-based solutions for sustainable cities and territorial resilience" part of this Work Programme, as well as other ongoing (such as the Biodiversa ERA-net[42]) or upcoming (such as the EU Mechanism for Biodiversity and Ecosystem services[43]) initiatives of high relevance to this area.

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Actions should:

- establish a broad multi-stakeholder (science, policy, business, society) and multi-level (local, regional, national and EU) platform and launch innovation partnerships for developing and testing improved and innovative nature-based solutions (think-and-do-tank);
- identify and promote successful innovative nature-based solutions, by developing appropriate handbooks and consolidating best practices, and foster stakeholders' ownership and commitment for their large scale deployment;
- foster dialogue and collaboration across levels (stakeholders and governance) and with key strategic international partners. In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged, in particular with key strategic international partners such as Latin America, countries participating in the Belmont Forum, and South East Asia.

Proposals shall address **all** of the above points.

The Commission considers that 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: Actions are expected to lead to:

- strategic, effective and sustained multi-stakeholder dialogue between science, policy, business, society to support the research and innovation policy making process on nature-based solutions to societal challenges, functional within one year after the onset of funding;
- increased awareness, interest and commitment to invest in innovative nature-based solutions by stakeholders, decision- and policy makers, as well as from the private sector;
- enhanced impact of research and innovation activities through better identification of innovation priorities, potential and requirements (both from the demand and the supply side) to stimulate a market for nature-based solutions, in collaboration with relevant actors, including businesses, SMEs and private investors;
- improved coordination among EU, Member States and Associated and Accession Countries on research, innovation and demonstration activities as well as sharing of practices,

[42] http://www.biodiversa.org/

[43] Horizon 2020 Work Programme SC5-10c-2015: Coordinating and supporting research and innovation for the management of natural resources: An EU support mechanism for evidence-based policy on biodiversity & ecosystems services.

knowledge and expertise to promote the deployment of nature-based solutions as cost-effective and economically viable means to address societal challenges;

- improved cooperation and synergies with relevant strategic international research and innovation programmes and key strategic international partners (e.g. developing countries, US, Brazil, SE Asia, China) in order to create a global market on nature-based solutions.

Type of action: Coordination and support actions

Water

Introduction:

The objective of this part of the call is to harness water's strong potential for European industry (including SMEs) to become global market leader by continuing the efforts undertaken in the 2014-2015 Focus Area call 'Water Innovation: Boosting its value for Europe', i.e. bringing innovative water solutions to the market and supporting the implementation of the objectives of the European Innovation Partnership (EIP) and of the Joint Programming Initiative on Water.

Water is a key resource and intervention at EU level is crucial to meet water demand from increased urbanisation and agriculture, and to manage the competition for scarce water from multiple uses and the water/energy nexus. Moreover, water, as part of the Sustainable Development Goals agenda, can provide additional opportunities for international co-operation (e.g. in the Mediterranean region). Water issues are therefore addressed across the entire Horizon 2020 structure and integrated in the work programmes of LEIT and of several Societal Challenges. Within the concept of the systemic approach of Societal Challenge 'Climate action, environment, resource efficiency and raw materials', actions to boost water innovation for Europe and beyond are also addressed in the areas of the circular economy, renaturing cities, climate-smart Europe, resilience etc. Topics in the Work Programme 2016-2017 with a clear relevance to water issues include the following:

[Cross-referencing to other topics in the WP addressing water will be included here at a later stage when the topic titles and number are final, including SC5 topics in the 'Industry 2020 in the Circular Economy' and other calls.]

SC5-13-2016: Supporting international cooperation activities on water

Specific challenge: The outreach and opening of Water JPI to third country partners is increasingly raising interest among its members and among third countries as demonstrated in recent meetings with third countries such as South Africa and India, and in international fora like the Belmont Forum. Building on this momentum, the challenge is to further enhance the opening of the Water JPI to international cooperation and thus contribute to creating a coherent European Research Area that is open to international cooperation in the area of water – a global R&I challenge par excellence.

Scope: Actions should aim to create a framework and permanent dialogue to encourage the opening in a structured and strategic manner of the Water JPI to international cooperation with

key international water research and innovation programmes and funding and investment institutions. This should align with and support the post-2015 sustainable development agenda, in particular the Sustainable Development Goal on water. Flagship actions for possible joint funding between the members of the JPI Water, international cooperation partners and international programmes of strategic importance for the EU should be identified and prepared for.

This action should also organise and develop the knowledge base required to address water challenges and EU policy priorities within a global perspective, by providing access to and an integrated analysis of research results from national and EU funded research and innovation projects.

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: Projects are expected to:

- increase the scale and ambition of water research and innovation activities beyond the level that would be otherwise sustainable, increasing overall the coherence and efficiency in the use of European resources and valorise European know-how on water solutions at global level in the context of the post-2015 sustainable development agenda;
- contribute to making the Water JPI a privileged and attractive partner for global cooperation in research and innovation;
- strengthen the role of the Water JPI in underpinning knowledge and evidence for supporting the implementation of related EU policies and for fostering the EU's position in global water-related negotiations and fora.

Type of action: Coordination and support action

SC5-14-2016 or 2017: Food systems and water resources for the development of inclusive, sustainable and healthy Euro-Mediterranean societies

[Placeholder: to be developed; will be added to call tables when finalised]

Specific challenge: Rapid demographic, socio-economic, and climate changes are threatening the sustainable development of the Mediterranean region, especially the capacity of its agriculture to cope with increased demand for food production in a scenario of water scarcity and increasing competition for water use between different sectors. A significant and well-coordinated research effort at regional scale is needed to find innovative solutions to further improve water productivity at farm and processing levels. In its recent conclusions on a partnership for research and innovation in the Mediterranean area, the EU Council recalled the importance of creating a stable long-term and sustainable framework to deal with these challenges, based on the principles of co-ownership, mutual benefit and shared benefit. To ensure a long term commitment from the participating countries in a well-structured and integrated partnership, it is necessary to prepare the ground by integrating various related on-going joint programming activities on food and

water into a large scale coherent programme with well-defined objectives and implementation actions.

Scope: The objective of this action is to bring together the main national research funding owners and/or managers involved in the PRIMA joint programming process, including the non-European participating states and their institutions, around a jointly designed Strategic Research Agenda with appropriate governance and implementation structures.

Expected impacts: Projects are expected to:

- reinforce cooperation and coordination of food systems and water research programmes within a long term partnership involving research funding bodies from the two sides of the Mediterranean area, reduce fragmentation of efforts and enhance a collective ownership;
- facilitate consultation, awareness and commitment;
- support structural, long-lasting progress toward sustainable economic and social development in the Mediterranean;
- unlock the innovation potential of participating countries in water management and use for food security;
- optimise the launch and implementation of a long term partnership, ensuring an appropriate funding from the participating countries and leverage effect.

Type of action: *Tbd*

Raw Materials

Introduction:

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. However, Europe is confronted with a number of challenges along the entire raw materials value chain, from sustainable exploration, extraction, processing and recycling to secure a sustainable access to non-energy non-agricultural raw materials used for industrial purposes, including Critical Raw Materials.

Similarly as in the first programming period of Horizon 2020 covering 2014-2015 the actions in the raw materials part of the Societal Challenge 5 are expected to contribute to the implementation of both the Raw Materials policy[44] and the Strategic Implementation Plan[45] of the European Innovation Partnership (EIP) on Raw Materials.

The main focus of the raw materials part is on securing supply of minerals and metals through innovative production technologies for primary and secondary raw materials. This part is complementary to cross-cutting call on "Industry 2020 in the Circular Economy" focused more on resource-efficiency, re-use and product life cycles.

In order to reach the critical mass of available funding, issues related to bio-based materials (wood-based and natural rubber) are mainly targeted by the Societal Challenge 2: Food security, sustainable agriculture and forestry, marine, maritime and inland water research, and the bio-economy and the Joint Undertaking for Bio-Based Industries (BBI). Similarly, substitution of Critical and scarce Raw Materials would mainly be addressed under the Industrial leadership pillar of Horizon 2020 in the part of Advanced materials and nanotechnologies (NMBP 03-2016: Innovative and sustainable materials solutions for the substitution of critical raw materials in the electric power system).

The raw materials part builds on the first Research and Innovation Actions at lower Technology Readiness Levels (TRL) (3-6), and the Co-ordination and Support Actions launched in 2014-2015. The first large innovative pilot actions at higher TRL levels (6-8) are planned to demonstrate viability of a cost-effective, environmentally sound and safe production of primary and secondary raw materials and unlocking a substantial volume of various raw materials within the EU. For the pilot actions the opportunities to harness funding from ESIF will be explored. Complementary actions with relevance to raw materials are targeted by calls under SPIRE PPP (e.g. SPIRE 07-2017: Integrated approach to process optimisation for raw material resources efficiency, excluding recovery technologies)

Co-ordination and Support actions will target different parts of the raw materials value chain, including the framework conditions for primary and secondary raw materials production that would provide a stable and competitive supply from the EU sources; building the EU knowledge base of primary and secondary raw materials; better co-ordination of the Member States' R&I programmes and funded activities; as well as international co-operation with countries producing and using raw materials.

[44] 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

[45] https://ec.europa.eu/eip/raw-materials/en/content/strategic-implementation-plan-sip-0

SC5-15-2016/2017: 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 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.

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 proposals should develop solutions through industrially-driven multidisciplinary consortia covering the relevant value chain. A participation of SMEs with R&D capacities is encouraged.

Assessment of the related environmental and safety risks and a plan to communicate the added value of the proposal to the local communities and society for improving public acceptance and trust should be addressed by all the proposals. A participation of civil society is strongly encouraged.

Projects should include a work-package to cluster with other projects financed under this topic and – if possible – also under other parts of Horizon 2020.

Proposals should develop solutions validated in lab or in industrially relevant environment, finishing at the level of Technology Readiness Levels (TRL) 4-5.

Proposals shall address **only one** of the following issues:

SC5-15a-2017: New sensitive exploration technologies

Scope: Proposals should develop new and more sensitive exploration technologies and solutions able to identify targets for detailed exploration with lower costs, leading to finding new deposits and to re-assessing the mineral potential for the EU. The solutions could include remote sensing technologies, innovative multi-method approaches to reprocess existing or new geophysical data. Any of the metallic, industrials and/or construction minerals could be targeted; however, the importance of the targeted raw materials for the EU economy has to be duly justified. Proposals should include the participation of science and technology oriented SMEs, as far as possible.

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 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.

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

Expected impact: Projects are expected to justify and provide evidence that they lead to:

- achieving the objectives of the EIP on Raw Materials;
- pushing the EU to the forefront in the area of sustainable exploration technologies and solutions;

- reducing the exploration costs for the industry through new cost-effective exploration technologies;
- increasing the reserves of various primary raw materials within the EU;
- in longer term improving the competitiveness of and creating added value and new jobs in raw materials producing and downstream industries.
- improving the awareness, acceptance and trust of society in a sustainable Raw materials production in the EU;

SC5-15b-2016: Sustainable selective low impact mining

Scope: Proposals should develop new selective low impact technological solutions for mining of small mineral deposits (including small complex deposits) on the continent. The proposals have to clearly show integration of mining solutions with the processing and/or metallurgy steps in order to justify economic viability of the overall process. Proposals should include the participation of science and technology oriented SMEs, as far as possible.

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 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.

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

Expected impact: Projects are expected to justify and provide evidence that they lead to

- achieving the objectives of the EIP on Raw Materials.
- pushing the EU to the forefront in the area of sustainable mining technologies and solutions.
- unlocking substantial reserves of new or today unexploited resources within the EU.
- improving the economic viability of small industrial mining operations.
- improving the competitiveness and creation of new jobs in mining and/or equipment manufacturing industries.
- improving the environmental, health and safety performance of the operations.
- improving the awareness, acceptance and trust of society in a sustainable Raw materials production in the EU.

SC5-15c-2016: New technologies for the enhanced recovery of by-products

Proposals should, first of all, evaluate the potential by-products existing in primary or secondary raw materials (usually accompanying the major raw materials at low concentrations). Secondly, they should develop energy-, material- and cost-efficient new mineral processing and/or

metallurgical technologies and processes to increase the effectiveness of the selectivity and the recovery rates of valuable or critical by-products (accompanying materials and elements).

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 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.

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

Projects should target actions finishing at Technology Readiness Levels (TRL) 4-5.

Expected impact: Projects are expected to justify and provide evidence that they lead to:

- achieving the objectives of the EIP on Raw Materials;
- pushing the EU to the forefront and improving the competitiveness and creation of new jobs in processing, refining, equipment manufacturing and downstream industries;
- increased process selectivity, broader range and higher recovery rates of valuable, strategic or critical raw materials and elements that accompany the major raw materials at low concentrations in primary and/or secondary raw materials, leading to increased reserves of primary and secondary raw materials in Europe;.
- 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 stronger resource depletion of waste generated.
- improving the health and safety performance of the operations.
- improving the awareness, acceptance and trust of society in a sustainable Raw materials production in the EU.

Type of action: Research and innovation actions

SC5-16-2016/2017: Raw materials Innovation actions

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 make sure that research and innovation end-up on the market, to strengthen the competitiveness of the European raw materials industries, to meet ambitious energy and climate 2030 targets and to gain the trust of the EU citizens to raw materials sector.

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: The main objective is to develop innovative pilots demonstrating sustainable production of raw materials in the EU, from primary and/or secondary sources as one of the major targets of the European Innovation Partnership (EIP) on Raw Materials.

All proposals should:

- justify relevance of selected pilot demonstrations, finishing at Technology Readiness Levels (TRL) 6-8, in different locations within the EU (and also outside if there is a clear added value for the EU economy, industry and society);
- facilitate the market uptake of solutions developed through industrially-driven multidisciplinary consortia covering the relevant value chain;
- include an outline of the initial exploitation and business plans (with indicated CAPEX, OPEX, IRR and NPV[46]) with clarified management of Intellectual Property Rights, and commitment to the first exploitation;
- assess environmental and safety risks and their management for all proposed actions;
- include a plan to communicate the added value of the proposal to the local communities and society for improving public acceptance and trust should be addressed by all the proposals. A participation of civil society is strongly encouraged.

Wherever possible, proposers could actively seek synergies, including possibilities for funding, with relevant national/regional research and innovation programmes.

Within the projects funded, additional, complementary or follow-up funding should be sought, be it private or public, including from relevant regional/national schemes under the European Structural and Investment Funds (ESIF), in particular under the European Regional Development Fund (ERDF). To achieve this, projects could seek contact with ERDF managing authorities and with the authorities who developed the Research and Innovation Smart Specialisation Strategies (RIS3). The responsible regional/national authorities could then take an interest in the projects and their expected results. They could engage in the use and deployment of the novel solutions resulting from projects e.g. through pre-commercial public procurement or public procurement for innovative solutions. The project proposals could already indicate which interested regions/countries or other partners have been pre-identified for contact during the project.

