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**Call Topics for International Cooperation
in Horizon 2020
EU and Japan**

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Industrial Leadership

Horizon 2020 Pillar:	Industrial Leadership
Programme:	Information and Communication Technologies
Call Title:	Information and Communication Technologies
Call Identifier:	H2020-ICT-2018-2020
Topic Title:	Unconventional Nanoelectronics
Topic Identifier:	ICT-06-2019
Type of Action:	RIA Research and Innovation action
Deadline(s):	28-03-2019 (single-stage)

Participant Portal Weblink:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/ict-06-2019.html>

Specific Challenges: The challenge is to maintain Europe's position at the forefront of advanced nanoelectronic technologies developments. This is essential to ensure strategic electronic design and manufacturing capability in Europe avoiding critical dependencies from other regions. Advanced nanoelectronics technologies enable innovative solutions to industrial and societal challenges.

Scope: Projects will aim at demonstrating the viability of new approaches to computing components. The focus should be on demonstrating new concepts at transistor or circuit level which bring the potential of highly improved performance for generic or specific applications. This can be based on materials, computing unit architecture (transistor or beyond) as well as at circuit level. Still the focus is on devices and components, as well as related processing technologies.

The concept validation should be addressed in a controlled environment at a limited scale (laboratory, research line) amenable to transfer to larger scale developments in industrial environments (pilot lines, etc.).

Innovative concepts include, but are not limited to, the design, processing and integration of devices based on new approaches, e.g. spintronics, neuromorphic, resulting in computing devices and circuits. Proposals are expected to prove the industrial relevance of the intended approach.

The scope of the call covers Research & Innovation Actions on

- Energy-efficient computation devices beyond the current CMOS paradigm. These can address steep slope devices, quantum bits implemented in solid-state, spintronic-based devices, single electron devices, nanomechanical switches, etc.

- Energy-efficient computation circuit architectures. These can be based on the devices above but approaches based on neuromorphic computing or other hardware implementation are relevant.
- Specific technological developments may include (i) promising approaches for 3D stacks, both sequential and monolithic to address challenges of compactness, heat dissipation, reduced interconnect length, and (ii) development of cryogenic electronics to support advances in applications to computing (superconducting, quantum computing) or constraints faced in space. The aim is the demonstration of functionality at circuit level by integrating the adequate functional blocks.
- Design for advanced nanoelectronics technologies. Focus will be on design-technology solutions for energy efficiency, high reliability and robustness. All above topics can be addressed as well as the issues related to improving the devices and circuits in the advanced technology nodes.

The proposed demonstrations are expected to be validated in laboratory (TRL 4).

Proposals are also expected to specify the road to industrialisation and establish links to applications likely to benefit from the development.

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 have substantial research in the area (e.g. **Japan**, South Korea, Taiwan and the USA).

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 and 4 million would allow this area to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Proposals should address one or more of the following impact criteria and provide metrics to measure and monitor success.

- Identify applications likely to benefit from the intended approach with indication of key parameters (power, energy-efficiency, size, frequency, and cost) and quantitative targets to be achieved (figures of merit).
- Contribute to the mid-term viability of the European Nanoelectronics industry ensuring that new technologies with high potential for computing emerge in time to be taken up by industry.
- Sustain the technological integration requirements by focussing on challenging 3D integration issues as well as for electronics at cryogenic temperature.
- Contribute to the European industry capability to design advanced circuits for its needs.

Cross-cutting Priorities: International cooperation

Horizon 2020 Pillar: Industrial Leadership

Programme: Leadership in Enabling and Industrial Technologies - Space

Call Title: Space 2018-2020

Call Identifier: H2020-SPACE-2018-2020

Topic Title: International Cooperation Copernicus – Designing EO downstream applications with international partners

Topic Identifier: DT-SPACE-06-EO-2019

Type of Action: RIA Research and Innovation action

Deadline(s): 12-03-2019 (single-stage)

Participant Portal Weblink:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/dt-space-06-eo-2019.html>

Specific Challenges: Copernicus, the Union's Earth observation and monitoring programme produces a wealth of data and information regarding the Earth sub-systems (land, atmosphere, oceans) and cross-cutting processes (climate change, emergency and security). Cooperation with international partners is key to promoting the uptake of Copernicus globally, exploiting possibilities for integrating in-situ, space data and information technologies. Building the Copernicus full, free and open data policy, the Commission seeks to facilitate access to Copernicus data and information for interested international partners. Administrative cooperation arrangements on Copernicus data access and earth observation data exchange have already been signed with the United States and Australia, and discussions towards similar cooperation have been started with other countries and regions (including Africa, Latin American countries and **Asia-Pacific** countries).

Cooperation with partner countries should be fostered with a view to using Copernicus data to jointly develop algorithms, services and/or products which serve local user needs and/or enhance the Copernicus global product quality.

Proposals are encouraged to use the Copernicus Data and Information Access Services (DIAS), or other existing data access solutions instead of setting up their own download and processing infrastructure. They are also encouraged to integrate third-party data (including in-situ data) and envisage data assimilation into models and products made available on the Copernicus platform of the Copernicus services..

For such applications and developments to succeed in the market or with public users, the products need to be shaped according to users' needs and their value to users must be openly demonstrated to the wider user community. This needs

to be achieved in an environment integrated at the level of the user, in order for users to accept the innovative potential which the product promises. This will require also specific attention to be given to the various processes in place in the users' workflows which incorporate the EO information. Furthermore, the transition of R&D product prototypes to viable commercial product lines after the end of the EU funded phase remains a challenge to be addressed early on during product development.

Scope: Proposals shall address a wide variety of applications stemming from the use of Earth observation and their smart integration with other related technologies. Copernicus should be considered as part of the solution which may include other space or non-space inputs. This is likely to lead to greater value, opportunities and especially market uptake. Applications shall be sustained by a production process capable of delivering to the user a product which is validated and accepted as a marketable product in the international partner country. International collaboration has a key role to play in this context, as it enhances access to markets beyond the national borders, notably by enabling space application providers to absorb market-related tacit knowledge and know-how of their partners. Corresponding validations and customisations are to be undertaken, and the business case for the application is to be demonstrated. Service level models are to be developed, with appropriate quality of service definitions for the application. Application products are expected to adopt open standards for data documentation, data models and services including data processing, visualisation and cataloguing on a large scale.

Tasks shall include joint calibration and validation activities or integration of local in-situ systems to enhance the quality of data and service products. It is important to exploit the added value of integration of EO observation technologies (both satellite, airborne and ground based) with positioning ones, and ICT (enhancing new frontiers opened by cloud computing) from international partner countries through the development of applications, and encourage their insertion into the market.

The choice of EO application is left to the proposer.

Applicants are advised to consult further information on the availability of Copernicus Sentinel Data, access to Copernicus Contributing Mission data, as well as issues recommended to be detailed in the proposals via the Commission's Copernicus website^[1].

For proposals under this topic:

- Participation of at least one partner from a country that has signed a Copernicus Cooperation Arrangement^[2] is required;
- Participation of industry, in particular SMEs, is encouraged;
- Involvement of post-graduate scientists, engineers and researchers is encouraged, for example through professional work experience or through fellowships/scholarships as applicable;
- Participation of partners involved in international **GEO Initiatives** is encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 and 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

This topic contributes to the Horizon 2020 focus area "Digitising and transforming European industry and services".

Expected Impact:

- Establish sustainable supply chains for innovative EO value added products and services with demonstrated commercial value with international client communities;
- Complete integration, based on international standards, into the customer's existing business processes and processing chains, as well as the economic viability of the application is to be demonstrated;
- Enhance the European industry's potential to take advantage of market opportunities and establish leadership in the field and to boost business activity;
- Lead to new or improved products, processes or services on the market that are capable of generating within 3 years after the end of public funding a significant turnover for the participants, and create new jobs;
- Lead to an improved quality of the Copernicus global product, thereby enhancing the stating of Copernicus data and information in a global environment and **GEOSS**.

Cross-cutting Priorities: International cooperation

^[1] <http://www.copernicus.eu/main/data-access>

^[2] See Copernicus.eu for list of countries concerned

Societal Challenges

Horizon 2020 Pillar:	Societal Challenges
Programme:	Climate action, environment, resource efficiency and raw materials
Call Title:	Building a low-carbon, climate resilient future: climate action in support of the Paris Agreement
Call Identifier:	H2020-LC-CLA-2018-2019-2020
Topic Title:	The changing cryosphere: uncertainties, risks and opportunities
Topic Identifier:	LC-CLA-07-2019
Type of Action:	CSA Coordination and support action
Deadline(s):	19-02-2019 (single-stage)

Participant Portal Weblink:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/lc-cla-07-2019.html>

Specific Challenges: Globally, glaciers and the large ice sheets of Antarctica and Greenland are particularly vulnerable to climate change, risking a significant future contribution to changes in sea levels. At present, there are significant uncertainties, e.g. relating to their stability, which prevent an accurate assessment of their vulnerability. The 'Arctic amplification' of global warming is putting pressure on the ecosystems and communities of the region and having an impact at global level as well. The Arctic's fragile natural ecosystems and societies are under serious threat, and additional human activities, linked to the new economic opportunities that are made possible by climate change, are putting additional pressure on them.

Scope: Actions should aim at developing innovative approaches to address the following sub-topic:

- d. Arctic standards (Coordination and Support action): The action should propose guidelines and protocols to develop 'Arctic standards', also including the legal framework, based on the translation of research outcomes into cold-climate technologies and services with commercial potential and the assessment of the sustainability of associated processes and technologies. The action should cover a wide range of technologies and services that have the potential to bring broad social and economic benefits within and beyond the Arctic region. The action should also provide requirements on how to design, build, install, and operate equipment and services to safely perform activities in the Arctic and to respond to emergencies.

The participation of standardisation organisations 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.

For all sub-topics, in line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged^[1], in particular with countries – beyond the EU Member States and countries associated to Horizon 2020 – that took part in the first Arctic Science Ministerial of 28 September 2016^[2].

Expected Impact:

the project results are expected to contribute to:

- enhanced stakeholder capability to operate in cold climate environments;
- better servicing of the economic sectors that operate in the Arctic (e.g. shipping, tourism);
- promoting sustainable Arctic opportunities arising from climate change and supporting the leverage of regional (EU) funds into these opportunities;
- supporting the competitiveness of European industry, particularly SMEs, engaging in sustainable development of the Arctic.

Cross-cutting Priorities: Blue Growth, International cooperation, RRI, Socio-economic science and humanities, Open Innovation

^[1] Proposals should pay attention to the special call conditions for this topic.

^[2] i.e. the United States of America, Canada, the People’s Republic of China, **Japan**, the Russian Federation, South Korea, New Zealand, India, Singapore, and Greenland; see https://www.arctic.gov/publications/other/supporting_arctic_science.html

Horizon 2020 Pillar:	Societal Challenges
Programme:	Climate action, environment, resource efficiency and raw materials
Call Title:	Building a low-carbon, climate resilient future: climate action in support of the Paris Agreement
Call Identifier:	H2020-LC-CLA-2018-2019-2020
Topic Title:	The changing cryosphere: uncertainties, risks and opportunities
Topic Identifier:	LC-CLA-07-2019
Type of Action:	RIA Research and Innovation action
Deadline(s):	19-02-2019, 04-09-2019 (two-stage)

Participant Portal Weblink:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/lc-cla-07-2019.html>

Specific Challenges: Globally, glaciers and the large ice sheets of Antarctica and Greenland are particularly vulnerable to climate change, risking a significant future contribution to changes in sea levels. At present, there are significant uncertainties, e.g. relating to their stability, which prevent an accurate assessment of their vulnerability. The 'Arctic amplification' of global warming is putting pressure on the ecosystems and communities of the region and having an impact at global level as well. The Arctic's fragile natural ecosystems and societies are under serious threat, and additional human activities, linked to the new economic opportunities that are made possible by climate change, are putting additional pressure on them.