Projects should include a work-package to cluster with other projects financed under this topic and – if possible – also under other parts of Horizon 2020.

Proposals shall address **only one** of the following issues:

SC5-16a-2016: Intelligent mining

[46] Capital expenditures (CAPEX), operational expenditure (OPEX), internal rate of return (IRR), and net present value (NPV)

Scope: Proposals should develop and demonstrate a new intelligent mining system to increase profitability, to avoid exposure of workers in dangerous operations, and to minimise environmental impacts of the mining operations. Any of the metallic, industrials and/or construction minerals could be targeted; however, the importance of the targeted raw materials for the EU economy has to be duly justified.

In line with the EU's strategy for 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.

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

- contribute to achieving the objectives of the EIP on Raw Materials;
- have a market potential and the competitive technology advantage that will be gained through the pilot leading to expanding the EU business and to be implemented across the EU after the project is finished.;
- push the EU to the forefront in the area of mining technologies and solutions;
- lead to unlocking substantial reserves of new or today unexploited resources within the EU.
- create added value and new jobs in raw materials producing, equipment manufacturing, information and communication technologies and/or downstream industries;
- lead to improving the environmental, health and safety performance of the operations;
- improve the awareness, acceptance and trust of society in a sustainable Raw materials production in the EU;

SC5-16b-2017: Processing of lower grade and/or complex primary and/or secondary raw materials in the most sustainable ways

Scope: Proposals should demonstrate new physical, chemical, biological and / or mechanical processing technologies for the comminution, separation, extraction, pre-treatment and recovery of minerals and metals from low grade and/or complex ores, industrial or mining wastes at increased efficiency (better yield and process selectivity). The importance of the targeted raw materials has to be justified in the proposal.

The solution proposed should be flexible enough to adapt to different ore grades and should be supported by efficient and robust process control.

In line with the EU's strategy for 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.

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

- contribute to achieving the objectives of the EIP on Raw Materials;
- improve 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;
- optimise raw materials recovery (increased yield and selectivity) from low grade and/or complex and variable primary and/or secondary resources.
- lead to unlocking substantial reserves by giving economic viability to new or today unexploited resources within the EU.
- improve the environmental performance, including reduction in waste generation and a stronger resource depletion of waste generated;
- improve the health and safety performance of the operations;
- push the EU to the forefront in the area of raw materials processing technologies and solutions
- create added value and new jobs in raw materials producing, equipment manufacturing and/or downstream industries;
- improve the awareness, acceptance and trust of society in a sustainable raw materials production in the EU.

SC5-16c-2017: Sustainable metallurgical processes

Scope: Proposals should develop and integrate innovative metallurgical processes, such as pyro-, hydro-, bio-, and/or electro-metallurgical and/or electrochemical processes, in order to enhance the production efficiency, metal recovery and selectivity from primary and/or secondary raw materials.

In line with the EU's strategy for 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.

Expected impact:

- contribute to achieving the objectives of the EIP on Raw Materials;
- optimise metal recovery (increased yield and selectivity) from primary and/or secondary resources;

- improve resource efficiency (reduction in materials use, water and chemicals consumption) and optimised energy use.; improve 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;
- improve the environmental (control of emissions, residues, effluents), health and safety performance of the operations;
- push the EU to the forefront in the area of metals processing and refining technologies and solutions;
- create added value and new jobs in metallurgy, equipment manufacturing and/or downstream industries;
- improve the awareness, acceptance and trust of society in a sustainable raw materials production in the EU.

Type of action: Innovation actions

SC5-17-2016/2017: Raw materials policy support actions

Projects should include a work-package to cluster with other projects financed under this topic and – if possible – also under other parts of Horizon 2020.Proposals shall address **only one** of the following issues:

[DRAFT: Some of these CSAs will be merged]

SC5-17a-2016: Public awareness, acceptance and trust in mining - Social Licence to Operate (SLO)

Specific Challenge: In order to foster sustainable supply of raw materials within the EU, the mining companies are confronted with a number of non – technology challenges One of the most important ones is called Social Licence to Operate (SLO). SLO refers to the level of acceptance or approval by local communities and stakeholders of mining companies and their operations.

Globally, mining sites have been increasingly causing local conflicts, both social and environmental. At the same time the EU faces considerable challenges related to access to non-energy raw materials, including increasing competition with new economic powers in this regard. The EU Member States and certain third countries have strengthened their raw materials policies and measures, as well as approaches towards SLO; There is however still a lack of awareness of citizens in the EU of the importance of raw materials for the society and mining activities for their sourcing, hampering the implementation of the policies to secure supply of raw materials and the start of new mining activities, even if they meet high standards.

Scope: Proposals should define guidelines and develop a toolbox improving communication and transparency during the permitting and licensing procedures and in the production cycle (from exploration, mine operation to rehabilitation and residues and tailings management) by mobilising all the concerned EU's stakeholders (relevant authorities municipalities, mining and

other relevant companies, civil society organisations and local communities) which can be affected by the mining project. Proposals should use a multidisciplinary approach, involving in particular social sciences and humanities, in order to better understand the different aspects of Social Licence to Operate (SLO) in mining in a given cultural context. Proposals should also benchmark the EU SLO guidelines and initiatives with those developed internationally (Canada, Australia, USA, etc.).

The proposal shall develop a communication campaign and/or workshops to present and challenge the project outcomes and shall propose an optimal approach towards SLO for EU industry by making recommendations on how to implement it.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 million and EUR 1.5 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 is expected to:

- improve engagement of local communities towards mining projects;
- improve awareness of the importance of raw materials for the society;
- improve awareness about new ways of mining taking into account environmental, health and safety considerations;
- help stakeholders to make informed decisions about new mining projects in the EU, which will facilitate social agreements and gain citizens' acceptance and trust;
- lead to a more transparent and secure environment for investment in new mining projects in the EU;
- ensure effective implementation and widespread use of the SLO guidelines and toolbox in practice.

SC5-17b-2016: Support to standardisation for recovery of critical raw materials from specific types of waste

Specific Challenge: Many high value and critical raw materials (CRMs) contained in Waste Electrical and Electronic Equipment (WEEE) and waste (automotive, industrial and portable) batteries still have global recycling rates below 1%. One of the main reasons is the lack of detailed European standards for treatment of WEEE and waste batteries and other end-of-life products with a view to maximising the recovery of high value and critical raw materials.

Scope: Proposals should comprehensively assess the existence of critical raw materials in Waste Electrical and Electronic Equipment (WEEE), waste batteries and other relevant end-of-life products within the EU, including a quantification of estimated amounts in different types of waste and the identification of any major trends. The project should contribute to the further development of European standards for the treatment of WEEE optimising the recovery of critical raw materials by identifying the most relevant WEEE categories and additional

standardisation needs for the further development of CENELEC standards under the European Commission Mandate M/518 EN.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 million and EUR 1.5 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 is expected to contribute to:

- development of European standards for the treatment of WEEE, waste batteries and other relevant end-of-life products optimising the recovery of critical raw materials;
- increase the recovery rates in the EU as regards CRMs from WEEE, waste batteries and other relevant end-of-life products;
- reduce the EU dependency on imports of raw materials;
- achieve the objectives of the EIP on Raw Materials.

SC5-17c-2017: Good practice in waste collection systems

Specific Challenge: Proper collection of waste is a pre-condition for optimal recovery of materials from waste. In the EU, Member States and their local governments apply many different waste collection systems. For example, some Member States continue to practise co-mingled collection systems instead of separate collection. Decision-makers need more information about the overall performance of different systems, including their economic performance, and a better understanding of the conditions that are necessary for shifting to alternative, better-performing waste collection systems.

Scope: Proposals should map and assess existing waste collection systems in a representative set of EU Member States for a wide range of waste streams, including packaging and paper waste, and end-of-life products (e.g. electrical and electronic equipment, batteries, tyres, construction products, furniture). Proposed projects where feasible should assess advantages and disadvantages of different approaches – including socio-economic impacts – with quantified costs and benefits. The proposals should identify good practices and key elements for effective and efficient waste collection systems, as well as the barriers for implementation and possible solutions to overcome bottlenecks taking into consideration the adaptability of solutions to different regions of the EU. The identified key elements, good practices, and the measures to overcome obstacles, should be validated by consulting stakeholders through a participatory approach involving citizens. Targeted dissemination actions should be included.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 million and EUR 1.5 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 is expected to contribute to

- better-informed decision-making at EU, national and local levels with regards to waste management framework conditions;

- better performing waste collection systems in EU Member States, including socio-economic impacts;
- reduce the EU dependency on imports of raw materials;
- contribute to achieving the objectives of the EIP on Raw Materials.

SC5-17d-2017: Linking land use planning policies to national mineral policies

Specific Challenge: In order to foster sustainable supply of raw materials within the EU, the mining companies in the EU are confronted with a number of non – technology challenges. One of the most important ones is access to land within the land-use planning. Most of the EU is densely populated and there are therefore conflicts of land-use caused by the competing interests of different activities and interest with economic requirements such as urbanization, nature conservation, agriculture, infrastructure etc.

Scope: Proposals should review and analyse how exploration and extraction of mineral raw materials in Member States are integrated in land use planning and practices at all levels of implementation (national, regional, local) seeking the development of harmonised national minerals policies and legislations and land-use planning policies and practices. Proposals should consider how to best link land-use planning with the concept of safeguarding valuable mineral deposits (such as mineral deposits of public importance) in order to ensure the current and future access to the deposits and to avoid "land sterilization".

The analysis should also take into account the following relevant issues, for example: a) the integration of land use and subsurface planning, b) the assessment of different options for land use where there is no pre-exclusion, c) the INSPIRE directive, d) information needed in the process, e) e-procedure, f) smart regulation, g) the infrastructure planning and approaches.

Proposals should involve civil society, practitioners, land-use planners and mining public authorities at local, regional and national levels and should develop a dissemination strategy.

Proposals should provide recommendations and publish guidance documents to promote a harmonized approach and good practise sharing among Member States in order to ensure a more effective access to raw materials.

Proposals should build on the report “Recommendations on the framework conditions for the extraction of non-energy raw materials in the European Union“ (2014) of the Ad-Hoc Working Group on exchange of best practices on mineral policy and legal framework, information framework, land-use planning and permitting.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 million and EUR 1.5 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 is expected to contribute to:

- achieving the objectives of the EIP on Raw Materials, particularly in terms of improving conditions for sustainable access and supply of raw materials in the EU;more efficient exploration and mining permitting and licensing processes;
- better land-use planning based on a better knowledge of identified or potential deposits at EU level;
- bring mineral resources in parity with other natural resources within land use planning;

SC5-17e-2017: Optimising collection of raw materials data in Member States

Specific Challenge: Most of Member states are collecting some type of minerals raw materials data for a long time, some even more than 100 years. This is particularly the case with primary minerals raw materials data, production and related data. In recent years there have been few projects and initiatives in EU Member States aiming at collecting different types of data sets in the field of primary and secondary mineral raw materials. However, neither older data sets nor the latest ones are harmonized and related efforts are scattered and information is not shared to the extent it ought to be. Considering that access to raw materials is a major challenge for all Member States, there is a need to optimise collection of data in Member States.

Scope: Proposals should map and analyse the current situation of collection of data and data sources in all Member States. They should provide recommendations for improvement of data sets and for EU level harmonization with justified benefits for the EU and the Member States and taking into account the INSPIRE Directive. Proposals should involve all mandated key players for primary and secondary mineral based raw materials in Member States including in particular data providers and relevant public authorities and bodies and should provide information on how data and best practices will be shared and made accessible to the wider EU raw materials community.

Proposals should demonstrate the applicability of recommendations on a number of improved data sets at Member states level. Improved data sets related to primary mineral raw materials should include for example: data on mineral occurrences and deposits; economic and technical data on mineral exploration and extraction; data on the environmental and social dimensions of extraction and, minerals intelligence data. Data sets related to secondary mineral raw materials should build on raw materials flows at Member state level (Materials Systems Analysis) and be presented in a form of Sankey diagrams. Other data sets on minerals secondary raw materials could also be considered.

Proposals should involve all mandated key players for primary and secondary mineral raw materials in Member States, including in particular data providers and relevant public authorities and bodies. Proposals should ensure that information on how data and best practices will be shared and made accessible to the wider EU raw materials community.
The Commission considers that proposals requesting a contribution from the EU of between EUR 1 million and EUR 1.5 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 is expected to contribute to:

- improve the quality assurance and accessibility of primary and secondary mineral raw materials data in Europe;
- add to transparency of Member state and EU mineral raw materials data and information;
- facilitate better informed decision-making for raw materials policy at EU and Member State levels, as well as for facilitating investment decisions by industry;
- achieve the objectives of the EIP on Raw Materials and in particular to the European Union Raw Materials Knowledge Base.

SC5-17f-2017: EU network of mining and metallurgy regions

Specific challenge: While the challenge to secure the raw materials supply is of a global nature, the actions to respond to the challenge are usually implemented at regional and local levels and are dependent on several factors, including the framework conditions (e.g. land-use planning, permitting and authorisation procedures), availability and performance of the industry, social aspects (public acceptance and trust, skilled workforce), available funding to keep the industry competitive (e.g. R&I infrastructure and capacity, ability bring innovation to the market) etc.

Therefore there is a need to identify and bring together the EU regions with raw materials production capacity and common Smart specialisation objectives to exploit synergies and jointly improve the mentioned factors.

While the issues of recycling, re-use and product life cycles are covered by the topic CIRC-3-2016: 'Smart Specialisation for systemic eco-innovation/circular economy' in the call 'Industry 2020 in the Circular Economy', the focus of this topic is on mining and metallurgy.

Scope: The purpose is to create a sustainable European network of regions dedicated to mining (including exploration), processing and metallurgy aiming at improving related framework conditions, social aspects and industry competitiveness.

Specifically, this network should:

- establish coherent coordination and support mechanisms among a representative number of EU regions, and identify and engage the other relevant EU regions;
- establish the right framework conditions based on good practices in the addressed regions, including administration, land use planning, investment conditions, building social acceptance and trust, training and attracting skilled workforce;
- explore and promote in and across the regions potential synergies between raw materials, value chains, market and societal players in order to create new business opportunities and economic growth;
- plan and establish operational synergies between R&I investments (public and private) and the European Structural and Investment Funds (ESIF) to strengthen competitiveness of the industry, through different improve R&I infrastructure and capacity and to foster market uptake and replication of innovative solutions in the relevant fields;

- identify synergies and collaborate closely with the relevant established or new initiatives at the EU and national levels, such as EIP on Raw materials and KIC on Raw materials.

Consortia should involve relevant competent authorities, private sector, research and academic organisations, civil society. Participation of regional authorities from all the regions addressed in the proposal is compulsory.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 million and EUR 1.5 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impacts: The project is expected to contribute to:

- longer term sustainability of the network;
- achieve the objectives of the EIP on Raw Materials;
- establish operational synergies between R&I investments and ESIF to improve R&I infrastructure and capacity and to foster market uptake and replication of innovative solutions in the relevant fields;
- improve framework conditions at regional level which are favourable both to mining and metallurgy investments and to society and economic growth in the regions;
- improve the awareness, acceptance and trust of society in a sustainable raw materials production/mining and metallurgy in the EU.

SC5-17g-2017: EU network of regions on sustainable wood mobilisation (wood supply)

Specific challenge: Sustainable supply of wood raw material is a precondition to maintain and strengthen the competitiveness of the forest-based bioeconomy in the EU. A potential exists to mobilise more wood from the EU primary sources in an efficient and sustainable way. This however requires creation of favourable framework conditions at local and regional levels, facilitating access to funds for innovation and fostering trained and skilled workforce. Regions play an important role in enabling these conditions that are necessary for improved wood supply and cooperation along the value chain (forest owners, managers, forest contractors, traders, industry).

There is therefore a need to bringing together regions with sustainable wood mobilisation among their priorities in order to stimulate knowledge and investment related to wood mobilisation at local or regional level, foster innovation in the wood-based value chains and competitiveness of industries using wood as primary raw material.

Scope: The objective is to create a European network of regions for improved and sustainable supply of wood raw material for material and energy uses that will contribute to improved industrial competitiveness and rural development. The network's activities shall:

- establish coherent coordination and support mechanisms among a geographically and socio-economically representative number of regions, and identify and engage the other relevant EU regions;

- plan and establish operational synergies between R&I investments (public and private) and the European Structural and Investment Funds (ESIF), notably EAFRD, to facilitate uptake and replication of innovative solutions.
- identify, exchange and widely disseminate good practices (replicable between the regions) in the area of wood mobilisation with an aim to establish the right framework conditions. This should building on EC/Forest Europe/UNECE 'Good practice guidance on sustainable mobilisation of wood in Europe) and relevant projects such as SIMWOOD, and contribute to the strategic orientations on this topic of the EU Forest Strategy;
- explore and promote potential synergies between materials, value chains, market and societal players in order to create new business opportunities and economic growth.

The areas of focus for the regional network activities should at minimum cover the following aspects of framework conditions: (a) forest ownership and land tenure, management, administration, co-ordination and planning, including silvicultural measures; (b) infrastructure and logistics; (c) organisation and transparency of the markets; and (d) financing sourcing, legal and fiscal measures; (e) education, training and skills.

Participation of competent regional authorities relevant to wood mobilisation in required, and participation of relevant competent authorities and actors to wood mobilisation e.g. chambers of agriculture and forestry, and environmental NGOs, forest owners/managers associations, academia, research centres; EU stakeholders organisations is encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 million and EUR 1.5 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 is expected to contribute to:

- achieve the goals on wood supply of the EIP Raw Materials, the EIP Agricultural Productivity and Sustainability, and the new EU Forest Strategy and objectives of the EU Bioeconomy Strategy;
- improve the framework conditions for sustainable wood mobilisation that result in increased supply of wood raw materials to the forest-based bioeconomy ;
- innovation at regional and local levels leading to increased wood-based industrial competitiveness and rural development.
- creation of clusters of regions with common interests on wood mobilisation.
- establish operational synergies between R&I investments and ESIF to improve R&I infrastructure and capacity and to foster market uptake and replication of innovative solutions in the relevant fields.

SC5-17h-2017: Expert network on Critical Raw Materials

Specific Challenge: Many high value and Critical Raw Materials (CRMs) are essential for EU high-tech industries. They are often mined as by-products and they still have global recycling

rates below 1% after decades of use. The scarcity of critical raw materials, together with their economic importance, makes it necessary to map significant potential primary and secondary sources of CRMs and to explore new avenues towards production.

Scope: The proposed action should develop an expert network including the stakeholders covering the value chain of Critical Raw Materials[48] as much as possible. Proposals should build on the experience of similar initiatives, such as the ERECON [49] a network on Rare Earth Elements.

Proposals have to deliver a report for the producers and users of raw materials and the policy makers with a complete picture of potential sources of and alternatives to Critical Raw Materials and of the expected demand in the future, as well as with policy and technology recommendations for actions improving the production of primary and secondary Critical Raw Materials and actions for their potential substitution, in order to secure their supply and decrease the relative dependence upon their imports. Proposals should provide a plan for transparent consultation with relevant external stakeholders and effective communication of the findings to the professional and general public across the EU. The Commission considers that proposals requesting a contribution from the EU of between EUR 1 million and EUR 1.5 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 is expected to contribute to:

- the implementation of the Raw Materials Initiative[50] and achieving the objectives of the EIP on Raw Materials, in particular in terms of the access to critical raw materials;
- better informed decision making by the EU and Member States policy makers and the producers and users of raw materials regarding the supply of raw materials;

improved awareness of relevant external stakeholders and general public across the EU about importance of the critical raw materials for society, challenges related to their supply and about proposed solutions.

Type of action: Coordination and support actions

SC5-18-2016/2017: Raw materials international cooperation

SC5-18a-2016: Demand-supply forecast and raw materials flows at global level

Specific challenge: Many countries are facing similar challenges in the field of mineral raw materials, including shortage of knowledge on raw materials and their flows for decision making by authorities, industry, financial sector etc. There is a need to better exploit knowledge and skills synergies and enhance the international cooperation with the most developed countries as well as with materials producing countries in order to understand materials flows at a global level.

[48] The latest public EU list of Critical Raw Materials, expected to be updated in 2016 (otherwise the list of 2014 is applicable (COM(2014) 297))
[49] http://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical/index_en.htm
[50] http://ec.europa.eu/growth/sectors/raw-materials/policy-strategy/index_en.htm

Scope: Proposals should develop a common methodology to mineral raw materials flows at global level which could be agreed and used at international level. As a pilot case, focus should be on critical raw materials and in particular the ones used in low-carbon technologies. The methodology should incorporate models on demand-supply forecast in order to allow for a more dynamic analysis of global materials flows. Proposals should provide recommendations and feed into future policy developments.

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged, in particular with the US and Japan in the field of Materials Flow Analysis. Where appropriate, synergies with the relevant EU Member States initiatives are to be explored and fostered.

Proposals should build on the outcomes of the Study on Data Inventory for a Raw Material System Analysis and on related studies performed by the International Resource Panel. The Commission considers that proposals requesting a contribution from the EU of between EUR 1 million and EUR 1.5 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 is expected to contribute to:

- better informed future decision-making by authorities and companies at the EU and global levels;
- improve the understanding of global market trends,;
- the implementation of the Raw Materials Initiative[51] and achieving the objectives of the EIP on Raw Materials, in particular in terms of establishing and maintaining strong and sustainable relationships with the countries concerned, in particular with Japan and US.

SC5-18b-2016: International network of raw materials training centres

Specific challenge: The EU is still highly dependent on supply of raw material from international markets. However, understanding of the global nature of raw materials value chains and developing sources of sustainable supply of primary and secondary raw materials from the EU requires relevant knowledge and skills. At present, there is a shortage of specialists in Europe in some areas related to primary and secondary raw materials production and raw materials markets. This is a challenge that needs to be addressed at the European level.

Scope: Proposals should create a self-sustainable long-term lasting international network of training centres for professionals including the leading educational and research institutions in the EU and the third countries based on specific country capabilities to cover the primary and secondary raw materials sectors. The network should map skills and knowledge in the EU and third countries, identify key knowledge gaps and emerging needs, develop roadmap for

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

improving skills and knowledge, as well as establish common training programmes in the primary raw materials sectors.

In line with the EU's strategy for international cooperation in research and innovation international collaboration is encouraged. Where appropriate synergies with the relevant EU Member States initiatives are to be explored and fostered.

The Commission considers that proposals requesting a contribution from the EU of between EUR 0.5 million and 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.

Expected impact: The project is expected to contribute to

- increasing the EU competence and expertise in the field of the primary and secondary raw materials;
- improving the availability of qualified workforce and new jobs in the EU;
- enhancing the possibility for new cross-sectorial innovations;
- the implementation of the Raw Materials Initiative[52] and achieving the objectives of the EIP on Raw Materials, in particular in terms of establishing and maintaining strong and sustainable relationships with the leading training institutions in the relevant countries.

SC5-18c-2017: Advancing the idea of a World Forum on Raw Materials

Specific challenge: Due to the global nature of raw materials value chains many countries are facing similar challenges in the field of raw materials which require common approach and solutions at a global level in order to ensure fair and unrestricted access to raw materials worldwide. There is as well a need for a more active involvement of the EU in relevant initiatives and closer collaboration with competent international organisations in the field of raw materials.

Scope: With a view to contribute to the fair and unrestricted access to raw materials worldwide, this action shall:

- develop a platform of international key experts and stakeholders that would advance the idea of a World Forum on Raw Materials and enhance the international cooperation among G20 Member countries as well as the other third countries active in the mining and other raw materials sectors, engaging with relevant organisations, such as OECD, International Study Groups, CONNEX, the Intergovernmental Forum on Mining, UNEP Resource Panel. These organisations should be represented in the consortium and deeply involved in planned activities;
- where appropriate explore and foster synergies with the relevant EU Member States initiatives;

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

- identify common needs and threats, and develop and promote (on international fora) recommendations on possible actions to consolidate the efforts of the countries involved towards a more joint and coherent approach towards raw materials policy and investment.

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged, in particular with G20 Member countries as well as the other third countries active in the mining and other raw materials sectors,

The Commission considers that proposals requesting a contribution from the EU of between EUR 0.5 million and 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.

Expected impact: The project is expected to contribute to:

- the fair and unrestricted access to raw materials worldwide;
- enhance the economic stability in the raw materials supply at a global level;
- better informed future decision-making at EU and global levels;
- the implementation of the Raw Materials Initiative and achieving the objectives of the EIP on Raw Materials, in particular in terms of establishing and maintaining strong and sustainable relationships with the relevant international organisations and countries.

Type of action: Coordination and support actions

SC5-19-2016: ERA-NET Cofund on Raw materials

Specific Challenge: In order to secure sustainable supply of raw materials to the EU society, the raw materials sector needs to strengthen its performance and competitiveness through research and innovation. The efforts made at the EU level need to be complemented by concerted actions between the Member States in view of implementing joint initiatives.. The EU research and innovation funding for raw materials has been targeted under Horizon 2020, and several Member States have already built the first network of funding agencies in the raw materials field called ERA-MIN under FP7. However, further integration of national and regional R&I programmes across the whole EU is needed to tap the potential of available funding and to reach the critical mass pushing the EU raw materials sector to the forefront in the sustainable production of primary and secondary raw materials and scarce materials substitution.

Scope: The objective of the ERA-NET is to strengthen coordination of research programmes in the field of industrial production and supply of raw materials building on the experience of ERA-MIN ERA-NET. This should be achieved in line with the integrated strategy proposed in the EU Raw Materials Initiative (RMI) and the Strategic Implementation Plan of the European Innovation Partnership (EIP) on Raw Materials. The ERA-NET should cover the whole raw materials value chain including exploration, extraction and processing technologies and recycling, as well as substitution.

Proposals should pool the necessary financial resources from the participating national (or regional) research programmes with a view to implementing a joint call for proposals resulting in grants to third parties with EU co-funding in this area.

Proposers are encouraged to include other joint activities including additional joint calls without EU co-funding.

Participation of legal entities from international partner countries and/or regions is encouraged in the joint call as well as in other joint activities including additional joint calls without EU co-funding. Participants from this/these country/ies may request a Union contribution (on the basis of the ERA-NET unit cost) for the coordination costs of additional activities.

The Commission considers that proposals requesting a contribution 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: Actions are expected to lead to

- achieving the objectives of the EIP Raw Materials, particularly in the area of Research and Innovation coordination;
- improved use of human and financial resources in the area of raw materials research and innovation;
- reduced fragmentation of raw materials research and innovation efforts across Europe;
- improved synergy, coordination and coherence between regional, national and EU funding in the relevant research fields through transnational collaboration, and where appropriate international collaboration.

Type of action: ERA-NET Cofund

Earth Observation

Introduction:

The overall objective of this Earth Observation package is to maximise the benefits for European citizens of the Earth observation infrastructure by developing innovative services (e.g climate services) that support more sustainable production and consumption patterns and resilient societies. The following R&I actions aim at developing innovative solutions to complete the in-situ component of GEOSS and Copernicus and make available an operational information system, enabling sharing, discovery and full, open and unrestricted access to validated Earth observation datasets, through engaging with the private sector to leverage emerging technologies and develop services.

Horizon 2020 Earth observation (EO) activities are considered an essential element to accompany the investments made by the European Union in Copernicus, the European Union Earth observation and monitoring programme and in the Global Earth Observation Systems of Systems (GEOSS). Activities addressing Earth Observation funded by Societal Challenge 5, LEIT/Space and Research Infrastructures form a coherent overall approach. Activities under Societal challenge 'Climate action, environment, resource efficiency and raw materials' focus in

particular on GEOSS, notably the development of comprehensive and sustained global environmental observation and information systems that stimulate the smart use of strategic resources, support the development of evidence-based policies, foster new environmental and climate services, and develop new opportunities in global markets. Activities under the 'Leadership in Industrial Technologies – Space' part of the programme focus on the evolution of Copernicus and the exploitation of existing European space infrastructure by promoting the development of innovative products and services based on remote sensing, geo-positioning or other types of satellite enabled data.

Moreover, the application and uptake of EO for the development of innovative applications addressing specific challenges is expected to primarily take place through the Horizon 2020 Societal Challenges. To that end, users can access Copernicus data and information[53].

To facilitate access to opportunities for applicants, the following list includes dedicated Earth observation activities in calls in other work programme parts, in addition to those in this call:

- Blue Growth – demonstrating an ocean of opportunities:
  - Integrated Arctic Observing System
- Sustainable Food Security – resilient agri-food chains:
  - EO services for the monitoring of agricultural production in Africa.
- LEIT/Space – Earth Observation
  - Downstream applications
  - Downstream applications for public sector users
  - Evolution of Copernicus services
  - EO Big Data Shift
- LEIT/Space – COMPET
  - Earth observation technologies
- SME Instrument (SC5 and LEIT/Space)
  - Focus on applications

[Cross-referencing to other topics will be fine-tuned when the topic titles and numbers of topics in other parts of the H2020 WP are final.]