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

- a. Sea-level changes (Research and Innovation action): Actions should assess the processes controlling changes to global ice mass balance - including ice dynamics - such as ice shelf-ocean and sea-ice interactions, surface components, effects of crustal de-loading (Glacial Isostatic Adjustments) on relative sea-level changes and/or gravitational effects of ice mass changes on the spatial patterns of sea-level changes. Actions should assess the status of ice sheets and glaciers, report on how their changes are likely to affect future sea-levels, and increase confidence in predicting changes in the cryosphere including through better representation of poorly represented processes. Actions should also analyse low-probability high-impact scenarios including those associated with the collapse of ice sheets (sea-level fingerprints). Actions may be focused on specific issues which substantially contribute to

sea-level changes and to the assessment of the associated major risks to and impacts on coastal communities, coastal ecosystems and critical infrastructure across the globe. Clustering with relevant projects funded by the ESA Earth Observation Programme is encouraged.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 8 to EUR 10 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

- b. Changes in Arctic biodiversity (Research and Innovation action): Actions should identify and analyse major drivers and implications of changing biodiversity in the Arctic, such as the role of invasive species, and how vulnerable land and/or marine ecosystems are with respect to combined human and natural influences. Actions should assess the ecosystems' responses to both external and internal factors and how these responses are impacting on indigenous populations and local communities at socio-economic level. Actions should also identify adaptation strategies in relation to the changes in Arctic ecosystems.

The participation of social sciences and humanities disciplines is important for addressing the complex challenges of this topic.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 5 to EUR 6 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

- c. Sustainable opportunities in a changing Arctic (Research and Innovation action): Actions should assess the viability of new economic activities – such as resource exploitation, shipping and tourism – and their ecological and socio-economic impacts and feedbacks at various scales, and their impact on the provision of ecosystem services. Actions should investigate key processes with high societal and economic impacts and provide appropriate, solution-oriented adaptation and mitigation responses, as well as capacity building for sustainable livelihoods while considering – in a co-design approach – the needs, priorities and perspectives of indigenous populations, local communities and economic actors operating in the region.

The participation of social sciences and humanities disciplines is essential for addressing the complex challenges of this topic.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 5 to 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.

For all of the above sub-topics, in line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged^[1], in particular with countries – beyond the EU Member States and countries associated to Horizon 2020 – that took part in the first Arctic Science Ministerial of 28 September 2016^[2].

Expected Impact: For projects addressing parts a), b) or c), the project results are expected to contribute to:

- the implementation of the new integrated EU policy for the Arctic^[3];
- the IPCC assessments and other major regional and global initiatives;
- enhanced engagement of and the interaction with residents from local communities and indigenous societies.
- support the EU Arctic Research Cluster^[4]

Cross-cutting Priorities: Blue Growth, International cooperation, RRI, Socio-economic science and humanities, Open Innovation

^[1] Proposals should pay attention to the special call conditions for this topic.

^[2] i.e. the United States of America, Canada, the People's Republic of China, **Japan**, the Russian Federation, South Korea, New Zealand, India, Singapore, and Greenland; see https://www.arctic.gov/publications/other/supporting_arctic_science.html

^[3] JOIN(2016) 21 final

^[4] <http://www.eu-polar.net/eu-arctic-cluster/>

Horizon 2020 Pillar:	Societal Challenges
Programme:	Climate action, environment, resource efficiency and raw materials
Call Title:	Greening the economy in line with the Sustainable Development Goals (SDGs)
Call Identifier:	H2020-SC5-2018-2019-2020
Topic Title:	Multi-stakeholder dialogue platform to promote nature-based solutions to societal challenges: follow-up project
Topic Identifier:	SC5-23-2019
Type of Action:	CSA Coordination and support action
Deadline(s):	04-09-2019 (single-stage)

Participant Portal Weblink:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/sc5-23-2019.html>

Specific Challenges: Nature-based solutions (NBS) have a high – but largely untapped – potential for delivering multiple ecosystem services (such as carbon sequestration, soil and water retention and purification, pollination, increased human well-being...) to address diverse societal challenges with a systemic and innovative approach. An effective and self-sustainable multi-stakeholder platform that fosters dialogue, interactions, knowledge and information sharing, collaboration and think-and-do-tanks among relevant stakeholders is necessary to support the understanding and promote the use of nature-based solutions and speed up market up-take. Stakeholders include science, policy, administration, business (including SMEs), society (including NGOs, CSOs, and citizens as appropriate), public and private investors.

The establishment of such platform is currently being undertaken by ThinkNature^[1], with support from Oppla^[2] and Biodiversa^[3]. ThinkNature is an ongoing CSA funded under SC5 WP 2016 that is due to terminate end 2019. The Oppla portal is developing as the EU NBS knowledge repository, supporting access, sharing and marketing of nature-based solutions knowledge, including from NBS EU-funded projects.

Scope: The action should aim to build upon the achievements of ThinkNature and further develop and consolidate an effective and self-sustainable EU community of innovators and practitioners and think-and-do-tanks to promote the design, development, replication and upscaling of nature-based solutions at the European and global scale.

The action should, on the basis of continuous and strategically driven stakeholder dialogue, exchanges of practices and experiences and sharing of expertise related to the various social, economic, financial, environmental, educational, institutional, regulatory and cultural NBS-relevant aspects, across multiple scales (local, regional, national and EU):

- further develop and maintain an online open source stakeholders platform that would facilitate the interactions;
- develop a business plan to make such a platform financially self-sustainable;
- identify specific domains and priorities where further research and innovation is needed for marketable nature-based solutions;
- establish NBS hubs and organize communication and outreach campaigns and regular events in all Member States, involving, as appropriate, international networks and environmental communicators and targeting all relevant stakeholders involved, including the scientific community, in the overall NBS value chain;
- facilitate the clustering of current and upcoming EU-funded nature-based solutions relevant research and innovation projects and other EU or national initiatives;
- assist the European Commission in organizing science-policy workshops and drafting briefings and contributions to EU policies related to nature, environment, climate, water, etc. Appropriate links with other relevant policy platforms such as Climate-ADAPT^[4] and BISE^[5] should be ensured;
- develop guidelines for practitioners with state-of-the-art NBS design practices, protocols and standards;
- facilitate the development and mainstreaming of NBS-related professional training and the inclusion of NBS in high-education curricula (as, for example, NBS for architects and urban planners; ecosystem services for engineers, etc.), and Masters;
- promote international cooperation with key strategic international partners^[6];
- proposals shall address all of the above points. The platform must ensure that all evidence, data and information will be accessible through the Oppla portal.

The Commission considers that proposals requesting a contribution from the EU of up to EUR 2 million for a period of up to 4 years 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:

- effective and self-sustainable EU community of innovators, practitioners and think-and-do-tanks; identification of knowledge gaps and user needs; assessment of market potential for NBS;
- enhanced awareness among public authorities, the private sector and society at large about the advantages and any risks of NBS and therefore a wider use of these solutions as opposed to or in combination with grey infrastructure;
- improved cooperation and synergies with key strategic international partners and the emergence of a global market for nature-based solutions.

Delegation Exception Footnote: This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to EASME and will be implemented by the Commission services.

[1] <https://www.think-nature.eu/>

[2] <https://oppla.eu/> Developed by FP7-funded projects OPERAs and OpenNESS for knowledge on ecosystem services, natural capital and nature-based solutions;

[3] <http://www.biodiversa.org/> Funded under the Horizon 2020 ERA-NET COFUND scheme

[4] <http://climate-adapt.eea.europa.eu/>

[5] <https://biodiversity.europa.eu/>

[6] Such as CELAC countries, China, **Belmont Forum**, South East Asia

Horizon 2020 Pillar:	Societal Challenges
Programme:	Food security, sustainable agriculture and forestry, marine, maritime and inland water research and the bioeconomy
Call Title:	Sustainable Food Security
Call Identifier:	H2020-SFS-2018-2020
Topic Title:	Anti-microbials and animal production
Topic Identifier:	SFS-11-2018-2019
Type of Action:	IA Innovation action
Deadline(s):	23-01-2019 (single-stage)

Participant Portal Weblink:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/sfs-11-2018-2019.html>

Specific Challenges: Since their discovery, anti-microbials have played an essential role in the treatment of infectious diseases in humans and farmed animals, whether terrestrial or aquatic, and have enormously improved population health as well as food security and safety. However, with the widespread use of anti-microbials for human and animal health in recent decades, the world is increasingly confronted with the emergence and spread of microbes that resist anti-microbial treatment. Discoveries of new anti-microbials are not keeping up with pace anti-microbial resistance (AMR). AMR is responsible for an estimated 25 000 deaths yearly and over EUR 1.5 billion of healthcare costs and productivity losses in the EU alone. Addressing AMR is a cross-sectorial issue, requiring action by different policy areas, from health to agriculture, aquaculture and environment, from research to users, stakeholders and policy makers. A large proportion of anti-microbials is used in livestock production. Although links between this and resistance on human health are not fully established, agriculture is a main target for action. In line with the EU animal health strategy "prevention is better than cure" alternative strategies to anti-microbials need be developed. Alternatives to antimicrobials may be valuable, although evidence of efficacy in controlled trials is currently very limited.

In 2011, the European Commission came up with a five year action plan to fight against AMR and the new action plan^[1] is focussing on three pillars: making the EU a best practice region; boosting research, development and innovation; shaping the global agenda. For the purpose of this topic, the words 'animals' and 'farmers' apply to both terrestrial and aquatic animals.

Scope: Alternatives to anti-microbials (IA)

Activities shall focus on developing and testing new, efficient and targeted alternatives to anti-microbials in farmed animal production. This could be any type of alternative intervention measures (prophylaxis/prevention or treatment), other than vaccines - such as the modulation of host immunity and/or of microbial flora, feed additives or novel molecules. Basic research on gut microbiome should not be covered under this topic. Proposals should take into account the guidelines, standards and legislation in the field, to facilitate the marketing of the measures the project will identify. Proposals should fall under the concept of 'multi-actor approach'^[2], involving at least representatives of practitioners (e.g. veterinarians), of the feed/feed additives and pharmaceutical industries.

The selected projects should follow the policies and contribute to the objectives of the **STAR-IDAZ International Research Consortium**^[3]. International cooperation is recommended.

The proposals should liaise with other relevant EU projects and initiatives, in particular JPI AMR^[4] and the project selected under topic SFS-36-2017. The projects should take into account the guidelines and standards of relevant EU and international statutory bodies, in particular the European Medicines Agency and the World Organisation for Animal Health.

The Commission considers that proposals requesting a contribution from the EU of up to EUR 6 million, for sub-topic A and for sub-topic B, 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 funded activities will contribute to the fight against anti-microbial resistance arising from farmed animal production. More specifically they will help:

- develop options for reducing the use of anti-microbials in farming (scope A);
- develop alternative intervention measures from technology readiness levels (TRL) 5-6 to TRL 7 (scope B).

More generally, the funded activities will contribute to improved animal disease prevention and control, reduced production losses and improved resource-use (scopes A and B).

Cross-cutting Priorities: International cooperation, Socio-economic science and humanities, RRI, Blue Growth

^[1] https://ec.europa.eu/health/amr/sites/amr/files/amr_action_plan_2017_en.pdf

^[2] See definition of the 'multi-actor approach' in the introduction of this Work Programme part

^[3] <http://www.STAR-IDAZ.net/>

^[4] <http://www.jpiamr.eu/>

Horizon 2020 Pillar: Societal Challenges

Programme: Food security, sustainable agriculture and forestry, marine, maritime and inland water research and the bioeconomy

Call Title: Blue Growth

Call Identifier: H2020-BG-2018-2020

Topic Title: The Future of Seas and Oceans Flagship Initiative

Topic Identifier: BG-07-2019-2020

Type of Action: IA Innovation action

Deadline(s): 23-01-2019 (single-stage)

Participant Portal Weblink:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/bg-07-2019-2020.html>

Specific Challenges: Our future is intimately linked to the future of the seas, oceans and coasts. The seas, oceans and coasts provide multiple ecosystem services and a wealth of resources, influence climate and provide many economic opportunities. To fully profit from the seas and oceans also in the future, we have to preserve those valuable resources and ensure that their exploitation is sustainable. Furthermore, without appropriate ocean observations for forecasting and for the protection of property and human activities, the global economy would lose hundreds of billions of euros annually. For this, we need to have the technologies for observations, integrated ocean observing systems, data management systems, and appropriate models and services. This action will contribute to make ocean observations and data management in European seas and the Atlantic Ocean fit for the future, in line with the **G7** Future of the Oceans Initiative (Tsukuba Communiqué of the **G7** Science Ministers^[1]). It will also support the Collaborative Research Action on Oceans of the **Belmont Forum**^[2] and the International Ocean Governance Communication^[3]. Similarly, ocean observation data must be available to effectively address local, national and global challenges such as the forecasting of ocean conditions and climate change, to take stock of biomass and biodiversity, to mitigate the impact of climate change and ocean acidification, to ensure food security and food safety (also in fresh water), and to contribute to the UN 2030 Sustainable Development Agenda, notably UN SDGs 2, 13, 14 and 15, and monitoring their targets for 2020 and 2025.