SC5-20-2017: Novel in-situ observation systems

Specific challenge: A more systematic observation of the Earth system is required at a resolution and accuracy that cannot always be provided through remote sensing technologies. There is

[53] Access to Copernicus Sentinel data and service information is provided to users on a free, full and open basis. Licensing conditions may apply. For other satellites data, the DataWareHouse document 2.0 is available at http://www.copernicus.eu/main/library/technical-documents/ and licensing details can be consulted at http://gmesdata.esa.int/web/gsc/dap_document as well as http://gmesdata.esa.int/web/gsc/terms_and_conditions.

therefore a need to extend and improve the in-situ component of the Global Earth Observation System of Systems (GEOSS) and the EU Copernicus programme in order to collect the relevant data necessary to cover observation gaps, calibrate and validate remote-sensing data and deliver Earth Observation services, including monitoring variables, for policy makers, local users and citizens.

However, components of existing in-situ observing and monitoring systems are too often bulky, expensive and power hungry, which hinders their wide-scale deployment for continuous environmental monitoring. The challenge here is to explore and test new technological solutions that would lower the costs of acquiring, deploying and maintaining monitoring and observing stations which would contribute to filling the in-situ observational gaps of Earth observation systems. This issue is especially acute in developing countries where in-situ Earth observation capacities have deteriorated.

Scope: Actions should develop new, in-situ Earth observation systems, taking advantage of new technology and the latest developments in sensor science so that measurements can be performed using low energy sensors and communication systems, requiring less demanding maintenance. Actions should focus on the transfer and adaptation of new technologies into operational systems, enabling a real breakthrough in the efficiency of deploying and maintaining new in-situ observing systems in a cost-effective way. The research and innovation activities under this topic may take into account concepts such as citizens' observatories, disposable sensors, and the use of unmanned platforms. The project should take into account as much as possible relevant research outcomes from programmes of the European Research Council, the Leadership in Enabling and Industrial Technologies and the European Metrology Research Programme[54].

Prominent criteria for the selection of the projects will be fulfilling agreed European and international standards regarding the quality of the measurements, the interoperability for data exchange with other existing monitoring and observing platforms and with user applications. Proposals should establish formal links with the GEO Global Initiatives (e.g. GEOGLAM, GEOBON, GFOI, GMOS, AFRIGEOSS) and with Copernicus services so that the new monitoring and observing platforms fulfil well-identified needs under these two major initiatives. Test phases enabling proof-of-concept of the observation and monitoring platforms in real conditions should be organised during the course of the project. Participation of SMEs in the project consortia is encouraged in order to facilitate the development of innovative and operational systems.

Projects should include a work-package to cluster with other projects financed under this topic and – if possible – also under other parts of Horizon 2020.

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's results are expected to:

[54] http://www.emrponline.eu/

- achieve successful transfer within the project duration of new technologies into operational sensor platforms supporting GEO Global Initiatives and Copernicus services and products;
- demonstrate cost-effectiveness of the new systems when compared to previous ones;
- foster new opportunities and market development of the European Earth observation commercial sector and for downstream users;
- provide measurable added value for the Copernicus and GEOSS initiatives.

Type of action: Research and innovation actions

SC5-21-2017: Coordination of citizen observatories initiatives

Specific challenge: Citizens' Observatories[55] are community-based environmental monitoring and information systems which build on innovative and novel Earth observation applications embedded in portable or mobile personal devices. Thanks to the vast array of ubiquitous information and data they can provide, Citizens' Observatories can enable authorities to obtain evidence and inform policy making, complementing more authoritative in-situ observation and monitoring networks and systems with a very positive cost-benefit ratio.

Citizens are also provided with new opportunities to address environmental issues affecting them and to influence local decision making. Social innovation can be achieved through these novel partnerships which involve the private and public sector, NGOs and citizens, offering new business opportunities for SMEs in the fields of Earth observation and mobile technologies.

These activities are, however, at an early stage and still largely rely on research funding. Risks and opportunities still have to be explored, which requires a comprehensive analysis of their full potential and applicability. There is a need to create a Citizens' Observatories knowledge base in Europe across disciplines to avoid duplication, ensure interoperability and create synergies and facilitate its stepwise uptake by environmental authorities. With an increasing number of citizen-based initiatives, a coordinated approach for the integration of citizens' observations is becoming necessary in Earth observation systems at local, regional and also global level.

Scope: Scope: This action should bring the Citizens' Observatories and relevant communities together to benchmark and pinpoint best practices, identify synergies and facilitate integration and stronger cooperation solutions, and stimulate a gradual uptake by public authorities of these new technological and methodological approaches. Best practices and standards for data visualisation and exploitation in the context of Citizens' Observatories should be promoted via outreach and networking activities. Relevant issues such as state-of-the-art technologies and methodologies for engaging citizens, sustainability approaches considering socio-economic challenges, interoperability of platforms, data quality, reuse and preservation as well as privacy

[55]See http://ec.europa.eu/research/environment/index_en.cfm?pg=earth for more information about previously EU funded Citizens' Observatories activities

and data protection issues should be addressed. Technological, social and policy gaps and barriers should also be identified and prioritised. A coherent approach should also be taken to ensuring the delivery and uptake of in-situ data and information coming from Citizens Observatories through GEOSS and Copernicus. The action should also analyse and showcase social innovation opportunities brought in by Citizens Observatories while investigating ways to strengthen the role of the European private sector, especially SMEs, in this field. Hence, proposals should include a broad range of stakeholders, including public bodies, private sector representatives, research institutions - including from Social Science and Humanities -, NGOs and citizens' associations.
To address these points effectively, social science research tools and methods will be required.

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.

Expected impact: The project's results are expected to:

- improve coordination between existing Citizens' Observatories and related activities at regional, European and international level;
- expand geographical coverage and use of citizens' observation through an effective promotion and uptake of best practices and standards;
- foster a wider dissemination and uptake of efficient information and data management and preservation strategies for existing and future Citizens' Observatories platforms;
- increase opportunities for SMEs and businesses in the field of in-situ Earth observation systems;
- increase awareness of the Citizens' Observatories approach among environmental decision makers and facilitated integration of these solutions in environmental policies and actions;
- integrate citizens' observations in GEOSS and Copernicus;
- consolidate the leading role of Europe in the integration and uptake of citizens' information within in-situ information systems in the context of the GEO initiative.

Type of action: Coordination and support action

SC5-22-2016: European data hub of the GEOSS information system

Specific challenge: The specific challenge is to overcome the fragmentation of the European landscape of existing public and private Earth observation data infrastructures and to maximise their combined exploitation in the light of the evolving demand and supply of Earth observations in Europe. This landscape has to adapt to a series of global trends related to open data policies, big data technologies and the rising digital economy. Bigger volumes of various types of environmental data are increasingly shared on a free, full and open basis in Europe by different programmes and organisations having a mandate at regional, national or European level. New Earth observation data and service providers are emerging from the private sector. Alternative Earth observation data sources are gaining in maturity such as citizen observatories, crowdsourcing, social networks, sensor webs or drones. At the same time, societal challenges like climate and resource efficiency, as well as energy, water, agriculture, or sustainable

development aid are increasingly being tackled in a systemic and multidisciplinary way, leading to a higher demand for combined data solutions (geospatial and socio-economic data) integrated with processing, analytic or predictive capacities increasingly located in the cloud.

Scope: This action will develop a GEOSS European Hub consisting of a web-based IT platform to provide users with a unique access point (gateway) to the European diversified offer in terms of Earth observation data (space-based and in situ data, from research and operational data infrastructures, across disciplines and communities) and services. This platform shall cope in particular with requests from European users willing to discover, access, combine and process multiple Earth observation data and information streams. Full interoperability with the GEOSS Discovery and Access Broker and with environmental infrastructures associated with major EU programmes, legislations and initiatives shall be ensured. This applies especially to the Copernicus programme[56], the EU Directives related to INSPIRE[57] and the reuse of Public Sector Information[58], as well as to research infrastructures such as GEANT and the EU High Performance Computing facilities. Special attention shall be given to user-friendliness for multiple user profiles while ensuring system adaptability, scalability and robustness.

The European hub shall be open to academia and to the European private sector. Its core concept of data federation shall support an open ecosystem of services and business opportunities and build on past EU research investments in support of the GEOSS information system. Proposals should address the sustainability issue of this platform beyond the project lifetime and a governance model driven by the public sector with possible contributions from private entities.

The Commission considers that proposals requesting a contribution from the EU of between EUR 9 million and 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's results are expected to:

- improve user-friendly discovery, access and exploitation of Earth observation data and information in Europe;
- foster a European regional approach to GEOSS;
- widen uptake of GEOSS and Copernicus data, information and services;
- increase EO-driven innovation and business opportunities for European SMEs and companies, taking into consideration the specificities of the European market (e.g. INSPIRE-compliant applications);
- widen commercial exploitation of Earth observation data and products, including by sectors that are not traditionally engaged in Earth observation;
- increase the European capacity to address societal challenges of prime importance to the EU.

[56]http://ec.europa.eu/enterprise/policies/space/copernicus/
[57]http://inspire.ec.europa.eu/
[58]http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:345:0090:0096:EN:PDF

Type of action: Research and innovation actions

Cultural heritage for sustainable growth

Introduction:

The objective of the actions in this part of the call is to harness the full potential of cultural heritage as a strategic resource for a sustainable Europe. A renewed agenda is needed to ensure its sustainability, safeguarding and enhancement, and to maximise its intrinsic, economic and societal value. The focus is therefore on placing cultural heritage at the centre of a successful and vibrant society, contributing to its well-being, promoting its cultural diversity and social cohesion and exploring its potential for being a production rather than a cost factor in Europe via its remarkable economic potential. Sectoral and country-based studies have highlighted the significant economic contribution of the heritage sector and its spill-over effects on other sectors of the economy[59]. However, since our heritage is a shared, non-renewable, non-replaceable, unique resource and a common good, confronted with important environmental challenges, possible over-exploitation and under-funding, looking after it to avoid neglect and possible decay is a common responsibility.

The outcomes of the Horizon 2020 Expert Group on Cultural Heritage have fully been taken into account to prioritise the challenges to be addressed and thus promote cultural heritage as a production (rather than a cost) factor and an investment opportunity as well as a catalyser for social cohesion and environmental sustainability.

The actions in this call support the Communication 'Towards an integrated approach to cultural heritage for Europe'[60], the Council Conclusions of 20 May 2014 on cultural heritage as a strategic resource for a sustainable Europe, the Council Conclusions on participatory governance of cultural heritage[61], the Council Conclusions on participatory governance of cultural heritage[62], the Communication on 'Promoting cultural and creative sectors for growth and jobs in the EU'[63] and a number of EU policies[64], and link to the Joint Programming Initiative on Cultural Heritage and Global Change, the Energy-efficient Buildings Public-Private Partnership (EeB PPP), and the cultural heritage focus of the European Construction Technology Platform (ECTP FACH).

[59] Tourism is estimated to contribute revenues of EUR 415 billion p.a. to EU GDP and accounts for 15.2 million jobs in the EU – many directly or indirectly linked to cultural heritage (www.wttc.org/site_media/uploads/downloads/european_union2014.pdf). Renovation and maintenance represent 27.5% of the value of Europe's construction industry (www.fiec.eu/en/library-619/key-figures.aspx, figures quoted for 2013) while the conservation market is EUR 5 billion annually (The Joint Programming Initiative on Cultural Heritage and Global Change: a new challenge for Europe Vision Document, version 17 June 2010).

[60] COM (2014) 477 of 22 July 2014

[61] OJ (2014/C 463/01)

[62] OJ (2014/C 463/01)

[63] COM (2012) 537 of 26 September 2012

[64] European Agenda for Culture; Communications on Green Infrastructure, A European Strategy for more Growth and Jobs in Coastal and Maritime Tourism; EU cohesion and rural development policies; Directives on Energy Efficiency and the Energy Performance of Buildings

SC5-23-2016/2017: Cultural heritage as a driver for sustainable growth

Specific challenge: European cities and rural areas are unique cultural landscapes full of character at the core of Europe's identity. They are examples of our living heritage which is continually evolving. However some of them are facing economic, social and environmental problems, resulting in unemployment, disengagement, depopulation, marginalisation or loss of cultural and biological diversity. These challenges create demand for testing experimental pathways for regeneration. Cultural heritage can be used as a driver for the sustainable growth of urban and rural areas, as a factor of production and competitiveness and a means for introducing socially and environmentally innovative solutions. The environment of these landscapes, made up of both tangible and intangible cultural heritage elements, is a powerful magnet for the set-up of companies, start-ups in new productive activities in different fields (research and innovation, arts and crafts, new cultural products and services, tourism, construction industry etc.), developing talent and attracting investment. Cultural heritage can also be at the basis of new participative and collective arrangements and of nature based solutions.

Demonstrating how to reuse heritage in an innovative and creative way, unlocking its potential as a powerful economic, social and environmental catalyst for regeneration will be a step forward in reconfirming/reclaiming the role of heritage in sustainable development. The overall challenge is to go far beyond simple restoration, physical rehabilitation or repurposing of a site and make use of heritage potential to promote sustainable development and improve economic performance, people's well-being and living environments.

This approach will contribute to the recognition of cultural heritage as a production factor and the deployment of the potential of culture and cultural heritage as a shared strategic resource in line with the Council of the European Union conclusions on cultural heritage as a strategic resource for a sustainable Europe (http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/educ/142705.pdf).

Scope:

In 2016, the call for proposals will be targeted towards Heritage-led urban regeneration through the Topic "SC5-23-2016: Heritage-led urban regeneration".

In 2017, the call for proposals will be targeted towards Heritage-led rural regeneration through the Topic "SC5-23-2017: Heritage-led rural regeneration".

For both topics, actions should develop and deploy via large-scale demonstration projects novel heritage-led solutions for sustainable growth. In order to pave the way for their rapid replication and up-scaling, a 'Role models' and 'Replicators' approach should be implemented.

The 'Role models' are urban or rural landscapes which have demonstrably and successfully pursued a heritage-led regeneration.

The 'Replicators' are urban or rural landscapes that will be assisted/"mentored" by 'Role models' and committed to the regeneration of urban or rural landscapes within the duration of the project, assisted by and replicating the heritage-led regeneration "blueprints" of the 'Role models', properly contextualised to fit their particular contexts. They will therefore have privileged

contact with and access to the know-how of the 'Role models' and participate in the definition of user requirements and the methodology for transferability of solutions, data collection etc.

Proposals should foresee the participation of at least six 'Role models' and three 'Replicators' from different Member States to ensure a maximum benefit across Europe in the project development, the effective and continuous knowledge transfer, and support (e.g.) from the front-runner cities.

Replication critically depends on the timely and active involvement of the ‘Replicators’ in the project development, the effective and continuous knowledge transfer, mentoring, networking and support by the 'Role models' (e.g. through staff exchangesto enhance their capacity in, among other, securing the financial resources necessary for the demonstration of the regeneration through innovative financing models, partnerships (e.g. public/ private) and mobilisation of investments. Consortia should propose a sound methodology of how they will establish the “baseline” at the time of the proposal of the urban or rural baselines to be regenerated and a sound methodology and measurements needed to assess, in as a quantifiable way as possible, the regeneration impact of the project. The success potential of the proposal will be assessed according to the innovative nature of the approach, financing, business models, business and replication models, the mobilisation of new investments, the participatory, multi-stakeholder and trans-disciplinary processes (securing also citizens' engagement and empowerment) processes followed in co-designing and co-implementing the regeneration plans, the long-term commitment, both politically and financially, of the competent authorities in the “Replicators” and the existence of sustainable financing that would guarantee the project implementation independently of possible changes in their political context during the course of the project, the deployment of appropriate business and replication models and the capacity for mobilising additional investments to secure economic sustainability for the execution of the project, the sound documentation and dissemination of results; the soundness of the approach in 'mentoring' and transferring knowledge by the 'Role models' to the 'Replicators' and beyond, the setting-up of robust monitoring schemes to measure against a well-defined baseline the effectiveness and benefits of the measures, and the potential for optimisation of policy and regulatory and administrative frameworks. It is essential that the project develops long-term sustainable data platforms securing open, consistent data and performance measurements and interoperability of data infrastructures to ensure systematic documentation, communication, public consultation, exchange of practices and sharing of experiences among the partners of the consortium and beyond. This will allow for a continuous building up of the 'knowledge portfolio' through future activities under Horizon 2020 and beyond and long-term (beyond the life of the project) exploitability of the results.

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.

Consortia should develop an integrated protocol for monitoring and documenting performance and impact of solutions. Performance monitoring should last for a period of at least 2 years within the life of the project. Longer term monitoring commitment beyond the end of the project, whilst continuing the systematic documentation of the data, will give an added value to the proposal.

Projects should aim to:

- map, analyse and document in 'Role models' existing successful business and management models, financing mechanisms (also focusing on the combined use of funds, e.g. structural funds and investments etc.), governance structures and legal frameworks for successful heritage-led regeneration, linking where appropriate cultural and natural heritage. 'Role models' would, if they so wish, also have the possibility of further upscaling their regeneration activities during the life of the project;
- assist 'Replicators' in developing and implementing during the life of the project their heritage-led regeneration plans, also in mobilising new investment, through provision of expertise, advice and capacity building ;
- collect, synthesise and systematically document information and provide evidence on practices and lessons learnt, as well as toolkits that can be adjusted at different local conditions, regarding heritage-led regeneration and make this evidence base readily accessible to an EU-wide community of competent authorities, planners, practitioners, enterprises and stakeholders (including civil society) with a potential interest through innovative communication and training strategies.

Proposals shall address **all** of the above points.

Projects should include a work-package to cluster with other projects financed under this topic as well as other projects under the "Cultural Heritage for sustainable growth" area and – if possible – also under other relevant parts of Horizon 2020.

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

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged. To this end, participation of "Role models" from non-EU countries would further enrich the evidence base of successfully implemented heritage-led regenerations and will thus enhance the replication and impact potential of such activities in no-EU regions (e.g. Latin America) and countries.

Because of the substantial investments that might be necessary for the heritage-led regeneration in the urban and rural context, additional, complementary or follow-up funding should be sought, be it private or public, so as to achieve a more effective implementation and deployment at larger scale and scope of the innovative solutions addressed. Additional funding sources could include relevant regional/national schemes under the European Structural and Investment Funds (ESIF), such as under the European Regional Development Fund (ERDF). In the latter case, contacts could be established with the funds managing body during the duration of the projects. In case of relevance for the Research and Innovation Smart Specialisation Strategies, the project proposals could already indicate which interested regions/countries have been pre-identified.

Expected impact: Projects are expected to

- strengthen Europe's capacity in promoting, financing, developing and managing processes of urban and rural regeneration based on cultural heritage, taking into account the concept of cultural landscape, both at the urban and rural level;
- replace the object-oriented approach with a spatial approach in heritage planning, including in urban or rural setting, vernacular and non-monumental heritage. This will incorporate the value of intangible assets and ecosystems that cultural landscapes hold and will include stakeholders' participation and direct engagement in common heritage management and transformation, also with slight, bottom up and adaptive reuse strategies. Research will lead to a better awareness of the use of cultural heritage as a competitive advantage and a production factor, able to foster job creation especially with shared, collaborative and innovative processes, using experimental legal, financing and governance scheme and tools;
- trigger innovation in providing new methods for designing integrated regeneration processes through the collaboration of trans-disciplinary expertise, clearly assessing benefits of heritage reuse at different levels (social, environmental and economic) also in deprived or less developed areas. In the medium term, activities will help to establish networks among European local policy makers and leaders, supporting them to develop the vision, and gain the skills, to be successful at using heritage to regenerate their sites;
- mobilise investment and new market opportunities for businesses, as evidenced in the short-term. Wide and fast deployment of solutions derived from demonstration projects will be achieved and new market opportunities for businesses will open. Results can feed into the implementation of the Europe 2020 strategy and the positioning of Europe as a leading force in the use of heritage as a means for social and economic development.

Type of action: Innovation actions

SC5-24-2017: Innovative financing, business and governance models for adaptive re-use of cultural heritage

Specific challenge: Due to economic problems and social change many historic assets have been facing functional redundancy. These assets are mostly churches no longer used for worship, industrial buildings no longer used for manufacturing, farm buildings no more used for agriculture etc. In most instances, the costs for the adaptive re-use of these assets cannot be supported by the public sector or by traditional private sector models relying on return on investment. Adaptive re-use of this heritage is needed through research into innovative financing and governance models. Adaptive re-use practices contribute considerably to the maintenance of the historic fabric, to its integration with the modern world and to the appreciation of heritage inherent values and qualities by contemporary societies.

Scope: Projects should:

- map and analyse existing successful business and management models, financing mechanisms and governance arrangements for adaptive re-use of groups of cultural heritage monuments, buildings or sites in relation to the larger area in which they are embedded;

- develop and validate methods, tools, indicators and matrixes for analysing and assessing effectiveness and performance of governance arrangements, business models, financing instruments (e.g. crowd-funding), new forms of partnerships (e.g. public-private, community-based) for adaptive re-use of groups of cultural heritage monuments, buildings or sites. Efforts should be made to link cultural with natural capital where appropriate.
- propose innovative governance arrangements also fostering increased participation by citizens, business models, financial instruments, new forms of partnerships, strategies for mobilising new investments and creating new business opportunities for adaptive re-use of groups of cultural heritage monuments, buildings or sites;
- identify cultural, social, economic, institutional, legal, regulatory and administrative barriers and bottlenecks at city, regional, national and EU level for adaptive re-use of groups of cultural heritage monuments, buildings or sites, and recommend ways to overcome them;
- develop and validate tools with a replicability potential in different local conditions to assist decision-making processes, using multi-stakeholder approaches, involving local communities and underpinned by social science and humanities expertise, for adaptive re-use of cultural heritage.

Proposals shall address **all** of the above points.

Projects should include a work-package to cluster with other projects financed under this topic as well as other projects under the "Cultural Heritage for sustainable growth" area and – if possible – also under other relevant parts of Horizon 2020.

The Commission considers that proposals requesting a contribution from the EU of up to 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: Projects are expected to lead to:

- more integrated approaches and strategies for the preservation and valorisation of cultural heritage through its adaptive re-use (securing thus its sustainability) comprising innovative finance (with high leverage capacity), business models and institutional and governance arrangements that foster multi-stakeholder involvement, citizens' and communities engagement and empowerment;
- new investment and market opportunities for businesses in the adaptive re-use of cultural heritage assets, both tangible and intangible, including opportunities for stimulating the creation of start-ups;
- provide an enabling context for the development and wide deployment of new technologies, techniques and expertise enhancing industrial competitiveness and contributing to economic growth, new skills and jobs;
- provide innovative adaptive re-use blueprints for socially and economically inclusive societies with reduced financial and operational burden for the public sector in heritage conservation.

Type of action: Research and Innovation actions

Support to policy

SC5-26-2016/2017: Support to confirmed Presidency events (conferences)

Specific challenge: 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 within the areas covered by Societal Challenge 5. Examples are events organised together with successive EU Presidencies, such as PROVIA in the Netherlands and the Innovative Enterprise Presidency conference on Circular Economy Financing in Luxembourg.

Scope: Actions should contribute to creating 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. Member States which will hold a forthcoming Presidency of the European Union and are in the time range of this Work Programme are Slovakia in 2016, Malta and the United Kingdom in 2017 and Estonia in 2018, and they may be particularly interested in this topic.

Proposals should address issues of major relevance at the time of the events. Innovation should be at the core of the event. An appropriate balance should be present in the proposed action(s), 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 these events, the subject of each event should not overlap with that of other Presidency events over the two-year period.

The commitment of the national authorities to support the event(s) 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(ies) will be positively reflected in the evaluation under the 'impact' criterion.

The Commission considers that proposals requesting a contribution from the EU of between EUR 250 000 and 350 000 would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. No more than one action will be funded for each Presidency (possibly covering more than one event).

Expected impact: The action is expected to result in:

- improved visibility, in particular in the hosting country, 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;

- efficient networking of various stakeholders and supporting their activities, e.g. natural scientists, social scientists, researchers, industrialists, investors, local authorities, environmentalists, museums and schools.

Type of action: Coordination and support actions

SC5-27-2016: Macro-economic and societal benefits from creating new markets in a circular economy

Specific challenge: The EU has committed itself to a resource efficient growth path. A strong record in eco-innovation and an ambitious EU environment and climate policy has provided to Europe global excellence and competitiveness in a range of areas, such as waste and water management, climate adaptation, nature protection and biodiversity enhancement, air quality and soil decontamination. These economic sectors have consistently grown figures over the last decade and in many cases increased their research intensity. The challenge is to further boost the potential of these sectors in a transition to a circular economy as important sources of growth and jobs within an enabling EU macro-economic policy framework.

For its dialogue on progress with the Member States notably in the context of the European Semester, a solid and policy-actionable assessment of the macro-economic, societal and labour market benefits/costs of developing successful and innovative approaches which contribute to the transition towards the circular economy.

Scope: Within the context of the European Semester, the action should:

- facilitate a better understanding and operational use of the current evidence base, including reliable datasets, projections and identification of key gaps on the market and non-market impacts of resource and waste flows – from extraction to end of life;
- identify innovative approaches based on the circular economy concept in Member States;
- assess their economic, societal and resource-efficiency impact on existing or new markets;
- estimate such impacts in the short, medium and long term; and
- estimate and assess the macro-economic, societal and environmental costs and benefits of mainstreaming such approaches.

The project should also elaborate a benchmark between Member States and with a set of performing Third Countries, covering both green and blue growth potentials, further building on achievements in the waste and water sectors, and embedding the role of digital economy in the analysis.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 0.5 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: Projects are expected to lead to:

- create a reliable knowledge base and reference framework on the macro-economic, societal and environmental impacts of resource efficiency/circular economy innovations, for both the European Commission and Member States, as potential sources of growth and jobs and on the macro-economic policy conditions for tapping these;
- leveraging the European Semester in areas related to Societal Challenge 5;
- develop options for policies and investments that are economically, environmentally and socially sound.

Type of action: Coordination and support actions

PCP/PPI

[DRAFT TEXT]

SC5-28-2017: Pre-commercial procurement on soil decontamination

Specific challenge: The challenge is to address the lack of public demand driven innovation in the soil decontamination sector in Europe. This is needed to close the gap between supply and demand for innovative solutions. Pre-commercial procurement (PCP) has the potential to be an effective demand side innovation action by excellence. It targets consortia of procurers with similar procurement needs of common European interest, to drive innovation from the demand side and reduce fragmentation of public sector demand in Europe, by together asking the market to develop innovative solutions responding to common needs in this specific sector.

Pre-commercial procurement enables consortia of procurers to share the costs of procuring high-tech R&D and to speed up the time-to-market for promising research outcomes that can provide best value for money and solutions for common public sector needs dealing with soil decontamination. The aim of engaging in such more forward looking R&D procurement to modernise the provision of public services, whilst creating opportunities for industry, business and researchers in Europe to take international leadership in new markets in the soil decontamination area.

This challenge also encourages public procurement of innovative solutions to address the needs of the soil decontamination sector in making better use of near-market solutions.

Scope: Launch of a PCP to find common innovative and sustainable solutions for soil decontamination/remediation, avoiding 'dig and dump'. The proposal is expected to bring radical improvements to the quality and efficiency of public soil decontamination services and products by encouraging the development and validation of breakthrough solutions through the procurement of research and development leading to innovative solutions.

The related CSA (SC5-25-2016, end date 2017) should be finalised before the PCP call is launched and should have delivered all the necessary elements in preparation of the PCP as described in the general annexes. The "buyers group" (public procurers consortium) must therefore be in a position to start the procurement process from the onset of the Grant Agreement.

The final aim is to develop innovative and fully tested products in a competitive environment (TRL 8-9) based on common needs and higher innovative performance standards set by the buyers group. Subsequently a limited series of the innovative products will enter the commercialisation/market deployment phase during the PPI (separate call) which has to follow the PCP. Frequent review meetings with the Commission services should be foreseen.

Research institutes and universities can enter in competition with SMEs and industry to reach the innovative performance standards. This action is particularly favourable for small and/or new innovative SMEs.

The PCP should deliver a successful innovative and fully tested product that meets the common needs of the buyers' group as well as innovative performance standards and that is therefore marketable (TRL 8-9).

The Commission considers that proposals requesting a contribution from the EU of around 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. Projects with duration of maximum 2 years will be financed.

At least 50% of the PCP consortium participants at the moment of grant agreement signature should be SMEs. At least 30% of the PCP consortium participants at the moment of grahnt agreement signature should be small innovative SMEs ("small" to be de defined).

The proposal should explain clearly and in detail how the creation of (1) jobs, (2) economic growth and (3) new businesses will be assessed as an integral part of the project.

Expected impact: The project is expected to lead to:

- innovative solutions to deal effectively with soil contamination that respond to the common needs and beyond state-of-the-art performance targets of the buyers group
- reduce the fragmentation of demand for innovative solutions by enabling public procurers to collectively implement PCP in the area of soil decontamination, which, due to their nature, are better addressed jointly, or which they would not have been able to tackle independently;
- new opportunities for wide market uptake and economies of scale for the supply side through the use of joint specifications, wide publication of results and where relevant contribution to standardization, regulation or certification to remove barriers for introduction of innovations into the market.
- creation of viable businesses, jobs and growth.