Scope: Proposals shall address one of the following sub-topics: blue cloud services, or ocean observations and forecasting^[4], or technologies for observations (in 2020). Actions shall demonstrate integration, capacity and (scientific, economic etc)

potential. They shall complement and build on existing observation tools and systems such as EuroGOOS/EOOS, IOOS, **GEO/GEOS**, COPERNICUS Marine Service or EMODnet, European research infrastructures such as Euro-Argo ERIC and EMSO ERIC as well as funded H2020 projects such as SeaDataCloud^[5]. The interdisciplinary and cross-sectorial nature of the proposal should also apply to training activities improving the professional skills and competencies of workers and supporting the creation of new jobs in the blue economy.

[A] 2019 - Blue Cloud services

Activities shall develop cloud services for applications that are specific for oceans, seas and fresh water bodies and are necessary for marine ecosystems research, conservation, forecasting and innovation in the Blue Economy, building and implementing also Blue Cloud demonstrators as needed. Blue Cloud demonstrators should integrate the Essential Ocean Variables^[6], notably the biological variables, including plankton biomass and diversity. They shall build on ongoing efforts (data, tools, EOSC, including its Pilot Blue Cloud, Data and Information Access Services (DIAS) of COPERNICUS, etc) and take account of the parallel EOSC thematic initiatives being developed – such as the Food Cloud Demonstrator.^[7] The action shall contribute to unlocking the innovation potential of the Blue Cloud, and demonstrate its potential in promoting the blue economy shortening the time span between research and innovation in frontier fields, such as micro-organisms and genomics-enabled innovations^[8]. Activities shall build on existing research infrastructures, take advantage of existing data sharing activities (for example EMODnet), and build on relevant results of past and on-going global, national and EU projects such as SeaDataCloud^[9], BlueBridge, the EOSC Pilot and other relevant projects funded under Horizon 2020, including those under Information and Communication Technologies^[10]. Proposals should include a task to cluster with other projects financed under this topic and – if possible – with other relevant projects in the field funded by Horizon 2020.

[B] 2019 - Observations and forecasting

The action shall contribute to the development and demonstration of the feasibility of the European component of a future Global Ocean Observing System in line with the **G7** Tsukuba Communiqué^[11]. It will support activities in the different EU sea basins and the Atlantic Ocean, including the deep sea (below 2000 m), also supporting the needs of food security and safety as outlined in Food 2030^[12]. It will also support the future Collaborative Research Action on Oceans of the **Belmont Forum**^[13]. It will underpin forecasting of the state of the ocean, climate change impact and weather. Activities shall include the demonstration of methods and technologies and their integration in existing systems to collect information on the state and variability of European seas and the Atlantic Ocean, including the impact of stressors and marine litter, and underpin sustainable management of the marine environment and its resources (e.g. the effect of networks of protected areas and other spatial protection measures). They shall take account of the needs deriving from the **G7** Future of the Seas and Oceans Initiative^[14], from actions such as the Atlantic Ocean Research Alliance and its related South Atlantic

Flagship, the BLUEMED Initiative, and notably common priorities with the WestMED Initiative^[15] and the EUSAIR^[16], and actions addressing other European regional seas. The inclusion of forecasting tools (for example to protect aquaculture installations or to inform fisheries decision making) shall be an advantage. Similarly, the sustainability of the approach selected, the integration of innovative observations solutions and existing systems, the smooth storage of data in open access data centres and the improvement of the predictive capability shall be demonstrated. Observations and data handling may also include pilots for Essential Ocean Variables (EOVs)^[6] under consideration (for example, nutrients, carbonate, sound and microbes/omics) and variables that are of importance in European regional seas as well as the integration of “augmented” observatories (i.e. genomic-enabled multidisciplinary observatories)^[17]. Flow of information across variables and disciplines shall be included. Data collected shall be in line with agreed standards, be openly available via portals (including EMODnet) and feed into the Pilot Blue Cloud (part of the European Open Science Cloud). International cooperation with Third Country partners is encouraged.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 6 million for sub-topic [A] and EUR 12 million for sub-topic [B] would allow this specific challenge to be adequately addressed. Nonetheless, this does not preclude the submission and selection of proposals requesting other amounts.

Proposals shall include a task to cluster with other projects financed under this topic and – if possible – with other relevant projects in the field funded by Horizon 2020. Possible links with related research and innovation activities supported by the **Belmont Forum**^[18] on Ocean sustainability shall also be considered.

[C] 2020 - Technologies for observations

Expected Impact: Contributing to the ongoing implementation of EU Policies such as the Bioeconomy Strategy, the Circular Economy Strategy, the European Open Science Cloud Initiative, the Blue Growth Strategy, the Common Fisheries Policy, the Maritime Spatial Planning Directive, the Marine Strategy Framework Directive, the International Ocean Governance Communication and the UN SDGs, activities shall:

In the short term:

- Support the implementation of the Future of the Oceans Initiative of the **G7** Science Ministers.
- Deliver cloud services with work starting at technology readiness level (TRL) between 4 and 5 and achieving TRL between 6 and 7 or higher (sub-topic A).
- Achieve at least TRL 6 for ocean observations' systems and tools (sub-topic B).
- Contribute to regularly measure 50% of biological and biogeochemical EOVs, including in the sea below 2000 m, and predict negative impacts of ocean acidification and other selected stressors to take timely prevention, notably to protect aquaculture resources by 2020 (sub-topic B).

- Lay the foundations for and contribute to the sustainable management and protection of marine and coastal ecosystems to avoid significant adverse impacts (UN SDG 14) (sub-topic).

In the medium term:

- Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health (UN SDG 14).
- Improve forecasting of climate change, weather and ocean conditions to protect human activities in support of UN SDG 14 and other relevant goals, and of the objectives of related Conventions (for example, on biodiversity).
- Shorten the time span between research and innovation and foster economic value in the blue economy.
- Improve the professional skills and competences of those working and being trained to work within the blue economy and in the context of open data sharing.
- Contribute to policymaking in research, innovation and technology.
- Increase data sharing and increase integration of data.

Delegation Exception Footnote: This topic is expected to continue in 2020.

Cross-cutting Priorities: Socio-economic science and humanities, International cooperation, Blue Growth

[1] <http://www8.cao.go.jp/cstp/english/others/20160517communique.pdf>

[2] **Belmont Forum** <https://www.belmontforum.org/>

[3] (JOIN(2016) 49)

[4] All proposals under B) must include an observation part.

[5] This will also include mutual feedback processes with the Copernicus Programme and other relevant actions such as those undertaken by IOC/IODE or the Marine Environment Monitoring Service.

[6] http://goosoocean.org/index.php?option=com_content&view=article&id=14&Itemid=114

[7] See topic DT-SFS-27-2019 under this Work Programme's SC2 Sustainable Food Security Call.

[8] Following up on the Communication "European Cloud Initiative – Building a competitive data and knowledge economy in Europe", the European Open Science Cloud (EOSC) will soon become an important tool for scientists, citizens and policy makers <https://ec.europa.eu/digital-single-market/en/news/communication-european-cloud-initiative-building-competitive-data-and-knowledge-economy-europe>

[9] This will also include mutual feedback process with the Copernicus Programme and other relevant actions such as those undertaken by IOC/IODE or the Marine Environment Monitoring Service.

[10] <https://ec.europa.eu/digital-single-market/en/information-communication-technologies-horizon-2020>

[11] <http://www.Japan.go.jp/G7/userdata/common/data/20160517communique.pdf>

[12] European Research and Innovation for Food and Nutrition Security, SWD(2016)319. <http://ec.europa.eu/transparency/regdoc/rep/10102/2016/EN/SWD-2016-319-F1-EN-MAIN.PDF>

[13] <https://www.belmontforum.org/collaborative-research-actions>

[14] Recommendations 1, 3 and 4 on ocean observations and data sharing

[15] Initiative for the sustainable development of the blue economy in the Western Mediterranean

[16] <http://www.adriatic-ionian.eu/>

[17] The development of such laboratories is not part of this call.

[18] <https://www.belmontforum.org/>

Horizon 2020 Pillar:	Societal Challenges
Programme:	Food security, sustainable agriculture and forestry, marine, maritime and inland water research and the bioeconomy
Call Title:	Sustainable Food Security
Call Identifier:	H2020-SFS-2018-2020
Topic Title:	European Joint Programme on agricultural soil management
Topic Identifier:	LC-SFS-20-2019
Type of Action:	COFUND-EJP COFUND (European Joint Programme)
Deadline(s):	23-01-2019 (single-stage)

Participant Portal Weblink:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/lc-sfs-20-2019.html>

Specific Challenges: Good agriculture soil management^[1] contributes to food security, climate change mitigation/adaptation and ecosystem services. Preserving and increasing fertility of soils, not least through their organic content and water retaining capacity, increases agricultural production. Soils and their carbon, nitrogen and phosphorus content are also important for climate change mitigation. A number of good soil management practices have been developed to deal with some of the challenges; however serious knowledge gaps exist, e.g. on the characteristics of soils in various regions of Europe, the factors influencing their fertility functions including their capacity to store carbon, depending on different climate and environment conditions. The European Union is committed to addressing climate change with ambitious targets. An integrated framework for soil research in Europe is required to overcome current fragmentation and unleash the potential of agricultural soils to contribute to climate change mitigation/adaptation, while preserving or increasing agricultural functions.

Scope: The European Joint Programme will boost soil research with main emphasis on agricultural soil management and its contribution to climate change mitigation and adaptation. The aim is to construct a sustainable framework for an integrated community of research groups working on related aspects of agricultural soil management^[2]. The activities should look at how management of agricultural soils can reduce degradation of land and soils (in particular soil erosion and loss of organic matter), preserve and increase fertility of soils and how the processes related to organic content and water retaining capacity can support mitigation and adaptation to climate change. The EJP will evaluate and foster implementation of novel technologies for soil management and carbon sequestration. The aim of the EJP is also to look for synergies between different

approaches used in Europe for farm level accounting of emissions and removals from agricultural activities and particularly of carbon storage. In doing so, activities will contribute to improving inventories, measurements, reporting and accounting activities at different scales. Sustainable agricultural productivity and environmental aspects will also be targeted in connection with climate change mitigation and adaptation, so that optimisation of land management is ensured.

The European Joint Programme will include joint programming and execution of research and other joint integrative activities such as education and training (e.g. short-term missions, workshops), knowledge management, access to experimental facilities and databases, including also harmonisation, standardisation. Farmers, landowners and other stakeholders should be included in research activities as appropriate in the spirit with the multi-actor approach^[3].

State-of-art technologies for mapping and soil sampling and analysis (physical, chemical and biological parameters) should be explored for wider and simple use at various levels. In return, by e.g. developing new ICT tools, this could help farmers to protect and manage soils in line with current scientific understanding of processes. The EJP should also facilitate sampling and further development of LUCAS^[4] –European Soil Database as well support EU contribution to global soil mapping activities.

Participating legal entities must have research funding and/or management responsibilities in the field of agriculture soil management.

The proposal should include a five-year roadmap describing the key priorities and governance processes as well as the first annual work plan.

The acquired knowledge should support policy making in the domain of agricultural soil management and related areas, such as agriculture, climate and environment, and when feasible and appropriate knowledge exchange between science and practice for better agricultural soil management by farmers should be envisaged.

The activities will need to be coordinated as appropriate with other international soil related activities under the United Nations umbrella among them the **Global Soil Partnership** and more particularly with European Soil Partnership node; with **The Global Research Alliance on Agricultural Greenhouse Gases**; Horizon 2020 project CIRCASA^[5]; 4% Initiative: soils for food security and climate; Joint Programming Initiatives (FACCE, CLIMATE); the **Belmont Forum** and soil activities coordinated by the European Commission Joint Research Centre ^[6] when relevant and appropriate. The work of the EJP will also support a number of policies: the Common Agricultural Policy, Climate Change related policy and relevant environmental policies, in particular the implementation of the EU Soil Thematic Strategy^[7].