Type of action: Pre-Commercial Procurement (PCP) Co-fund actions

SC5-29-2016: Preparing for pre-commercial procurement (PCP) and/or public procurement of innovative solutions (PPI) in support of climate action, environment, resource efficiency and raw materials

Specific challenge: Pre-commercial procurement (PCP) and public procurement of innovative solutions (PPI) are effective demand side innovation actions, since they enable public procurers to drive innovation from the demand side by acting as technologically demanding first buyers.

This helps improve the quality and effectiveness of public services and at the same time stimulate opportunities for companies to create, maintain or take international leadership in new markets.

PCP is an approach for procuring research and innovation services which enables public procurers to:

- share the risks and benefits of designing, prototyping and testing new products and services with the suppliers, without involving state aid;
- create the optimum conditions for wide commercialization and take-up of research results through standardization and/or publication;
- pool the efforts of several procurers.

Innovation-oriented public procurements (PCP and PPI) are therefore key to fostering lead markets and generating a critical mass of demand for climate action, environment, resource efficiency and raw materials solutions and services. Barriers to these kinds of public procurement include the absence of cross-border coordination and lack of access to best practices and to knowledge of close-to-market innovative solutions.

Scope: Actions should prepare for PCPs and/or PPIs, which would then be launched at the latest in 2018-2019. All areas covered by Societal Challenge 5 are eligible. All preparatory work should be achieved and delivered for at least eight PCPs and two PPIs.

The action should deliver all the necessary elements in preparation of the PCP and PPI as described in the general annexes.

Proposals should lead to the establishment of buyers' group(s) of public procurers to overcome the fragmentation of demand for solutions and services and to lead to a more rapid market uptake of such solutions and their early deployment. Procurements could address entire value chains in the areas(s) covered.

Solutions should be based on a complete set of common specifications. Proposals should engage public and/or private procurers from each country participating (at national, regional or local level) that have responsibilities and budget control in the relevant area(s).

The buyers' group(s) should prepare for a joint or coordinated procurement. The feasibility of launching a joint or coordinated public procurement (PCPs and/or PPIs) should be assessed and tested. Preparation activities for the joint or coordinated PCPs and/or PPIs will be supported, not the costs of the procurement resulting from any PCP and/or PPI procedures.

Project duration should be 12 months.

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

Expected impact: Projects are expected to lead to:

- creation of a critical mass of procurers of solutions and services in the area of Societal Challenge 5, which would not otherwise be able to penetrate the market;
- leverage of additional investment in research and innovation;

- increased awareness and successful use of public procurement by procurers to boost innovation;
- reduced fragmentation of public sector demand via creation of a network of public procurers capable of collectively implement PCPs and/or PPIs.

Type of action: Coordination and support actions

Prizes

[DRAFT TEXT]

SC5-30-2016/2017: Designing and implementing inducement prizes for climate action, environment, resource efficiency and raw materials

Specific challenge: Inducement prizes are pure demand side actions with a high potential that is currently underused in Europe and for which experience in the fields of Societal Challenge 5 is as yet rather limited.

Scope: This topic calls for the design of at least eight inducement prizes in the areas covered by Societal Challenge 5 and for the subsequent implementation of at least three of them.

The final aim is to develop innovative and fully tested prototypes (products and/or services) that can subsequently rapidly enter the commercialisation/market deployment phase.

The design and implementation of inducement prizes should provide opportunities to consult with and mobilise relevant stakeholder communities.

SC5-30-2016: Design phase

The action should design at least eight inducement 8 prizes in any of the areas covered by Societal Challenge 5. The feasibility of designing inducement prizes in at least the following two fields should be thoroughly examined:

(1) web based applications integrating Earth Observation data (in-situ remote, sensing, citizen observatories, crowdsourcing) that can be further taken up by industry and put on the market (e.g. for urban services, environment and health applications, renewables, etc.) in consultation with the GEO community, and

(2) cultural heritage for sustainable growth, in consultation with the cultural heritage research and innovation community.

To develop this prize, social sciences and humanities tools and methodologies are required.

The proposal should explain clearly and in detail how the creation of jobs, economic growth and new businesses will be assessed as an integral part of the project.

The Commission considers that proposals requesting a contribution from the EU of around EUR 0.3 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Both the design phase and the implementation phase should be based on the different steps, criteria and methodologies already used in the Commission and by experts in the field of prize design and implementation.

SC5-30-2017: Implementation phase:

The action should successfully support, organise and manage all steps needed for the implementation of at least three major inducement prizes, up to the evaluation and award by the European Commission, including the external communication needed at all steps of the process. The three prizes will be selected by the European Commission from among the eight designed under SC5-29-2016, and will be specified on the Horizon 2020 website (http://ec.europa.eu/programmes/horizon2020/en/h2020-section/climate-action-environment-resource-efficiency-and-raw-materials).

The Commission considers that proposals requesting a contribution from the EU of around EUR 0.7 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 is expected to:

- create innovative products that are marketable and that have the potential to create new businesses, jobs and growth.
- boost innovation via the less-used instrument of inducement prizes;
- make a positive contribution to the environmental and/or socio-economic challenges addressed;
- improve the visibility of European research and innovation.

Type of action: Coordination and support action

Framework Partnership Agreement

SC5-31-2016: Framework Partnership Agreement supporting Joint Actions towards a sustainable green economy in Europe and beyond[65]

[DRAFT TEXT]

Specific challenge: The European Environment Agency's 2015 State of the Environment Report[66] finds that Europe is making progress in reducing environmental pressures, but that current environmental policies and technology efficiency gains are not likely to be sufficient to address the substantial challenges it faces in protecting its natural capital, stimulating resource-efficient, low-carbon economic and social development and safeguarding its population from environmental health risks. It recommends fundamental, systemic transitions in the systems of

[65] This topic is connected to the Other Action *'Specific Grant Agreements supporting Joint Actions'*
[66] http://www.eea.europa.eu/soer#tab-synthesis-report

production and consumption and profound changes in dominant institutions, lifestyles, practices, policies and technological solutions.

The challenge of underpinning and accelerating the transformation of our economy and society to more sustainable development paths has a planetary scale. The post 2015 sustainable development agenda, with a number of sustainable development goals, is likely to give new impetus to address this challenge at global level and will provide a global framework for cooperation to that end.

Operating a systemic transformation for sustainable development requires the mobilisation of all relevant actors: public authorities at various levels, manufacturing industry and business at large, academia, research institutes, finance and insurance, non-governmental organisations and civil society.

It will not happen without a consistent and aligned effort to be planned over many years in research, technological development and innovation, in order to provide a solid knowledge and evidence base for new transformative solutions and co-investment between public and private sectors. An enabling policy framework should help to develop, test and deploy such solutions.

Substantial volumes of investment are required. They cannot be allocated by individual Member States or by European institutions alone. The European Union funding is only a limited part of the total amounts available across Europe. The scale and scope of required effort can be achieved by pooling together research, innovation and financial resources from multiple sources at European and national levels. A properly aligned European Research Area open to the world can make an essential difference in enabling a transformative sustainability agenda to take shape.

The research and funding landscape in Europe is complex, but there is already a basis of coordinated efforts, notably through a number of joint programming initiatives (JPIs) and ERANETs that address various aspects of environmental sustainability, in Europe and globally.

In the area covered by Societal Challenge 5, a Framework Partnership Agreement is foreseen with a view to create research and innovation synergies on a large scale, by organising joint programming actions between the entities responsible for public funding programmes at national, regional and European levels. This addresses JPIs and ERANETs that have a strong bearing on environmental sustainability.

Scope: The new possibilities foreseen in the H2020 Rules for Participation[67] simplify and accelerate the implementation of ERA-NET Co-fund actions and maximise their impact in addressing the climate, environment and resource efficiency societal challenge.

[67] Article 11, Calls for proposals " …2. As an exception and without prejudice to the other cases provided for in Regulation (EU, Euratom) No 966/2012 and Regulation (EU) No 1268/2012, calls for proposals shall not be issued for coordination and support actions and **programme co-fund actions to be carried out by legal entities identified in the work programmes** or work plans provided that the action does not fall within the scope of a call for proposals."
Article 18, Grant agreement "…7. In duly justified cases, **specific grants for actions may form part of a framework partnership** in accordance with Regulation (EU, Euratom) No 966/2012 and Regulation (EU) No 1268/2012."

The purpose of this call is to create one Framework Partnership Agreement to strengthen and simplify cooperation between the European Commission, Member States' and other national/regional programme managers and owners in the fields of relevance of the Societal Challenge 5, excluding the specific part on raw materials.

The Framework Partnership Agreement will cover the remaining duration of Horizon 2020. Proposals submitted to this call should include a maximum number of organisations that intend to participate in future ERA-NET Co-fund actions, both in-kind and cash-based. Later changes to the legal entities participating will be made through amendments to the Framework Partnership Agreement.

Expected impact: In areas of common interest within the scope of Societal Challenge 5, the Framework Partnership Agreement will:

- establish long-term and more strategic collaboration among programme managers and owners so as to create a globally attractive European Research Area that underpins the transformation towards sustainable development in line with the post 2015 sustainable development agenda;
- establish long-lasting joint programming research efforts with structural impacts between Member States in areas of common interest within the scope of the Societal Challenge 5;
- increase the involvement of programme managers and owners in jointly addressing sustainability challenges, inter alia through ERA-NET Co-fund actions, thereby improving the synergy at European and global levels between JPIs and ERANETs within a common strategic frame;
- simplify the definition, preparation and implementation of ERA-NET Cofund actions and accelerate the dissemination and uptake of their results;
- substantially reduce the time between identifying research areas and the launch of co-funded calls in those areas.

Type of Action: Framework Partnership Agreement (for ERA-NET Co-fund actions)

CONDITIONS FOR THIS CALL

Opening date(s)[69]: XX/XX/2015 for 2016 topics
XX/XX/2016 for 2017 topics

Deadline(s)[70]:

SC5-3-2016, SC5-5-2016, SC5-6a-2016, SC5-6b-2016, SC5-9-2016, SC5-12-2016, SC5-13-2016, SC5-15b-2016, SC5-15c-2016, SC5-16a-2016, SC5-17a-2016, SC5-17b-2016, SC5-18a-2016, SC5-18b-2016, SC5-19-2016, SC5-22-2016, SC5-26-2016, SC-5-27-2016 SC5-29-2016, SC5-30-2016	XX/XX/2016 at 17.00.00 Brussels time	
SC5-31-2016	XX/XX/2016 at 17.00.00 Brussels time	
SC5-1-2016, SC5-8-2016, SC5-11-2016, SC5-23-2016	First stage XX/XX/2016 at 17.00.00 Brussels time	Second stage XX/XX/2016 at 17.00.00 Brussels time
SC5-1-2017, SC5-2-2017, SC5-4-2017, SC5-6c-2017, SC5-7-2017, SC5-15a-2017, SC5-16b-2017,	XX/XX/2017 at 17.00.00 Brussels time	

[69] The Director-General responsible may decide to open the call up to one month prior to or after the envisaged date of opening.
[70] The Director-General responsible may delay this deadline by up to two months.

SC5-16c-2017, SC5-17c-2017, SC5-17d-2017, SC5-17e-2017, SC5-17f-2017, SC5-17g-2017, SC5-17h-2017, SC5-18c-2017, SC5-19-2017, SC5-20-2017, SC5-21-2017, SC5-24-2017, SC5-26-2017, SC5-28-2017, SC5-30-2017		
SC5-8-2017, SC5-10-2017, SC5-23-2017	First stage XX/XX/2017 at 17.00.00 Brussels time	Second stage XX/XX/2017 at 17.00.00 Brussels time

Overall indicative budget: EUR 203.10 million from the 2016 budget, and EUR 218.10 million from the 2017 budget

Topics	2016 EUR million	2017 EUR million
SC5-1-2016	20.00	-
SC5-1-2017, SC5-2-2017, SC5-3-2016, SC5-4-2017, SC5-6-2016/2017	20.00	43.00
SC5-5-2016, SC5-7-2017, SC5-12-2016, SC5-13-2016, SC5-21-2017, SC5-26-2016/2017, SC5-29-2016, SC5-30-2016/2017	7.9	5.15
SC5-8-2016/2017, SC5-10-2017	40.00	65.00
SC5-9-2016, SC5-11-2016	20.00	-
SC5-15-2016/2017	26.00	10.00
SC5-16-2016/2017	28.00	56.00
SC5-17-2016/2017, SC5-18-	5.00	9.50

2016/2017		
SC5-19-2017	-	5.00
SC5-20-2017, SC5-22-2016	10.00	15.00
SC5-23-2016/2017, SC5-24-2017	10.00	15.00
SC5-28-2017	-	5.00
SC5-27-2016	0.5	

Eligibility and admissibility conditions: The conditions are described in parts B and C of the General Annexes to the work programme, with the following exceptions:

SC5-5-2016, SC5-7-2017, SC5-13-2016, SC5-17a-2016, SC5-17b-2016, SC5-17c-2017, SC5-17d-2017, SC5-17e-2017, SC5-17h-2017, SC5-18a-2016, SC5-21-2017, SC5-27-2016 SC5-30-2016, SC5-30-2017,	Up to one project per (sub-)topic shall be funded.

Evaluation criteria, scoring and threshold: The criteria, scoring and threshold are described in part H of the General Annexes to the work programme.

Evaluation procedure: The procedure for setting a priority order for proposals with the same score is given in part H of the General Annexes.

The full evaluation procedure is described in the relevant guide[71] published on the Participant Portal.

Indicative timetable for evaluation and grant agreement:

	Information on the outcome of	Information on the outcome of	Indicative date for the signing	

[71] See: http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/pse/h2020-guide-pse_en.pdf

	the evaluation (*single or first stage*)	the evaluation (*second stage)*	of grant agreements	
SC5-1-2017, SC5-2-2017, SC5-3-2016, SC5-4-2017, SC5-5-2016, SC5-6-2016/2017, SC5-7-2017, SC5-9-2016, SC5-12-2016, SC5-13-2016, SC5-15-2016/2017, SC5-16-2016/2017, SC5-17-2016/2017, SC5-18-2016/2017, SC5-19-2016/2017, SC5-20-2017, SC5-21-2017, SC5-22-2016, SC5-24-2017, SC5-26-2016/2017, SC5-27-2016, SC5-28-2017SC5-29-2016, SC5-30-2016, SC5-31-2016	Maximum 5 months from the final date for submission		Maximum 8 months from the final date for submission	
SC5-1-2016, SC5-8-2016/2017, SC5-10-2017, SC5-11-2016, SC5-23-2016/2017	Maximum 3 months from the final date for submission	Maximum 5 months from the final date for submission	Maximum 8 months from the final date for submission (second stage)	

Consortium agreements: In line with the Rules for Participation, participants in Research and Innovation Actions or in Innovation Actions are required to conclude a consortium agreement prior to grant agreement.

Other actions

[Placeholder: The announcement of the inducement prizes designed via topic SC5-29-2016 will be published in a revision to the Work Programme 2017.]

1. GEO subscription

Scope: An annual contribution to the 2016 and 2017 activities of the GEO Secretariat, as subscription to a body of which they are a member, according to Article 121(2)(d) of the Financial Regulation applicable to the general budget of the European Communities.

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

Indicative timetable: Second Quarter of 2016 and second Quarter of 2017

Indicative budget: **EUR 0.80 million from the 2016 budget and EUR 0.80 million from the 2017 budget**

2. IPCC secretariat

Scope: The IPCC is the key global climate science-policy interface, underpinning European and international climate policy making and is the leading body responsible for the scientific assessement of climate change. The European Union has an enhanced observer status at the UN and may exercise the following procedural rights at IPCC Sessions: the right to speak in turn, the right to reply and the right to introduce proposals.

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.

Legal entity: IPCC secretariat, hosted by the World Meteorological Organisation, Geneva, Switzerland

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

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

Indicative timetable: Third Quarter 2017

Indicative budget: **EUR 0.70 million from the 2017 budget**

3. Support actions for raw materials policy

a) 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:

For 2016:

- the EIP Annual Monitoring Report on "Raw Materials Commitments",
- the preparatory work on the EIP Strategic Implementation Plan (SIP) Implementation Document (e.g. via a Europe-wide questionnaire),
- the preparatory work on the Raw Materials Scoreboard (e.g. data extraction, development of new indicators).

For 2017:

- the EIP Annual Monitoring Report on "Raw Materials Commitments,
- the finalisation of the EIP SIP Implementation Document 2017 (e.g. involving stakeholder consultation/meetings),
- 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).

Type of action: Provision of technical/scientific services by the EC Joint Research Centre (2016/2017)

Indicative timeframe: 2016 and 2017

Indicative number of direct service contracts: 1 for 2016, 1 for 2017

Indicative duration: 12 months

Total indicative budget: **EUR 0.4 million from the 2016 budget and EUR 0.4 million from the 2017 budget**

b) 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

Indicative timeframe: 2016 and 2017

Indicative number of direct service contracts: 1 for 2016, 1 for 2017

Indicative duration: 12 months

Total indicative budget: **EUR 0.45 million from the 2016 budget, and EUR 0.45 million from the 2017 budget**

4. Specific Grant Agreements (SGAs) for ERA-NET Cofund actions supporting Joint Actions towards sustainable green economy in Europe and beyond [72]

[text to be fine-tuned]

Once the Framework Partnership Agreement (FPA) resulting from the topic SC5-30-2016 is concluded between the Commission services and the consortium of programme owners and programme managers, each individual ERA-NET Cofund action will be implemented as a Specific Grant Agreement (SGA) linked to the FPA.

Individual topics suitable for SGAs will be identified and discussed in close collaboration with Member States' representatives on the basis of the indicative list of topics below. The actual submission of the simplified ERA-NET Cofund proposals will only be possible after the Commission services have agreed to the scope and budget of each ERA-NET to be co-funded.

Proposals will have to pay particular attention to tackling the following challenges:

- Adhering to the specific challenges identified for the Framework Partnership Agreement;
- Focusing on projects developing innovative solutions and/or bringing them closer to deployment;
- Encouraging business participation to leverage private sector investment;
- Strengthening the European innovation and technology base, thereby creating economic growth and jobs in Europe;
- Realising systemic and integrated step changes towards a real sustainable "green economy";
- Reinforce the synergy at international level – where the case.

[72] This topic is connected to call FDA 1 - 2016 '*Framework Partnership Agreement supporting Joint Actions towards a sustainable green economy in Europe and beyond*'

It is expected that the time from proposal submission to signature of the grant agreement will normally not exceed 4-5 months and thus contribute to a faster launch of joint calls and implementation of actions. Proposals shall not be submitted later than October 31st of the budgetary year.

Type of action: Framework Partnership Agreement – Specific Grant Agreements for ERA-NET Cofund actions

Legal entities: Signatories of the Framework Partnership Agreement (SC5-29-2016)

Indicative budget: EUR total 13 million from the 2016 budget and EUR total 25 million from the 2017 budget.

[ERA-NETs to be incorporated in new text:

a) Transformations to sustainability

Specific challenge: To identify and tackle the social transformations needed to make a step change in addressing global environmental challenges and the sustainability of our society and economy, such as climate change, urbanisation, unsustainable consumption and production patterns, water and food security and safety, biodiversity loss, persistent poverty, growing inequalities and conflicts etc.

Scope: Proposals should pool the necessary financial resources from the participating national, regional, or international research programmes with a view to implementing a joint call for proposals resulting in grants to third parties with EU co-funding in this area. Proposers are also encouraged to include other joint activities including additional joint calls without EU co-funding.

Actions will provide solutions through a new approach to research and action on global environmental change and global sustainability that factors in complex social behaviours and social transformation. This will require transdisciplinary research on the complex processes of social transformation to secure effective, equitable and durable solutions that are targeted to local contexts, to comply with the Sustainable Development Goals. The approach should take into account existing experiences of programmes addressing the issue of transformation to sustainability and to low-carbon economies and societies, such as FP7, JPI Climate and the International Social Science Council (ISSC) programme, with a strong focus on developing countries.

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), actions will contribute to implementing multilateral activities such as the Belmont Forum and Future Earth initiatives to address cultural, economic, institutional and political barriers and opportunities and identify which sustainable development pathways linking economic prosperity with social justice and a healthy biosphere are actionable in different contexts.

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: Projects are expected to lead to:

- *alignment of EU Member States' and international partners' research programmes towards the objectives set by the Sustainable Development Goals;*
- *strengthened research capacities in low- and middle income countries around the world;*
- *transformed research on global environmental change by fostering transdisciplinarity, bringing together disciplines, practitioners and societal stakeholders, with the ultimate objective of bringing about transformative shifts to a more sustainable and just world.*

b) Strategic EU research and innovation for systemic eco-innovation

Specific challenge: The transition towards a systemic approach to eco-innovation and new circular economy business models should generate jobs, growth and opportunities for development.

Scope: The objective is to support systemic eco-innovation by pooling together the necessary financial resources from the participating national (or regional) research programmes with a view to implementing joint calls for proposals resulting in grants with EU co-funding.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR XX 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: Reduced fragmentation of research and innovation on systemic eco-innovation across Europe.

c) Climate services roadmap implementation

Specific challenge: Following the outcome of the European Workshop 'Towards a European Market of Climate Services' (18th March, 2014), a European Roadmap for Climate services has been prepared by an independent group of experts and presented in a subsequent European Conference on 17th March 2015. The Roadmap identifies a series of challenges and specific actions that need to be undertaken by various actors in Europe, in order to strengthen the European market of climate services. In the Horizon 2020 work programme of 2015 an ERA-NET action has already been launched with the JPI Climate for developing scientific advances in support to climate services, involving as well mandated governmental research centres in the design of co-aligned actions. The challenge is to support the implementation of the Roadmap, building upon the layer of activities already launched, in order to provide substantial advances on regional/local impact and resilience studies on various societal/economic sectors.

Scope: Support the implementation of the roadmap on climate services and align actions of the various national climate service centres of Member States, by developing capabilities and by carrying out transdisciplinary research – co-designed with key stakeholders – on the

quantification of regional/local impacts of climate change and variability on key economic/societal sectors, considering different mitigation and adaptation scenarios, and taking appropriately into account tipping points and low-probability/high-impact events. This action should be implemented through a close cooperation with Member States grouped around the JPI Climate, and will take into account relevant actions already carried out in the first H2020 programming cycle. The action should get benefit from cooperation with advanced programmes and projects on climate regional modelling and knowledge gaps, such as the one foreseen in this work programme for 2016.

The Commission considers a proposal 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 results of the projects launched through this ERA-NET are expected to:

- *substantially increase the capability of quantifying the impacts of climate change at local/regional level in a risk-assessment framework;*
- *increase the potential of using climate impact data in operational climate services;*
- *align public funding on actions in support to the development of climate services within the JPI Climate member countries and beyond.*

Type of action: ERA-NET Cofund

d) Sustainable urbanisation

Specific challenge: In a globalised world, cities all over the world are facing broadly similar challenges. Finding solutions and defining optimal pathways towards sustainable urbanisation receives high priority in the Research and Innovation (R&I) policy of the majority of the countries worldwide. In this context, aligning R&I agendas to underpin sustainable urbanisation and implementing them through international collaboration will promote synergies, and thus an optimal use of the available expertise, capacity and resources, avoid duplication and ensure robust outcomes of global relevance. The opening of JPI Urban Europe to third country partners is increasingly finding interest among its members and among third countries. The Belmont Forum provides an excellent platform for international collaboration in the area of sustainable urbanisation.

Scope: Proposals should pool the necessary financial resources from the participating national, regional, or international research programmes with a view to implementing a joint call for proposals resulting in grants to third parties with EU co-funding in this area. Proposers are also encouraged to include other joint activities including additional joint calls without EU co-funding.

Actions should build on the international strategy of the JPI Urban Europe and launch in collaboration with the Belmont Forum at least one international call on sustainable urbanisation.

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

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: Actions are expected to lead to:

- *the alignment of research and innovation agendas in the area of sustainable urbanisation and co-ordinated streamlining of the implementation of the respective calls;*
- *enhanced excellence and global relevance of research and innovation activities on sustainable urbanisation and increased visibility at international level;*
- *strong and lasting alliance with the funding agencies of key international partners for research and innovation actions on sustainable urbanisation (e.g China, Japan, Brazil, Mexico, USA etc.);*
- *linking of possible European and international demonstration actions on re-naturing cities to induce a wider, worldwide application of nature-based solutions.*

e) Closing the water cycle gap

Specific challenge: Water-related research and innovation is fragmented at EU level and dispersed at national level in several ministries, universities, agencies, regional governments and programmes. To be more effective and increase the added value of related investments, the efforts and strategic research agendas of the many funding networks and organisations existing in Europe need to be integrated to establish transnational and trans-disciplinary research and innovation actions.

Scope: The action will support delivering on priorities identified in the Strategic Research Agenda of the Water JPI, by pooling together the necessary financial resources from the participating national (or regional) research programmes with a view to implementing a joint call for proposals resulting in grants to third parties with EU co-funding. The joint call should address the thematic area "Closing the Water Cycle Gap" of the Strategic Research and Innovation Agenda. Proposers should also consider implementing other joint activities including additional joint calls without EU co-funding. In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation with third countries 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 impact: Projects are expected to lead to:

- *improved use of scarce human and financial resources in the area of water research and innovation;*
- *reduced fragmentation of water research and innovation efforts across Europe;*
- *improved synergy, coordination and coherence between national and EU funding in the relevant research fields through transnational collaboration;*

- *improved implementation of research and innovation programmes in these fields through exchange of good practices;*
- *contribution to the implementation of the JPI on Water.]*

Contribution to SME Instrument call

Topic XX: Boosting the potential of small businesses in the areas and priorities of SC5
[topic number to be confirmed when dedicated SME instrument call finalised]

Specific challenge: Innovative SMEs have been recognised as being able to become the engine of the green economy and to facilitate the transition to a resource efficient, climate-smart circular economy. They can play an important role in helping the EU to exit from the economic crises and in job creation. The potential of commercialising innovative solutions from SMEs is however hindered by several barriers including the absence of the proof of concept, the difficulty to access risk finance, the lack of prototyping, insufficient scale-up studies, etc. Growth therefore needs to be stimulated by increasing the levels of innovation in SMEs, covering their different innovation needs over the whole innovation cycle.

Innovative SMEs should be supported and guided to reach and accelerate their full green growth potential. This topic is targeted at all types of eco-innovative[73] SMEs in all areas addressing the climate action, environment, resource efficiency and raw materials challenge – including but not restricted to the 2016-2017 strategic priorities of systemic eco-innovation and circular economy, nature-based solutions, climate services, sustainable supply of raw materials, harnessing earth observation data, cultural heritage for sustainable growth, and water – focusing on SMEs showing a strong ambition to develop, grow and internationalise. All kinds of promising ideas, products, processes, services and business models, notably across sectors and disciplines, for commercialisation both in a business-to-business (B2B) and a business-to-customer (B2C) context, are eligible.

Scope: *[Standard SME instrument text, as for all SME Instrument topics, as in WP 2014-2015]*

Expected impact: *[Standard SME instrument text]*

Type of action: SME Instrument

[Budget envelope for this topic: **EUR 25.00 million from the 2016 budget and EUR 27.00 million from the 2017 budget**]

[73] http://ec.europa.eu/environment/eco-innovation/index_en.htm

Contribution to Focus Area 'Sustainable Food Security – Resilient Agri-food Chains'
[will appear in SC2 Work Programme]

Topic 1: Earth observation services for the monitoring of agricultural production in Africa (2017)

Specific challenge: The Fourth EU-Africa Summit of 2-3 April 2014 agreed on a roadmap for 2014-2017[74] including actions specifically targeted at delivering Earth observation services in priority domains for Africa such as food security. This topic aims to contribute to this roadmap by providing food supply prediction and agricultural risk assessment for Africa. These kinds of prediction remain very challenging tasks, requiring a lot of information on environmental and weather conditions, climate change, crops and livestock. This information is usually derived from both remote and in-situ Earth observation systems. The challenge is therefore to make agricultural production in Africa more predictable by using Earth observation assets, including – but not limited to – those made available through the Global Earth Observation System of Systems (GEOSS) and Copernicus programmes.

Scope: The action should lead to substantially increasing the use of Earth observing capabilities and supporting application systems to produce timely, objective, reliable, and transparent crop and livestock production predictions at the national and regional level for the African continent. It should support the GEOGLAM[75] and AfriGEOSS[76] initiatives and relevant aspects of the EU's development policy. Moreover, it should design and develop methods to assess/monitor agricultural production in Africa, taking into account its main drivers and the longer term impacts of its dynamics. Building on the outcomes of existing EU projects stimulating innovation for global agricultural monitoring – such as SIGMA[77] –, the research and innovation activities should cover as a minimum all the following domains: crop and livestock identification and crop and livestock area estimation, crop and livestock condition and stress, yield prediction and forecasting, crop cover mapping, and the impact of extreme events on food production.