Financial support provided by the participants to third parties is one of the aims of this action and, in order to achieve the objectives of the action, the 60 000 EUR threshold provided for in Article 137(1)(c) of the Financial Regulation N°966/2012 and Article 210(a) of the Rules of Application Regulation N°1268/2012 can be exceeded.

Considering the budget available, the scope covered and the potential entities for the EJP, the Commission considers that an EU contribution to a maximum 50% of the total eligible costs of the action or up to 40 million EUR would allow this specific challenge to be addressed appropriately.

Expected Impact: The project will lead to significant long term alignment and implementation of soil-related research strategies and activities at national and EU level by:

- fostering understanding of soil management and its influence on climate mitigation and adaptation, sustainable agricultural production and environment;
- understanding how soil carbon sequestration can contribute to climate change mitigation at regional level including accounting for carbon;
- strengthening scientific capacities and cooperation across Europe including training of young soil scientists;
- Supporting harmonised European soil information, including for international reporting;
- fostering the uptake of soil management practices which are conducive to climate change adaptation and mitigation;
- developing region-specific fertilisation practices considering the local soil, water and pedo-climatic conditions;

In the long term, the programme will strengthen the role of the farming sector as a steward of land and soil resources. It will increase its capacity to adapt to climate change and contribute to mitigation and carbon sequestration.

^[1] Soil management includes: soil conservation, soil fertility and soil biodiversity.

^[2] Agro-forestry is included in the topic.

^[3] See definition of the 'multi-actor approach' in the introduction of this Work Programme part.

^[4] Land use/cover area frame statistical survey, abbreviated as LUCAS, is a European field survey program funded and executed by Eurostat http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Land_use/cover_area_frame_survey_%28LUCAS%29

^[5] Project selected under SFS-50-2017 topic

^[6] European Soil Data Centre; EIONET - European Environment Information and Observation Network – soil network

^[7] COM(2006)231

Horizon 2020 Pillar:	Societal Challenges
Programme:	Food security, sustainable agriculture and forestry, marine, maritime and inland water research and the bioeconomy
Call Title:	Sustainable Food Security
Call Identifier:	H2020-SFS-2018-2020
Topic Title:	A vaccine against African swine fever
Topic Identifier:	SFS-12-2019
Type of Action:	IA Innovation action
Deadline(s):	23-01-2019 (single-stage)

Participant Portal Weblink:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/sfs-12-2019.html>

Specific Challenges: African swine fever (ASF) is a devastating viral disease of swine which is endemic in Africa and has been present in Europe for several years, after its introduction from Trans-Caucasian countries. It is a transmissible disease that has the potential for very serious and rapid spread, irrespective of national borders. It has a serious socio-economic impact on farming sector and is of major importance in the international trade of animals and animal products. While in the EU, strict control measures including in particular biosecurity, culling of infected pigs, killing of wild-boars, have so far managed to contain the spread of the disease, restrictions on farming and trade remain. The threat is permanent (including incursion of exotic strains from endemic countries) and concerns are raised on the possibility to eradicate the disease without vaccination.

No vaccine is currently available and the development of effective and safe ASF vaccines is urgent as an additional tool to re-inforce control and eradication strategies currently in place. For details of potential strategies and possible research steps for vaccine development, see the blueprint and roadmap^[1] produced by the EU Reference Laboratory for ASF.

Scope: The research proposals will address the necessary steps for developing safe vaccines against ASF for domestic pigs and wild boars. Proposals should build on past or ongoing EU funded research and on current knowledge of the characteristics of the viruses and research gaps, with the overall purpose of developing pilot vaccines and their companion DIVA test. Activities should address vaccination as part of a control strategy in different scenarios and should consider the potential impact on animal production and trade. Particular focus should be put on the European situation and the role of wild boars in the spread of the disease, so the proposals should address at least the ASF viruses

circulating in Europe, and may also cover all or the most relevant exotic ones. Wild fauna other than wild boars, that are involved in the epidemiology and for which vaccination may help control the disease, may also be addressed. Participation by non-EU regions particularly affected by ASF is recommended.

The selected project should take into consideration the EU animal health regulatory framework, and follow the policies and contribute to the objectives of the **STAR-IDAZ International Research Consortium**^[2].

Proposals should fall under the concept of the 'multi-actor approach'^[3] and be based on the active participation of stakeholders from research, animal health authorities and the farming and business sectors. Involvement of the pharmaceutical industry is highly recommended.

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

Expected Impact:

- Pilot ASF vaccines and their companion DIVA tests for the possible prevention and/or eradication of the disease in domestic pigs and wild boars, at target TRL 5-6;
- Contribution to international cooperation on animal health research, potentially reducing the threats from the introduction of exotic ASF virus strains in the EU and reducing the burden of ASF in countries outside the EU.
- More generally, the selected project will contribute to a reduction of economic losses by the farming sectors and contribute to healthy livestock production. It will contribute to reduce the sanitary barriers to trade in swine and products therefrom.

Cross-cutting Priorities: International cooperation, RRI

^[1] http://ec.europa.eu/food/animals/animal-diseases/control-measures/asf_en#bmrp

^[2] <http://www.STAR-IDAZ.net/>

^[3] See definition of the 'multi-actor approach' in the introduction to this Work Programme part.

Horizon 2020 Pillar:	Societal Challenges
Programme:	Food security, sustainable agriculture and forestry, marine, maritime and inland water research and the bioeconomy
Call Title:	Sustainable Food Security
Call Identifier:	H2020-SFS-2018-2020
Topic Title:	ERANETs in agri-food
Topic Identifier:	SFS-31-2019
Type of Action:	ERA-NET-Cofund ERA-NET Cofund
Deadline(s):	23-01-2019 (single-stage)

Participant Portal Weblink:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/sfs-31-2019.html>

Specific Challenges: The agri-food sector^[1] is subject to multiple external pressures, such as rising demand for food, competition for land and other natural resources with other biomass uses, globalisation, threats from animal or plant diseases, environmental and climatic changes and public health considerations. Climate change will further impact the agri-food sector both directly through its effect on production at EU level, but also indirectly through its supply chain. This implies the need to become more efficient and sustainable; improve its impact on consumer health; take advantage of new technological developments; and become more transparent and responsive to consumer demands, within a food-system approach.

Scope: Proposals should address one or more of the following sub-topics (A) to (C) and should clearly indicate to which one they refer.

A. [2019] ICT-enabled agri-food systems

Today, despite increased information demand from consumers and food chain players alike, Europe's food businesses and farmers are slow at adopting digital technologies. This is due in part to the inherent complexities of relevant products and processes, and in part to the dynamically changing open network organisation of the food sector with its multitude of SMEs, its cultural diversity, its differences in expectations and in the ability to serve transparency needs. The agri-food sector needs to take more advantage of the potential of digital technologies. Relevant technologies may include Internet of Things, Artificial Intelligence, Big Data technologies, remote and localised sensing. This sub-topic will engage the agri-food community in supporting the development of solutions to remove the barriers to adoption

of digital technologies, taking a multi-actor approach across different supply chains (conventional and organic) from farm to fork. These solutions will be targeted to supporting third party development of a variety of digital technologies which can take advantage of, integrate with, and complement the standardisation efforts and platform developments in other Horizon 2020, European Structural and Investment Funds (ESIF) and regionally/nationally-funded projects. In addition, this sub-topic will support the development of new data-driven ICT platforms and solutions which derive value for multiple actors from the data collected throughout the food chain, thereby enabling new business models which will increase the affordability and adoption of such solutions, reduce the environmental footprint, increase system resilience, and empower consumers. Interregional and international cooperation will be encouraged and complementarity with other ERA-NETs will be ensured throughout the project development stages by means of active collaboration and communication. When relevant, projects should consider synergies with the Thematic Smart Specialisation Platform on Agri-food (TSSP-AF)^[2] and related interregional partnerships under the Research and Innovation Strategies for Smart Specialisation (RIS3).

B. [2019] Climate change and food systems

Proposals under this sub-topic will aim at developing climate-resilient and sustainable value chains for food systems. In particular they will assess risks and vulnerabilities of food systems faced with climate change, including expected effects on supply chains, thereby offering low carbon footprint solutions (technological and/or non-technological) to increase resilience and sustainability. Specific focus will be put on the socio-economic impacts of climate change on different food chains, price volatility and the territorial dimension on access to accessible and nutritious foodstuffs. Complementarity with SusFood ERA-NETs will be ensured throughout the project development stages.

C. [2019] International coordination of research on infectious animal diseases

Animal health is a key element to guarantee food safety and security, by means of competitive and sustainable livestock systems. Partnerships and collaborations at the European and International levels are important for fighting infectious animal diseases, including those which are a significant threat to human health and international trade.

The ERA-Net will cover the major groups of infectious diseases of animals, including infections by viral, bacterial, protozoal, fungal pathogens, prions, parasites, and multifactorial diseases. An important focus will be put on at least African swine fever (ASF) and animal influenza.

The ERA-NET will pool and share resources and expertise between countries to further the fundamental understanding of hosts, pathogens and their interactions. Also, focus on understanding wider animal infectious disease issues e.g. systems-based studies that integrate host/pathogen studies with the epidemiology, and population dynamics of disease, pathogenesis, ecology, evolution, and transmission, resulting eventually in better prevention of

disease. An important focus will be put on the role of wildlife in the emergence and transmission of infectious diseases to livestock, and on related disease surveillance and control, in order to also contribute to animal health risk assessment activities, in particular by EFSA or OIE.

In addition, consideration needs to be given to data sharing, integration and analysis to develop new tools to accelerate identification of outbreaks, enabling a rapid response and thus reducing the spreading of diseases. This should be done in coordination with existing data sharing systems (e.g. WAHIS^[3] and ADNS^[4] systems).

Another focus will also be on development of safe and effective vaccines, generic technology platforms for producing novel and/or improved vaccines, and rapid, accurate and easy to use in-field diagnostics technology. Vaccination strategies, including the tools to distinguish vaccinated animals from non- vaccinated ones (DIVA vaccines) should also be addressed. New and improved vaccines have been identified as an important component in strategies to reduce reliance on antimicrobials (OIE ad hoc Group on prioritisation of diseases for which vaccines could reduce antimicrobial use in animals, 2015). There is a need to investigate new methods of generating vaccines and to understand of how best to design vaccines that drive long-lasting and protective memory responses.

Projects should be complementary to other H2020 projects in the same area.

International cooperation and industry engagement in projects selected under the ERA-Net are encouraged. The projects selected should take into consideration the EU animal health regulatory framework, and follow the policies and contribute to the objectives of the **STAR-IDAZ International Research Consortium**^[5]. Participation of legal entities from third countries, and/or regions including those not automatically eligible for funding in accordance with General Annex A, is encouraged in the joint call as well as in other joint activities including additional joint calls without EU co-funding. Participants from countries not listed in General Annex A are eligible for EU funding under this topic and may request a Union contribution (on the basis of the ERA-NET unit cost) only for the coordination costs of additional activities.

The Commission considers that proposals requesting a contribution from the EU of EUR 5 million for sub-topic A) and 5 million for sub-topics B) and C), respectively, would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact:

- Improve coordination between national and EU funding and ensure better use of resources in the priority research areas above [A, B, C];
- Reduce the environmental footprint of the sector by reducing inputs and waste [A, B].
- Realise the potential of ICT and digital technologies to share data throughout the food value chain, thereby driving greater sustainability, offering new

business models and helping to empower consumers to make smarter, more sustainable, healthier and more personal food and dietary choices, taking into account data regarding environmental impact, origin, nutrition, safety, integrity, etc., underpinned by the concept of transparency [A];

- Integrate effectively with major digital platforms from food actors, ICT solution providers and consumers [A];
- Enhance understanding and awareness about the effects of climate change on global food value chains [B];
- Develop innovative solutions to cope with the multiple risks and challenges to the food systems posed by global environmental changes [B];
- Improve control of specific infectious animal diseases, in particular those where the role of wildlife is prominent, by further understanding of the epidemiology and means of surveillance and control [C].
- Provide new generic tools, systems for better prevention and improved preparedness to react to infectious animal disease outbreaks, in particular by designing and developing new or improved vaccines, diagnostic tools and vaccination strategies[C];
- Improved translation of key knowledge on host and pathogen interaction into pathways for means of prevention, detection and control of animal infectious diseases [C];
- Improve collaboration with international initiatives to promote coherence and the applicability of research to preventive tools in order to control infectious animal diseases [C];
- Contribute to the reduction of antimicrobial use in livestock, minimising antimicrobial resistance [C].
- Contribute to animal welfare by a better prevention of diseases [C].
- More broadly, contribute to food security and sustainable production, by reducing the burden of disease and reducing impact on international animal trade [C].