The action should foster participatory approaches to collecting relevant information and data, taking advantage of the growing number of mobile communication devices owned by African citizens. There should be an emphasis on 'consensus of evidence approaches', integrating data from multiple sources including Earth observations, crop models, weather forecast, climate predictions and projections, surveys and ground observations to reach evidence-based assessments using repeatable and scientifically sound methods.

Large proof-of-concept actions, showing the capacity to deliver food supply prediction and agriculture risk assessment beyond the current state-of-the art at regional/pan-African level should be performed by the action. Proposals should contribute to supporting the implementation of an EU-Africa partnership on Food and Nutrition Security and Sustainable Agriculture and should include partners clearly representing the diversity of African countries.

[74] http://www.africa-eu-partnership.org/sites/default/files/documents/2014_04_01_4th_eu-africa_summit_roadmap_en.pdf
[75] http://www.geoglam-crop-monitor.org/
[76] http://www.earthobservations.org/afrigeoss.php
[77] http://www.geoglam-sigma.info/

The action should establish cooperation with institutions/networks engaged in the development of climate services in Africa.

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: Projects are expected to:

- move prediction of food supply and agricultural risk assessment at the level of the African continent beyond the current capability;
- improve decision making capacity regarding food supply and management in Africa;
- contribute to independent and neutral evaluation of agricultural production in Africa;
- strengthen collaboration between EU and African organisations in the domain of food prediction;
- increased involvement of citizens and stakeholders in food production and food supply chain management in Africa;
- provide a strong Earth observation building blocks for an EU-Africa Research and Innovation Partnership focusing on food and nutrition security and sustainable agriculture;
- improve participation of African organisations in GEO and Copernicus;
- foster cooperation with initiatives developing the Global Framework for Climate Services (GFCS)[78] in African countries.

Type of action: Research and innovation actions

[78] www.gfcs-climate.org/

CONDITIONS FOR THIS CALL

[part concerning SC5 topic]

Opening date(s)[79]: XX/XX/2015 for 2016 topics

XX/XX/2016 for 2017 topics

Deadline(s)[80]:

Topic1-2017	XX/XX/2017 at 17.00.00 Brussels time	

Overall indicative budget: EUR XX.00 million from the 2016 budget[81], and EUR XX.00 million from the 2017 budget [82]

Eligibility and admissibility conditions: The conditions are described in parts B and C of the General Annexes to the work programme, with the following exceptions:

Topic1-2017	At least one organisation from each African sub-region defined according to the United Nations Statistics Division[83] (Eastern Africa, Middle Africa, Northern Africa, Southern Africa, Western Africa) should participate in proposals. Up to one project per topic shall be funded

Evaluation criteria, scoring and threshold: The criteria, scoring and threshold are described in part H of the General Annexes to the work programme.

Evaluation procedure: The procedure for setting a priority order for proposals with the same score is given in part H of the General Annexes.

[79] The Director-General responsible may decide to open the call up to one month prior to or after the envisaged date of opening.

[80] The Director-General responsible may delay this deadline by up to two months.

[81] of which EUR 0.00 million from the societal challenge 'Climate action, environment, resource efficiency and raw materials', EUR XX.00 million from the societal challenge 'Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy'.

[82] of which EUR 10.00 million from the societal challenge 'Climate action, environment, resource efficiency and raw materials', and EUR XX.00 million from the societal challenge 'Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy'.

[83] http://unstats.un.org/unsd/methods/m49/m49regin.htm#africa

The full evaluation procedure is described in the relevant guide[84] published on the Participant Portal.

Indicative timetable for evaluation and grant agreement:

	Information on the outcome of the evaluation (*single or first stage*)	Information on the outcome of the evaluation (*second stage)*	Indicative date for the signing of grant agreements	
Topic1-2017	Maximum 5 months from the final date for submission		Maximum 8 months from the final date for submission	

Consortium agreements: In line with the Rules for Participation, participants in Research and Innovation Actions or in Innovation Actions are required to conclude a consortium agreement prior to grant agreement.

[84] See: http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/pse/h2020-guide-pse_en.pdf

Contribution to cross-challenge activities on 'Sustainable Subsurface Economy'

[will appear in SC3 Work Programme]

Topic XX: Cross-challenge ERA-NET on applied geosciences (2016)

The increasing use of subsurface resources resulting from growing energy needs and the growing demand for water and raw materials represent key challenges, requiring a more integrated, efficient and sustainable use of these resources, and the minimisation of its negative health and environmental impact. This creates at the same time significant opportunities in terms of growth and job creation in advanced technology sectors related to the optimal management and use of the resources. This topic addresses three specific challenges that are highly relevant to the sustainable use of the subsurface: Geo-energy, Groundwater and Raw Materials.

a) Geo-energy:

With regard to Geo-energy, information is needed on:

- the potential contribution from the subsurface (i.e. access to primary energy sources, energy storage potential and storage capacity for energy production effluents such as CO2);
- potential risks and environmental impacts associated with subsurface use for energy applications;
- potential competition and interference of different (energy and other) applications within the subsurface.

Information on the European subsurface must be available and accessible to society in order to enable the more efficient and sustainable use, more integrated management and spatial planning of the subsurface and the energy resources, groundwater and raw materials it contains. This requires setting up a Pan-European database of harmonised and scientifically robust digital information of the subsurface and its potential uses in the field of geo-energy. The use and implementation of the database should be unambiguous and based on common agreed principles.

b) Groundwater:

Groundwater resources and the subsurface in general are increasingly used for a wide range of applications and therefore under pressure. Groundwater resources are threatened by climate change, pollution and water abstraction. There is a clear need to assess the impact of these drivers on the groundwater resources, their inter-linkage with surface water resources and the groundwater dependent terrestrial and associated aquatic ecosystems including coastal waters; as well as the built environment and rural and urban land use.

Modern technologies allow characterisation and visualisation of groundwater bodies; simulation of potential pathways and groundwater flow velocities; assessment of temporal and spatial trends in groundwater quality and quantity; and assessment of their impact on and interaction with surface waters. Such work both provides and requires information and knowledge of physical, chemical and hydraulic parameters on the European subsurface. These data must be available and easily accessible for all relevant end users to enable proper water resource management and integrated surface and subsurface spatial planning and assessments.

c) Raw Materials:

The EU Raw Materials policy aims to ensure the sustainable supply of non-energy raw materials from the EU and global sources, including metallic and industrial minerals, as well as construction materials (dimension stones and aggregates).

Supply from the EU sources requires harmonized and standardized EU level data and information on raw material deposits, as well as on mine-wastes materials - such as by-products, waste rocks, tailings and residues – that could be recycled and re-used. Discovery of new resources needs enhanced information and ore deposit models in exploration and resource assessment to focus increasingly on deeply buried deposits, as well as on mineral deposits on or below the sea-floor.

Such EU level data and information do not exist at the moment. However, there is relevant knowledge of mineral deposits at the Member States level with heterogeneous terminology and reporting standards.

There is also a need for European sustainable sub-surface planning and use, that should be based on documentation and spatial databases of deposit and high-potential exploration areas.

Scope:

a) Geo-energy:

In the field of geo-energy, the ERA-NET shall collect, analyse and monitor reliable and impartial scientific information on geologically based energy resources and potential consequences related to their potential exploitation (e.g. hazards, interference), including conventional and unconventional oil and gas, coal, coal bed methane (CBM), gas hydrates, geothermal resources and uranium, as well as CO2 storage and energy storage (note that certain resources are of local relevance only such as for example gas hydrates and uranium). This includes developing state-of-the-art methodologies and workflows focusing on efficient cross border and integrated pan-European resource mapping and assessment, both onshore and offshore. Results may be used for recommending data acquisition and modelling strategies to uncover assumed potential in underexplored regions. Specific site investigations are excluded from the ERA-NET scope.

A database shall be developed with a view to, in the longer term, the operation and maintenance of an integrated geological database and map of the European underground and its potential uses. The database will have the technical specifications so that it can be potentially hosted by the European Commission.

Public deliverables could among others comprise maps of depth and thickness for major stratigraphic units and specific layers (aquifers, shales, ore) relevant to geo-energy potential; their properties essential for assessing feasibility, performance and behaviour; maps and cross-sections of main structural elements and faults.

b) Groundwater:

In the field of groundwater, research should develop and enhance the knowledge and the predictive capacity needed to assess the impact of climate change on groundwater resources and dependent surface waters and ecosystems, and the consequences for groundwater quantitative and chemical status assessed according to the Water Framework and Groundwater directives. High quality models including estimated simulation and projection uncertainties and decision support systems should be developed that would allow for:

- elaboration of cost-effective measures and assessment of their (cost) effectiveness;
- sustainable decision making taking into account the water-food-energy nexus;

The ERA-NET will contribute to:

- development of improved databases comprising harmonized existing and new (to be collected) subsurface data where data gaps exist at local to pan-European scale;
- state-of-the-art resource mapping and assessment that will set the basis for an integrated Europe-wide monitoring system of groundwater;
- integrated groundwater and surface water assessments, simulations and projections both at local/regional and transnational (large river basins) scale.

Deliverables shall include:

- improved tools and models for subsurface characterisation, risk assessment and assessment of the impact of climate change and subsurface use on:
- temporal and spatial groundwater pollution trends including diffuse pollution of especially nutrients (N, P) and pesticides from agriculture, trends in nutrient loadings to ecosystems, and fate, behaviour and degradation of emerging pollutants from industry, households and agriculture;
- groundwater and surface water flooding risks;
    - saltwater / seawater intrusion;
    - groundwater abstraction needs for water supply and irrigation and the resulting impact on dependent terrestrial ecosystems (including soils), surface waters, and groundwater associated aquatic ecosystems, the groundwater ecosystem itself, and the built environment (e.g. damage of infrastructure due to land subsidence

c) Raw Materials:

The Raw Materials specific challenge shall address non-energy non-agricultural raw materials and minerals, and shall address all 28 EU Member States.

The ERA-NET shall, through intelligence networking and coordination, enhance and maintain the pan-EU mineral deposits inventory/database, in line with and building on existing activities in the framework of the EIP on Raw Materials. It shall provide economic geology maps of construction materials and industrial and metallic minerals across the EU 28 Member States in a free publicly accessible Internet/web-portal form.

The ERA-NET shall also deliver a pilot study identifying targets for general exploration, using innovative technologies and challenging a better understanding of ore genesis and direct exploration at deeper, unexploited levels of the Earth's crust.

Deliverables shall include:

- a Pan-EU mineral deposits inventory
    - The deposits (land and marine) will contribute to enhancing investment conditions for the inventory will be developed with a view, in the longer term, to create an integrated

geographical database and a mineral resources map of the European sub-surface and its potential development and uses.

- The inventory should build upon national level databases and past and on-going EU funded projects providing better insight into the distribution of known mineral raw material resources.
- The database will have the technical specifications so that it can be potentially hosted by the European Commission, and it will be compatible with INSPIRE Directive, energy minerals data and marine maps (EMODnet) for the proper land planning and use of both surface and sub-surface.
- The use of standardized and harmonized pan-European datasets of primary and secondary resources mining industry.

- Pilot Study:
  - The pilot study should identify targets for general exploration and further governmental spending, which is necessary to attract private investment into detailed exploration and mining across the whole EU. This can be achieved by developing and applying innovative exploration technologies (3D/4D) to locate deep-seated deposits. The pilot study should deliver high-quality metallogenetic, mineral potential and predictivity maps - which may lead to discovery of new or little-known types of ore deposits and ore-forming systems, including of critical raw materials, in specifically targeted areas. Results of the pilot study will feed into the EU mineral deposits inventory, and will set the stage for follow-up activities.

Expected impact: A more integrated and efficient management and exploitation (and more responsible and publicly-accepted use) of subsurface resources for the various uses, while reducing any associated potential impacts and risks.

Type of action: ERA-NET Cofund

Explanatory note: During the discussions of the WP 2014-2015 in the SC5 shadow committee, a strong interest was expressed by a majority of delegations for supporting an initiative through Horizon 2020 to achieve an integrated European Geological Service providing a European geological knowledge base in support of many EU policies and underpinning most societal challenges of Horizon 2020. An Inter-Service Group concluded that a cross-challenge “in-kind” ERA-NET would provide the best instrument to achieve this. Horizon 2020 parts contributing to this ERA-NET are Societal Challenge 3 (Chef de File, contribution EUR 4 million) and Societal Challenge 5 (contribution EUR 6 million).

SC5 Budget overview

	2016 Budget EUR million[85]	**2017 Budget EUR million**
Calls		
Call H2020-SC5-2016/2017 *title tbc*	*187.60* *of which 59.17 from 02.040301 and 128.43 from 08.020305*	228.8 *of which 80.65 from 02.040301 and 148.15 from 08.020305*
Contribution from this societal challenge to cross-cutting call 'Industry 2020 in a Circular Economy' *official call number to be added*	*84.5* *from 08.020305*	70.00 *from 08.020305*
Contribution from this societal challenge to call 'H2020-BG-2016/2017' (under Part X of the work programme)	*30.00* *from 08.020305*	10.00 *from 08.020305*
Contribution from this societal challenge to call 'H2020-SFS-2016/2017' (under Part X of the work programme)	–	*10.00* *from 08.020305*
Contribution from this societal challenge to call 'H2020-??-2016/2017' (under Part X of the work programme) *ERA-NET for applied geo-sciences*	*6.00* *of which 3.00 from 02.040301 and 3.00 from 08.020305*	–
Contribution from this societal challenge to call 'H2020-??-2016/2017' (under Part X of the work programme) SME Instrument Call	25.00 *of which 5.00 from 02.040301 and 20.00 from 08.020305*	*27.00* *of which 6.00 from 02.040301 and 21.00 from 08.020305*
Contribution from this societal challenge to call 'H2020-FTIPilot-2015' (under Part X of the work programme)	7.00 *tbc* *of which 1.48 from 02.040301 and 5.52 from 08.020305*	–
Other Actions		
Experts (expert evaluators, monitors)	*3.00 tbc* *of which 0.63 from 02.040301*	3.00 *tbc* *of which 0.63 from 02.040301 and*

[85] The budget figures given in this table are rounded to two decimal places.

	and 2.37 from 08.020305	*2.37 from 08.020305*
Subscription – GEO secretariat	*0.80* *from 08.020305*	0.80 *from 08.020305*
Grant to identified beneficiary – IPCC	*0.70* *from 08.020305*	–
Administrative arrangement with JRC – Support actions for raw materials policy	*0.25* *from 02.040301*	0.25 *from 02.040301*
Public procurement – Support actions for raw materials policy	*0.45* *from 02.040301*	0.45 *from 02.040301*
Specific Grant Agreements (SGAs) for ERA-NET Cofund actions	*13.00* *from 08.020305*	*25.00* *from 08.020305*
Estimated total budget	***358.6***	***375.56***