[1] OECD/WTO (2013), developing on FAO (2005) on agrifood value chain: "A 'value chain' in agriculture identifies the set of actors and activities that bring a basic agricultural product from the field to final consumption and add value at each stage of the production process."

[2] <http://s3platform.jrc.ec.europa.eu/agri-food>

[3] <http://www.oie.int/en/animal-health-in-the-world/wahis-portal-animal-health-data/>

[4] https://ec.europa.eu/food/animals/animal-diseases/not-system_en

[5] <http://www.STAR-IDA.net/>

Horizon 2020 Pillar:	Societal Challenges
Programme:	Health, demographic change and wellbeing
Call Title:	Better Health and care, economic growth and sustainable health systems
Call Identifier:	H2020-SC1-BHC-2018-2020
Topic Title:	Support for the functioning of the Global Research Collaboration for Infectious Disease Preparedness (GloPID-R)
Topic Identifier:	SC1-HCO-15-2019
Type of Action:	CSA Coordination and support action
Deadline(s):	16-04-2019 (single-stage)

Participant Portal Weblink:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/sc1-hco-15-2019.html>

Specific Challenges: Human health worldwide is increasingly threatened by potential epidemics caused by existing or newly emerging infectious diseases, including those that are resistant to antimicrobial agents. With globalisation, people movement and trade at record highs, pathogens can spread further and faster than ever before in human history. To fight such an international challenge, the EU must think globally and coordinate with international infectious disease research funders.

It is for this reason that the **Global Research Collaboration for Infectious Disease Preparedness (GloPID-R)**^[1] was established in 2013 in response to a request for coordination by the Heads of International Research Organizations. Years on, **GloPID-R** now provides an important platform for infectious disease research funders to work together to better tackle deadly outbreaks such as Ebola, yellow fever, Zika and plague.

In order to save lives, a research response to an epidemic needs to be quick, flexible, comprehensive and global. For this reason, besides directly coordinating research to infectious disease outbreaks **GloPID-R** Members also work to improve the underlying international framework in which this research takes place. Ongoing efforts with the network include in-depth discussions on improved data-sharing during outbreaks, creating links between clinical trial networks, and the inclusion of social science into research responses to public health emergencies.

The above work, and more, requires a large amount of administrative support to **GloPID-R** Members. To maintain **GloPID-R**, facilitate its ongoing and new work

streams, and to increase the effectiveness of the network, further administrative and technical support in the form of a secretariat is warranted.

Scope: Proposals should provide administrative and organisational support to the Chair and Vice Chairs of **GloPID-R**, in close collaboration with the European Commission. This includes, but is not limited to, the organisation of meetings and teleconferences, including basic costs associated therewith as required; note-taking and record-keeping; management of information dissemination and communication between the Chairs, Members, Scientific Advisory Board (SAB), Industry Stakeholder Group (ISG), working groups, enquiries, and outside stakeholders. Proposals should also maintain and expand **GloPID-R**'s external communications activities, such as the website and newsletter, as requested by the Chairs.

Further to administrative and organisational issues, proposals should also provide more technical support on topics requested by the **GloPID-R** Chairs or groups such as the SAB or ISG. This may include preparing briefings, reports, mapping exercises or presentations. Furthermore, proposals shall take the lead in facilitating the work of the SAB, ISG and a number of **GloPID-R** working groups. For these reasons, proposals should have a familiarity with research preparedness and responses to infectious disease outbreaks, as well as the ability to facilitate and follow-up on discussions between high-level individuals in a professional manner.

Proposals should also provide a high level of adaptability. The **GloPID-R** secretariat primarily supports the work of the Chairs of **GloPID-R**, and should this work alter in scope or direction, remove or add work streams, or otherwise change the activities of the secretariat then it will be expected to have flexibility to change accordingly. In this regard, the selected consortium will be expected to submit an annual work plan to the Commission each year following the annual meeting of **GloPID-R**. This will take into account the conclusions of the annual meeting and will lay out an adapted plan for activities of the secretariat over the following 12 months as a result. Despite this, changes that alter the grant agreement will require approval by the Commission.

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. Funding may be complemented at a later date by additional funding from other members of **GloPID-R**.

Expected Impact:

- Effective operation of **GloPID-R** for at least three years.
- Reinforced international cooperation in funding of research in new and emerging infectious diseases, both between for-profit and not-for-profit research funders.
- Improved framework for a rapid and effective research response to prepare for or respond to public health emergencies, in areas such as data sharing, social science, clinical trial networks and others.

- Better communication of the activities of **GloPID-R** members, both as a group and individually, to the research community and other stakeholders.

Cross-cutting Priorities: International cooperation

^[1] GloPID-R website: <https://www.GloPID-R.org/>

Horizon 2020 Pillar:	Societal Challenges
Programme:	Health, demographic change and wellbeing
Call Title:	Better Health and care, economic growth and sustainable health systems
Call Identifier:	H2020-SC1-BHC-2018-2020
Topic Title:	Implementation research for maternal and child health
Topic Identifier:	SC1-BHC-19-2019
Type of Action:	RIA Research and Innovation action
Deadline(s):	02-10-2018, 16-04-2019 (two-stage)

Participant Portal Weblink:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/sc1-bhc-19-2019.html>

Specific Challenges: Each year, an estimated 213^[1] million women become pregnant and 140 million newborn babies are delivered. However, many of the women and infants receive no appropriate care or care that is below evidence-based standards; others suffer from over-medicalisation. Access to quality care, during and after pregnancy, is essential to ensure good maternal health and the favourable early development of the child.

The gap between countries with the lowest and highest maternal mortality rates has doubled between 1990 and 2013 and huge differences exist within countries in Europe and globally. The burden of maternal mortality in both contexts falls disproportionately on the most vulnerable groups of women and girls: Every day approximately 830 women die from preventable causes related to pregnancy and childbirth; 99% of maternal deaths occur in developing countries^[2]

Although there is a consolidated evidence base of what works in improving maternal and newborn health, the "knowledge-do" gap has not been bridged and evidence based guidelines are insufficiently implemented or integrated in routine training and service provision. Therefore, more and better targeted implementation research is needed.

Scope: Proposals should focus on implementation research^[3] for improving maternal and child health with a focus on the first '1000 days' from pregnancy until two years of age.^[4] This research can take place in either **High Income Countries** or low and middle income countries, or in a combination thereof.

The implementation research in the first 1000 days may cover:

- new or improved health service delivery interventions that strengthen maternal and child health; and/or

- the scaling up and/or adapting of existing evidence-based interventions to new contexts.

Neither pre-clinical research nor clinical trials in the context of product development are within the scope of this call.

The research should take into account the specificities of different contexts and situations. The research should be integrated from different perspectives, e.g. recognising the interdependent relationship between mother and child; addressing prevention, health promotion and treatment; allowing for the specific needs of vulnerable groups (e.g. preterm infants, adolescents, migrants); addressing different concurrent pathologies; avoiding the creation of parallel or vertical programmes, etc;. Research may cover physical and/or mental health, as well as communicable and non-communicable diseases. The integration of social sciences including gender analysis and the use of mixed methods research^[5] is strongly encouraged. In addition, particular attention should be given to equity issues.

The interventions should build on but may go beyond existing state-of-the art knowledge on biological, psychological and social determinants of maternal and child health. Research is expected to be carried out in continuous partnership, in particular with the end-users, i.e. the concerned women, the fathers, and their community, in addition to policy makers, politicians, and the media, to ensure that evidence can be translated into policy and practice.

The Commission considers that proposals requesting an EU contribution between EUR 2 to 4 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact:

- Research-supported solutions to maternal and child health challenges.
- Providing evidence of successful and/or innovative approaches for bridging the "knowledge-do" gap in improving maternal and child health.
- Better understanding of scaling-up processes with regard to different contexts and resource requirements.
- Contribution to the achievement of SDGs 2 on improved nutrition (target 2), Goal 3 on health (targets 1 and 2 on maternal and child health) and Goal 5 on gender equality (targets 1 and 6) and Goal 10 (on reducing inequality within and between countries).

Applicants may be interested in a separate but connected call topic on "Food systems Africa" under Societal Challenge 2.

Cross-cutting Priorities: Socio-economic science and humanities, International cooperation, Gender

^[1] <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4727534/>

^[2] WHO, Maternal mortality fact sheet (n. 348), Nov 2015 - <http://www.who.int/mediacentre/factsheets/fs348/en/> Lancet Series on Maternal Health (2016).

^[3] 'Implementation Research is the scientific study of methods to promote the systematic uptake of clinical research findings and other evidence-based practices into routine practice, and hence to improve the quality (effectiveness, reliability, safety, appropriateness, equity, efficiency) of health care. It includes the study of influences on healthcare professional and organisational behaviour

^[4] Lancet Series on Maternal and Child Nutrition (2013).

^[5] broadly defined as research in which the investigator collects and analyzes data, integrates the findings, and draws inferences using both qualitative and quantitative approaches or methods in a single study or a program of inquiry <http://journals.sagepub.com/doi/pdf/10.1177/2345678906293042>

Horizon 2020 Pillar:	Societal Challenges
Programme:	Secure societies - Protecting freedom and security of Europe and its citizens
Call Title:	Security
Call Identifier:	H2020-SU-SEC-2018-2019-2020
Topic Title:	Technologies for first responders
Topic Identifier:	SU-DRS02-2018-2019-2020
Type of Action:	RIA Research and Innovation action
Deadline(s):	22-08-2019 (single-stage)

Participant Portal Weblink:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/su-drs02-2018-2019-2020.html>

Specific Challenges: Resilience is critical to allow authorities to take proper measures in response to severe disasters, both natural (including climate-related extreme events) and man-made. Innovation for disaster-resilient societies may draw from novel technologies, provided that they are affordable, accepted by the citizens, and customized and implemented for the (cross-sectoral) needs of first responders.

Scope: Proposals are invited to propose novel solutions improving the protection of first responders against multiple and unexpected dangers, or enhancing their capacities by addressing related research and innovation issues, in particular:

Sub-topic 2: [2019] Innovation for rapid and accurate pathogens detection

Novel technologies are required by first responders for the rapid and accurate detection of pathogens, as well as tools for joint epidemiological and criminal risk and threat assessment and investigation.

Other technologies for use by first responders may be subject of proposals provided that they involve a large number of first responders' organisations (see eligibility and admissibility conditions.) For instance, but not exclusively: communicating and smart wearables for first responders and K9 units including light-weight energy sources; situational awareness and risk mitigation systems for first responders using UAV and robots, connected and swarms of drones; systems based on the Internet of Things; solutions based on augmented or virtual reality; systems communication solutions between first responders and victims; risk anticipation and early warning technologies; mitigation, physical response or counteracting technologies; etc.

Any novel technology or methodology under this topic should be tested and validated, not just in laboratories but also in training installations and through in-situ experimental deployment. They therefore need to be quick to deploy, based on resilient and robust communication infrastructure. First responders, including through interdisciplinary teams (e.g. involving medical emergency services, public health authorities, law enforcement team, civil protection professionals, etc.) need to be involved in these activities. Proposals should address the participation of first responders in a systematic manner, and propose new methods on how to involve them and to organise their interaction with researchers when developing, testing, and validating technologies and methods.

Solutions are to be developed in compliance with European societal values, fundamental rights and applicable legislation, including in the area of privacy, personal data protection and free movement of persons. Societal aspects (e.g. perception of security, possible effects of technological solutions on societal resilience, gender diversity) have to be taken into account in a comprehensive and thorough manner.

In line with the objectives of the Union's strategy for international cooperation in research and innovation (COM(2012)497), international cooperation according to the current rules of participation is encouraged (but not mandatory), in particular with **Japanese** or Korean research centres. Co-funding opportunities from the **Japan** Science and Technology Agency exist for **Japanese** partners. For more information, please consult http://www.jst.go.jp/sicp/announce_eujoint_04_GeneralInfo.html. Co-funding opportunities from the Korean MSIP/NRF exist for Korean partners. For more information on Korea, please consult <http://www.nrf.re.kr/eng/main> and http://www.nrf.re.kr/biz/info/notice/view?nts_no=82388&biz_no=116&search_type=ALL&search_keyword=EU&page=.

The centre of gravity for technology development with actions funded under this topic is expected to be up to TRL 4 to 6 – see General Annex G of the Horizon 2020 Work Programme.

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

Expected Impact:

As a result of this action, first responders should benefit from:

- Novel tools, technologies, guidelines and methods aimed at facilitating their operations
- New knowledge about field-validation of different tools, technologies and approaches involving first responders in (real-life) scenarios

Delegation Exception Footnote: It is expected that this topic will continue in 2020.

Cross-cutting Priorities: International cooperation, Socio-economic science and humanities, Gender

Horizon 2020 Pillar:	Societal Challenges
Programme:	Secure societies - Protecting freedom and security of Europe and its citizens
Call Title:	Protecting the infrastructure of Europe and the People in the European Smart Cities
Call Identifier:	H2020-SU-INFRA-2018-2019-2020
Topic Title:	Prevention, detection, response and mitigation of combined physical and cyber threats to critical infrastructure in Europe
Topic Identifier:	SU-INFRA01-2018-2019-2020
Type of Action:	IA Innovation action
Deadline(s):	22-08-2019 (single-stage)

Participant Portal Weblink:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/su-infra01-2018-2019-2020.html>

Specific Challenges: Disruptions in the operation of our countries' critical infrastructure may result from many kinds of hazards and physical and/or cyber-attacks on installations and their interconnected systems. Recent events demonstrate the increase of combined physical and cyber-attacks due to their interdependencies. A comprehensive, yet installation-specific, approach is needed to secure existing or future, public or private, connected and interdependent installations, plants and systems. Budgetary constraints on both the public and private sectors mean that new security solutions must be more accurate, efficient and cost-effective, and possibly more automated than the ones currently available.

Scope: Proposals should cover: forecast, assessment of physical and cyber risks, prevention, detection, response, and in case of failure, mitigation of consequences (including novel installation designs), and fast recovery after incidents, over the life span of the infrastructure, with a view to achieving the security and resilience of all functions performed by the installations, and of neighbouring populations and the environment.

They should:

- a. assess in detail all aspects of interdependent physical (e.g. bombing, sabotage and attacks with a variety of weapons against installations, buildings and ships; plane or drone overflights and crashes; spreading of fires, floods, landslides, disastrous consequences of global warming, seismic activity, space weather, combined threats, etc.) and cyber threats and incidents (e.g.

malfunction of SCADA system, non-authorised access of server, electronic interference, distributed attacks), and the cascading risks resulting from such complex threats,

- b. demonstrate the accuracy of their risk assessment approach using specific examples and scenarios of real life and by comparing the results with other risk assessment methodologies,
- c. develop improved real-time, evidence-based security management of physical and cyber threats, taking account of the ageing of existing infrastructure, and
- d. provide scenarios and recommendations for policy planning, engagement of the civil society, and investment measures encompassing all aspects of prevention-detection-response-mitigation

Innovative methods should be proposed for sharing information with the public in the vicinity of the installations - including through social media and with the involvement of civil society organisations -, for the protection of first responders such as rescue teams, security teams and monitoring teams, and for ensuring service continuity.

In 2018 and 2019, they should focus on any type of installation belonging to one of the following critical infrastructures: water systems, energy infrastructure (power plants and distribution, oil rigs, offshore platforms), transport infrastructure (airports, ports, railways, urban multimodal nodes), communication infrastructures and ground segments of space systems, health services, e-commerce and the postal infrastructure, sensitive industrial sites and plants, and financial services. Priorities for 2020 will be defined at a later stage. When selecting for funding the proposals submitted in 2018 or 2019, the Commission will take due account of similar projects financed in the previous years since 2016, with a view to cover the largest possible spectrum of installations. Each year, a list of infrastructures excluded from the Call will be published on the participant portal.

Consortia should involve the largest variety of relevant beneficiaries, including infrastructure owners and operators, first responders, industry, technologists and social scientists, etc. The participation of SMEs is strongly encouraged.

In line with the EU's strategy for international cooperation in research and innovation^[1] international cooperation is encouraged, and in particular with international research partners in the context of the **International Forum to Advance First Responder Innovation**^[2] in which the Commission has decided to participate.

The centre of gravity for technology development with actions funded under this topic is expected to be up to TRL 7 – see General Annex G of the Horizon 2020 Work Programme.

Indicative budget: The Commission considers that proposals requesting a contribution from the EU of about EUR 7 to 8 million would allow this topic to be addressed appropriately. Nonetheless this does not preclude the submission and selection of proposals requesting other amounts

Expected Impact:

Short term:

- State-of-the-art analysis of physical/cyber detection technologies and risk scenarios, in the context of a specific critical infrastructure.
- Analysis of both physical and cyber vulnerabilities of a specific critical infrastructure, including the combination of both real situation awareness and cyber situation awareness within the environment of the infrastructure.
- In situ demonstrations of efficient and cost-effective solutions to the largest audience, beyond the project participants.

Medium term:

- Innovative (novel or improved), integrated, and incremental solutions to prevent, detect, respond and mitigate physical and cyber threats to a specific Critical Infrastructure.
- Innovative approaches to monitoring the environment, to protecting and communicating with the inhabitants in the vicinity of the critical infrastructure.
- Security risk management plans integrating systemic and both physical and cyber aspects.
- Tools, concepts, and technologies for combatting both physical and cyber threats to a specific critical infrastructure.
- Where relevant, test beds for industrial automation and control system for critical infrastructure in Europe, to measure the performance of critical infrastructure systems, when equipped with cyber and physical security protective measures, against prevailing standards and guidelines.
- Test results and validation of models for the protection of a specific critical infrastructure against physical and cyber threats.
- Establishment and dissemination throughout the relevant user communities of specific models for information sharing on incidents, threats and vulnerabilities with respect to both physical and cyber threats.

Long term

- Convergence of safety and security standards, and the pre-establishment of certification mechanisms.
- Secure, interoperable interfaces among different critical infrastructures to prevent from cascading effects.
- Contributions to relevant sectorial frameworks or regulatory initiatives.

Delegation Exception Footnote: It is expected that this topic will continue in 2020.

Cross-cutting Priorities: Contractual Public-Private Partnerships (cPPPs), Cybersecurity, International cooperation

^[1] COM(2012) 497.

^[2] <http://www.internationalresponderforum.org/>

Horizon 2020 Pillar:	Societal Challenges
Programme:	Secure societies - Protecting freedom and security of Europe and its citizens
Call Title:	Security
Call Identifier:	H2020-SU-SEC-2018-2019-2020
Topic Title:	Human factors, and social, societal, and organisational aspects for disaster-resilient societies
Topic Identifier:	SU-DRS01-2018-2019-2020
Type of Action:	RIA Research and Innovation action
Deadline(s):	22-08-2019 (single-stage)

Participant Portal Weblink:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/su-drs01-2018-2019-2020.html>

Specific Challenges: The resilience of societies heavily depends on how their citizens behave individually or collectively, and how governments and civil society organisations design and implement policies for mitigating risks, preparing for, reacting to, overcoming, and learning from disasters. The spread of new technologies and media are inducing dramatic changes in how individuals and communities behave, and they are affecting societies in unpredictable ways. Building the resilience of society and citizens requires a better understanding and implementation of these new technologies, media and tools, and their capacity to raise disaster risk awareness, to improve citizen understanding of risks, to build a culture of risks in society, to enable an effective response from affected populations, to improve functional organisation in most fragile and vulnerable environments, and to increase the resilience of health services, social services, education, and governance, in line with target (d) of the Sendai Framework on critical infrastructure and disruption of basic services.

Scope: Proposals are invited to address related research and innovation issues, in particular:

Recent disasters related either to natural causes (including climate-related hazards) or to terrorist attacks have shown gaps in the level of preparedness of European society for disasters, and therefore highlighted the importance of increasing risk awareness, and hence resilience among people and decision-makers in Europe. There is much that can be learned from certain countries with a high level of risk of natural disasters (e.g. **Japan** with high-levels of risks of earthquakes, volcanic events, and tsunamis) and where risk awareness is high. Research is required with a view to how cultural changes among individuals,

business managers, government officials, and communities can create a resilient society in Europe, in line with the Sendai Framework for Disaster Risk Reduction.

Over the past few years several ways to exploit social media and other crowd-sourced data in emergency situations have been studied, and some put in place, but their impacts are not well known. Research is needed to assess such practices for different disaster scenarios (natural hazards, industrial disasters, terrorist threats) involving different actors, including first responders, city authorities and citizens. Research should analyse both the positive and negative roles of social media and crowd-sourced data in crisis situations. For instance in the wake of a terror attack or natural disaster they offer a quick and easy way to relieve friends and family from worry (where networks are not down), and they generate valuable information about the affected area in the first moments after a disaster; they have been used to spread early warnings and important safety information. However, social media may also be used to spread false statements and to overstate threats, so the validation processes of information should also be addressed. Social media itself is reliant upon the functioning of critical infrastructure such as phone networks and may not always be available. Research should also address solutions for communication between first responders and the victims and citizens in the affected area.

Research on risk awareness should encompass the whole of the disaster management cycle, from prevention (e.g. through education) and preparedness (knowing how to react), emergency management (collaboration and communication before and during an event), response (empowering citizens to act efficiently by themselves according to more effective practices and following established guidelines), and recovery (knowledge to build back better). Researchers should take into account tangible and intangible cultural heritage, traditional know-how, land use, construction technologies, and other local knowledge which is a valuable source of information for the local communities and can help prevent the creation of new risks, to reduce existing risks, to prepare for and to respond to disasters and to build back better.

Sub-issues to be addressed are diversity in risk perception (as a result of e.g. geography (within Europe), attitudes, institutional and social trust, gender and socio-economic contexts), in vulnerabilities and in understanding responses to crises in order to propose new approaches and strategies for community awareness, for leadership, and for crisis readiness and management with a particular emphasis on the use of new technologies.

For achieving disaster-resilient societies that cope with disasters and build back better, the research community needs to transfer research outputs in an appropriate manner to meet citizen expectations given the current levels of risk acceptance, risk awareness, and involvement of civil society organisations in a mediating role.

Civil society organisations, first responders, (national, regional, local, and city) authorities are invited to propose strategies, processes, and methods to enable citizens better to access research results related to disaster resilience, and to prepare the ground for exercises involving citizens. These strategies, processes, and methods should be tested with citizens and communities representative of

European diversity and for different types of disaster, in particular with regards to citizens' individual capacities and their involvement in checking and validating proposed tools, technologies and processes for disaster management. Studies will assess the value of raising awareness about relevant research among citizens and communities.

Proposals should be submitted by consortia involving relevant security practitioners and civil society organisations. Research should contribute to the understanding of society's awareness to risks in Europe in order to provide recommendations for the development of a culture of improved preparedness, adaptability, and resilience to risks, including the use of social media and crowd-sourced data, and the involvement of the citizens in the investigations and possible validation of tools and methods.

In line with the objectives of the Union's strategy for international cooperation in research and innovation (COM(2012)497), international cooperation according to the current rules of participation is encouraged (but not mandatory).

The Commission considers that proposals requesting a contribution from the EU of about EUR 5 million would allow this specific challenge to be addressed appropriately through multidisciplinary projects confronting different schools of thoughts. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: As a result of this action, Member States and Regional authorities as well as City and Metropolitan authorities should benefit from recommendations and tools aimed at improving the adaptability and preparedness of societies to different disaster risks, including:

- Comparative analysis of the European diversity in terms of risk-perception amongst citizens, and of vulnerabilities;
- Comparative analysis of different approaches to adapt to, and be prepared for risks in different countries (both within and outside the European Union), and among communities in precarious socio-economic conditions;
- Advances through the cross-fertilisation of concepts resulting from the collision of different ways of thinking and of different approaches developed by various partners in the proposals;
- Identification of existing tools and guidelines for an improved prevention (including risk understanding and communication), preparedness (including training involving citizens), alert systems and their recognition by citizens, responses using citizen's competencies and local knowledge, and recovery;
- Improved information exchanges among different actors involved, including first responders, local authorities, schools, and citizen representatives;
- Field-validation of different approaches related to different disaster risks involving the above actors, in representative urban and non-urban environments, including in areas where precarious socio-economic conditions prevail;
- Intensive sharing, among communities, of good practices and of learnings resulting from citizen-scientist interaction;
- A consolidated, common European understanding of disaster resilience.

Delegation Exception Footnote: It is expected that this topic will continue in 2020.

Cross-cutting Priorities: International cooperation, Gender, Socio-economic science and humanities

Horizon 2020 Pillar: Societal Challenges

Programme: Secure, clean and efficient energy

Call Title: BUILDING A LOW-CARBON, CLIMATE RESILIENT FUTURE:
SECURE, CLEAN AND EFFICIENT ENERGY

Call Identifier: H2020-LC-SC3-2018-2019-2020

Topic Title: Research on advanced tools and technological development

Topic Identifier: LC-SC3-ES-6-2019

Type of Action: RIA Research and Innovation action

Deadline(s): 05-02-2019 (single-stage)

Participant Portal Weblink:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/lc-sc3-es-6-2019.html>

Specific Challenges: A number of tools and future technologies need to be developed, matured and tested to cover gaps and/or to prepare the energy system of 2030 and beyond.

Scope: Proposals must address only one of the 4 following sub-topics whereby not necessarily all points listed in a sub-topic need to be addressed:

1. Advanced modelling tools for:
 - the modelling of the future electricity market to study and analyse the impact and the design of electricity pricing structure from the wholesale markets, to real time markets (balancing and congestion management) and retail markets;
 - modelling and forecasting energy production from variable renewables, associated frequency and voltage controls issues in the electricity grid and benefits associated with the use of storage.
2. Advanced tools for
 - the design and planning and operation of electricity grid infrastructure including distribution and transmission level, taking into account environmental concerns, such as air quality, and footprints and the new constraints from variable renewable generation, the place and role of storage and flexibility; the optimisation of the use of existing electricity assets and network capacity;
 - the development of grid predictive management strategies with uncertainty (forecasting plus stochastic grid management tools), improving the maintenance of electricity assets (distribution and transmission) as well as the associated data management;

- Enhanced TSO / DSO collaboration and coordination tools, secure data exchange across networks along whole the value chain, ICT tools for cross-border trading for nearly real-time balancing; definition of minimum set of specifications to allow automated digital cross-border electricity market.
 - Enabling technologies for reliable and resilient interconnected European electricity grids, making use of the specific features and the strategic role of the European Global Navigation Satellite Systems Galileo and EGNOS.
3. Technological developments:
- Develop a new generation of reliable, robust and cost-effective energy storage technologies, storage management systems, in particular batteries, able to provide high specific energy rates, large number of life cycles, fast response to the electrical network demands and low maintenance;
 - Power electronics for batteries and software to manage combined or hybridised decentralised energy systems, also combining several energy vectors: a key focus is on significant cost reduction of these key components for homes, districts and larger systems which have the potential to accelerate significantly the energy transition of the electricity network.
4. International Cooperation with non-EU/Associated country member of **Mission Innovation**^[1] on **Mission Innovation** Challenge 7 on Affordable Heating and Cooling for Buildings:
- Develop compact thermal energy storage for electricity load shifting that will take up electricity from the grid at the peak times, to be used for heating, cooling or hot tap water at later times. Typical required charging power is 3 kW, for periods of up to three hours. Integration into the building heating system and in the smart electricity grid is a key development element together to the storage materials and technologies.

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 to 4 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Proposal must clearly indicate which sub-topic 1, 2, 3 or 4 they are targeting.

Proposals should comply with the requirements stated in the section 'Common requirements' of the introduction to the part on the Smart citizen-centred energy system.

Expected Impact:

1. Advanced modelling tools are expected to: increase the knowledge on how to design of price structure and magnitude in order to be able to finance e.g. infrastructure and research and innovation; enhance the accuracy of the prediction of electricity production from variable renewables and better qualify and quantity associated issues and remedies
2. Advanced tools are expected to develop new approaches to electricity grid planning, monitoring and maintenance that are better suited to today's future characteristics of the grid and enable savings on infrastructure costs.

3. The technological developments are expected to reduce costs of key technology components to allow European Industry to keep and extend its leadership in power electronics for stationary battery systems of all sizes (from home to utility scale) and the integration of battery systems with high shares of renewable electricity and eventually also heating and cooling.
4. Contribute to the objectives of **Mission Innovation** and provide efficient innovative small scale power to heat/cool flexibility measures that can be deployed in a large number of buildings so as to enable the grid to operate with large share of variable renewable energy

Proposals are invited to include ad-hoc indicators to measure the progress against specific objectives of their choice that could be used to assess the progress during the project life.

Cross-cutting Priorities: International cooperation, Clean Energy

^[1] Australia, Brazil, Canada, Chile, People’s Republic of China, India, Indonesia, **Japan**, Mexico, Republic of Korea, Saudi Arabia, United Arab Emirates, United States

Horizon 2020 Pillar:	Societal Challenges
Programme:	Secure, clean and efficient energy
Call Title:	BUILDING A LOW-CARBON, CLIMATE RESILIENT FUTURE: SECURE, CLEAN AND EFFICIENT ENERGY
Call Identifier:	H2020-LC-SC3-2018-2019-2020
Topic Title:	Low carbon industrial production using CCUS
Topic Identifier:	LC-SC3-NZE-5-2019-2020
Type of Action:	IA Innovation action
Deadline(s):	27-08-2019 (single-stage)

Participant Portal Weblink:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/lc-sc3-nze-5-2019-2020.html>

Specific Challenges: CCUS in industrial applications faces significant challenges due to its high cost and the fierce international competition in the sectors concerned. However, these sectors currently account for 20% of global CO₂ emissions, and in the 2 degree scenario, should represent half of the stored CO₂ by 2050. Relevant sectors with high CO₂ emissions are for example steel, iron and cement making, oil refining, gas processing, hydrogen production, biofuel production and waste incineration plants.

Scope: Projects will focus on integrating CO₂ capture in industrial installations, whilst addressing the full CCUS chain. Projects will elaborate a detailed plan on how to use the results, i.e. the subsequent transport, utilisation and/or underground storage of the captured CO₂. Important aspects to address are of technical (e.g. the optimised integration of capture plant with industrial processes; scalability; CO₂ purity), safety (e.g. during transportation and storage), financial (e.g. cost of capture; cost of integration) and strategic nature (e.g. business models; operation and logistics of industrial clusters and networks).

Projects are expected to bring technologies to TRL 6-7 (please see part G of the General Annexes). Technology development has to be balanced by an assessment of the societal readiness towards the proposed innovations. Relevant end users and societal stakeholders will be identified in the proposal, and their concerns and needs will be analysed during the project using appropriate techniques and methods from the social sciences and humanities, in order to create awareness, gain feedback on societal impact and advancing society's readiness for the proposed solutions. Projects should also explore the socio-economic and political barriers to acceptance and awareness with a view to regulatory or policy initiatives.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 10 to 12 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged, in particular with relevant **Mission Innovation**^[1] countries such as China^[2].

Expected Impact: Successful, safe and economic demonstration of integrated-chain CCUS from relevant industrial sources such as mentioned in the specific challenge will accelerate the learning, drive down the cost and thus help break the link between economic growth and the demand for industrial output on one hand, and increasing CO₂ emissions on the other hand. The impact of projects under this call will to a large extent be determined by the extent to which the results will be exploited, i.e. the plan on how the captured CO₂ will be actually utilised and/or stored, either in the project or planned as a future phase. This will be evaluated based on the maturity and quality of the proposed post-capture solutions. Projects under this call that are carried out in areas where there is both a high concentration of CO₂ emitting industries and a nearby capacity for geological storage are considered prime sites for hub and cluster developments, and will generate the highest impact on full-scale deployment in the medium to longer term.

Delegation Exception Footnote: It is expected that this topic will continue in 2020.

Cross-cutting Priorities: Socio-economic science and humanities, RRI, International cooperation, Open Innovation

^[1] <http://mission-innovation.net/our-work/innovation-challenges/>

^[2] A Co-funding mechanism is in place in China; see <https://ec.europa.eu/programmes/horizon2020/en/news/eu-china-research-and-innovation-co-funding-mechanism-first-call-launched-china>

Horizon 2020 Pillar: Societal Challenges

Programme: Secure, clean and efficient energy

Call Title: BUILDING A LOW-CARBON, CLIMATE RESILIENT FUTURE: SECURE, CLEAN AND EFFICIENT ENERGY

Call Identifier: H2020-LC-SC3-2018-2019-2020

Topic Title: Converting Sunlight to storable chemical energy

Topic Identifier: LC-SC3-RES-29-2019

Type of Action: RIA Research and Innovation action

Deadline(s): 27-08-2019 (single-stage)

Participant Portal Weblink:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/lc-sc3-res-29-2019.html>

Specific Challenges: To replace fossil energy with sustainable alternatives that provide the same flexibility and convenience of use, we need to store sustainable energy on a large scale and for a long time in new kind of energy storage compounds. This can be done by direct conversion of sunlight into storable chemicals that can be stored for a virtually unlimited time. At present, these processes can be performed at the level of small prototype devices at high cost. Therefore, research and innovation are needed to bring these approaches from infancy to maturity. The production of clean forms of storable chemical energy from direct sunlight is the next step.

Performance breakthroughs, including day and night continuous processes, and cost reductions are a must in order to unlock the potential of technologies converting sunlight to storable chemical energy.

This challenge is fully aligned to the "Converting Sunlight Innovation Challenge"^[1] identified as a priority in **Mission Innovation**.

Scope: Proposals are expected to address renewable energy technologies that will answer the challenge described in the "Converting Sunlight Innovation Challenge" of **Mission Innovation**, bringing them up to TRL 4 or 5. Beside the technological development, the proposal will have to clearly address the following related aspects: the potential lower environmental impact than the current technologies, possibly through a LCA analysis, the better resource efficiency, issues related to social acceptance or resistance to new energy technologies, related socioeconomic and livelihood issues, and prospective market analysis. The proposal needs to consider all three dimensions of sustainability, resource efficiency and scalability, i.e. not using materials which

are uncommon, dangerous or scarce that could disable its future concept to be used at large scale.

At least one of the following technology-specific challenges has to be addressed:

- Improved light-harvesting and efficient charge separation in photocatalytic systems;
- Photoelectrochemical cells – PECs and catalyst development;
- Thermochemical pathways to energy rich chemicals (using concentrated solar light); and
- Design and engineering of devices, systems or prototypes integrating together the different processes, with day and night control and applicability for the production of chemical energy rich carriers.

The area of electrolyzers efficiently utilizing a renewable electricity input, such as provided by photovoltaics, wind turbines or other sustainable means, is not covered by this challenge.

The proposal must have a plausible pathway to scale the technology to the terawatt scale by 2050, a plausible potential for an EROI > 10 (EROI: Energy returned on energy invested) and the full recyclability of the conversion devices in the context of a circular economy must be ensured.

As part of **Mission Innovation** actions, the project will be required to contribute towards the activities of the "Converting Sunlight Innovation Challenge". Beside solving the technical challenge, the consortium is expected to budget the participation in the development of the Challenge work plan through activities such as dissemination, exchange of researcher and networking as well as through contributing in official meetings.

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 to 3 million would allow this challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Projects will not only contribute to mitigating climate change through the production of storable chemical energy from the sun, but also enhance energy security and provide opportunities for economic development across the globe.

Projects should show its contribution towards establishing a solid European innovation base and building a sustainable renewable energy system.

Contributing to **Mission Innovation** aims, projects will deepen the international collaboration in clean energy research and development.

Delegation Exception Footnote: It is expected that this topic will continue in 2020.

Cross-cutting Priorities: International cooperation, Clean Energy, Socio-economic science and humanities

^[1] <http://mission-innovation.net/our-work/innovation-challenges/converting-sunlight-challenge/>

Horizon 2020 Pillar:	Societal Challenges
Programme:	Secure, clean and efficient energy
Call Title:	BUILDING A LOW-CARBON, CLIMATE RESILIENT FUTURE: SECURE, CLEAN AND EFFICIENT ENERGY
Call Identifier:	H2020-LC-SC3-2018-2019-2020
Topic Title:	Developing the next generation of renewable energy technologies
Topic Identifier:	LC-SC3-RES-1-2019-2020
Type of Action:	RIA Research and Innovation action
Deadline(s):	16-10-2018, 25-04-2019 (two-stage)

Participant Portal Weblink:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/lc-sc3-res-1-2019-2020.html>

Specific Challenges: The renewable energy technologies that will form the backbone of the energy system by 2030 and 2050 are still at an early stage of development today. Bringing these new energy conversion solutions, new renewable energy concepts and innovative renewable energy uses faster to commercialisation, taking into account social acceptance and secure and affordable energy supply, is challenging. These new technologies must not only have a commercial potential but they should also have a lower environmental impact and lower greenhouse gases emissions than the current renewable energy technologies.

Due to the pre-competitive nature of the research activities of this type, particular emphasis is put on including international cooperation opportunities, whenever relevant to the proposal and the domain, in particular in the context of the **Mission Innovation** Challenges^[1].

Scope: Proposals are expected to bring to TRL 3 or TRL 4 (please see part G of the General Annexes) renewable energy technologies that will answer the challenge described. Beside the development of the technology, the proposal will have to clearly address the following related aspects: the potential lower environmental and climate impact on a life cycle basis, the better resource efficiency, issues related to social acceptance or resistance to new energy technologies, related socioeconomic and livelihood issues.

Support will be given to activities which focus on converting renewable energy sources into an energy vector, or the direct application of renewable energy sources.

One of the following technology-specific sub-topics has to be addressed:

- Developing the new energy technologies that will form the backbone of the energy system by 2030 and 2050. The challenge is to develop energy technologies currently in the early phases of research. It is crucial that these new, more efficient, and cost-competitive energy generation and conversion technologies, demonstrate their potential value in the future European energy system. Developments in sectors other than energy may provide ideas, experiences, technology contributions, knowledge, new approaches, innovative materials and skills that are of relevance to the energy sector. Cross-fertilisation could offer mutually beneficial effects;
- Innovative materials for geothermal heat exchangers to maximize energy transfer and improve the overall conversion efficiency of a geothermal system;
- Innovative testing methods and design tools for acceleration of wind energy technology development and increased life time extension;
- Sustainable fuels other than hydrogen for energy and transport application through ground-breaking conversion technologies, addressing for example development of novel microorganisms, enzymes, catalysts, photosensitizers and separation techniques, improvement of biomass and microalgae yields, and development of novel technologies of combined indirect and direct artificial photosynthesis with chemical/ biochemical/biological systems;
- Innovative very high efficiency thin-film photovoltaics concepts considering advanced, sustainable and low-cost materials and processes.

Novel technology solutions for grid integration, storage, fuel cells and hydrogen – (other than integral to the technology solution developed), energy efficiency and smart cities will not be supported under this topic but in the relevant parts of this work programme part and other H2020 work programme parts.

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 to 5 million would allow this challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: On its completion, the project is expected to advance the knowledge and prove the technological feasibility of the concept including the environmental, social and economic benefits. The proposal should show its contribution towards establishing a solid European innovation base and building a sustainable renewable energy system contributing to the decarbonisation of our economies. The proposed solutions are expected to contribute to strengthening the EU leadership on renewables.

Delegation Exception Footnote: It is expected that this topic will continue in 2020.

Cross-cutting Priorities: Blue Growth, Clean Energy, International cooperation, Socio-economic science and humanities

^[1] <http://mission-innovation.net/our-work/innovation-challenges/>

Horizon 2020 Pillar:	Societal Challenges
Programme:	Smart, green and integrated transport
Call Title:	2018-2020 Mobility for Growth
Call Identifier:	H2020-MG-2018-2019-2020
Topic Title:	InCo Flagship on Integrated multimodal, low-emission freight transport systems and logistics
Topic Identifier:	MG-2-9-2019
Type of Action:	RIA Research and Innovation action
Deadline(s):	16-01-2019, 12-09-2019 (two-stage)

Participant Portal Weblink:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/mg-2-9-2019.html>

Specific Challenges: Global as well as regional and local freight transport is massively changing due to accelerating technological changes, the establishment of new players in global trade, the rise of protectionism, and the slowing down of economic growth of important partners such as China. New logistics concepts (such as the Physical Internet) and new disruptive technologies, such as Blockchain, Industry 4.0, vehicle automation and truck platooning or new business models, like 'crowdshipping' and the circular economy models will have an impact on global freight transport, its optimisation and its environmental footprint that needs to be better understood and assessed. Furthermore new trade routes from and to Europe will probably change the traditional pattern of freight movement and will need new connections with European corridors and hubs at a time of budget limitation on investment for transport infrastructure.

Sustainable integrated multimodal freight transport is particularly important for the development of countries in special situations – least developed countries, landlocked developing countries, and small island states and outermost regions - which face common problems resulting from the under-resourcing of transport infrastructure and services, traffic-related air pollution and high accident levels, but also diverse geopolitical and trade situations. These countries/regions also have an enormous potential for sustainable development. International cooperation can support their economies both domestically and globally for a global benefit and ensuring better integration of these regions into the world economic landscape.

Scope:

Proposals should address one or more of the following aspects:

- Understanding how new concepts in logistics, in combination with new national strategies to organize freight flows in ports and airports have an impact on global freight transport, and on related greenhouse gas emissions. Multimodal transfer zones from ports and airports from long-haul to last mile logistics need to be better analysed in order to find appropriate measures and for ensuring seamless door-to-door transport, exploiting the full potential of modularization and other innovative logistics concepts. International cooperation with major trade partner countries is essential to ensure the smooth transfer at all levels of the transport chain. Proposals should also address solutions that enable peripheral regions and landlocked developing countries to have proper accessibility to international trade.
- Speed up the process and transition towards the Physical Internet paradigm, demonstrating how different technologies, business cases and standards come together in real-world applications, and are able to deliver added value to the users and have positive impacts in terms of emissions and energy consumption. Priority partners should be USA, Canada, China, **Japan**. Demonstrations of satellite-based applications using EGNOS and Galileo are also suggested.
- Research the range of new issues and questions emerging with the new trade routes to and from Europe, such as the Northern Sea Route (across an ice-free Arctic in summer months) or the new Silk Road routes and the Chinese One Belt One Road strategy; the effect of the development of these new routes on trans-continental freight modal split; the additional interfaces needed between the new overland routes and the EU internal transport networks / corridors. Priority partners are those along the routes. The geopolitical and trade aspects of these developments, in particular on countries affected by these developments, should be considered.
- Understand new disruptive trends emerging as on-demand logistics solutions such as crowd-sourcing of deliveries (or 'crowdshipping') which have the potential to be a logistics 'game-changer', evidencing different impacts in both emerging and industrialized countries, including the possible integration of passengers and freight flows. Research on the crowd-sourcing of logistics would benefit from international collaboration, partly to compare the development of the phenomenon in different markets, but also to explore whether it can be extended to long-haul / cross border freight delivery, taking in consideration economic, regulatory and security constraints.
- Assess the impact of emerging technologies in other sectors than freight transport (e.g. Blockchain, Industry 4.0, 5G, 3D printing, unmanned aerial vehicles (UAV's)) on the logistics operational system, and identify the potential development paths that lead to the optimal exploitation of their positive effect.
- Collect best case models and develop decision support systems aimed at helping public authorities and private companies to determine the most likely scenarios and to promote a higher level of collaboration between the different stakeholders, including new emerging ones.

- Consideration of aspects of governance, privacy and cybersecurity of and with regard to cargo.

The Commission considers that proposals requesting a contribution from the EU between EUR 3 and 7 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

In line with the Union's strategy for international cooperation in research and innovation^[1], international cooperation is encouraged. In particular proposals should consider cooperation with projects or partners from the US, **Japan**, Canada, China, Latin America.

In particular, proposals should foresee twinning with entities participating in projects funded by US DOT to exchange knowledge and experience and exploit synergies.

Expected Impact: Main impact from the R&I activities should be the improved integration of the European transport network (both hard – TEN-T – and soft – logistics and IT) with the global network, through the sustainable development of the transport nodes likely to benefit from the emergence of new trade routes and harmonised platforms and new and revised 'nodes', also in support of the sustainable development of new logistics routes and their link with national/regional markets. Better understanding of the impact of emerging technologies on freight flow and subsequent guidelines to optimize vehicle, infrastructure and operation accordingly. Facilitate the development of disadvantaged regions and their inclusion into the international trading system. Better understanding of links between technological development, trade and geopolitics. Research should be validated in a selected number of case studies through pilot demonstration, trials and testing involving service providers and end-users.

Cross-cutting Priorities: International cooperation

^[1] (COM(2012)497)

Horizon 2020 Pillar:	Societal Challenges
Programme:	Smart, green and integrated transport
Call Title:	2018-2020 Digitising and Transforming European Industry and Services: Automated Road Transport
Call Identifier:	H2020-DT-ART-2018-2019-2020
Topic Title:	Human centred design for the new driver role in highly automated vehicles
Topic Identifier:	DT-ART-03-2019
Type of Action:	RIA Research and Innovation action
Deadline(s):	25-04-2019 (single-stage)

Participant Portal Weblink:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/dt-art-03-2019.html>

Specific Challenges: Significant research efforts are addressing driver performance and behaviour in automated driving conditions still requiring the driver to be prepared to assume control (SAE automation level 3 and lower). In highly automated driving conditions (SAE automation level 4) the role of the driver will change dramatically since driver intervention is not required during defined use cases. This means that during a single trip there will be a coexistence of different automated driving functions demanding various degrees of human attention. When a vehicle is in highly automated driving mode the driver may take on different behaviours. Solutions need to be developed and they have to ensure both a safe transfer between use cases with different automation levels and that drivers always have a very clear understanding about the degree of automation enabled in each situation.

Scope: Proposals for research and innovation should focus on the design of safe human-machine interfaces for vehicles with highly automated driving functions and the safe and controlled transfer between use cases of different SAE automation levels (between level 4 to/from levels 3 or 2) for all types of drivers.

The proposed actions should include all of the following aspects:

- Research to characterise driver roles in use cases of SAE automation level 4 and for the transition between these and lower automation levels. Upgrade of comprehensive models for driver behaviour/reaction, awareness, readiness and monitoring. Driver generational effects, considering in particular variations in IT usage experience and age, but also other cultural factors should be taken into account.

- Effectiveness assessment methods, especially for safety aspects, based on these models. The new relationship between driver and vehicle (mutual cooperation or even handover rather than continuous control) should be reflected, also considering the variety of activities a driver may engage in while the vehicle is in charge. Use cases where an operator controls the vehicle remotely may be included.
- Develop easily understood solutions making it clear to the driver what is the operational capability (authority) of the automated mode or modes currently enabled, as well as ensuring safe and reliable function (re-)allocation and corresponding driver/operator readiness. Driver control handover, driver/operator state and impairment are among the aspects that should be considered and the intended driver reaction should be secured.
- Demonstration of concept functionality in real world situations with various use cases and driving environments where automated systems receive and give back control from/to the driver.

Proposed actions should build on the knowledge and results of ongoing projects addressing human machine interactions of automated driving systems.

In line with the Union's strategy for international cooperation in research and innovation, international cooperation is encouraged. In particular, proposals should consider cooperation with projects or partners from the US, **Japan**, South Korea, Singapore, and/or Australia. Proposals should foresee twinning with entities participating in projects funded by US DOT to exchange knowledge and experience and exploit synergies. Twinning with **Japan** is also encouraged.

The Commission considers that proposals requesting a contribution from the EU between EUR 4 to 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:

- Innovative solutions, concepts and algorithms for a safe human-machine interface of highly automated driving functions and for safe and controlled transfer between use cases of different automation levels.
- Reduction of risks for driver behaviour related incidents by ensuring that drivers/operators are adequately alerted, made aware and engaged when the highly automated vehicle encounters situations or use cases that it cannot handle and thus will turn to lower automation levels.
- The research will help achieve the European Transport White Paper "Vision Zero" objective by preventing road accidents caused by human errors. Once on the market the developed concepts and solutions will also contribute to Sustainable Development Goal 3 (Ensure healthy lives and promote well-being for all at all ages; in particular goal 3.6. "By 2020, halve the number of global deaths and injuries from road traffic accidents").

Cross-cutting Priorities: Socio-economic science and humanities, International cooperation

Horizon 2020 Pillar:	Societal Challenges
Programme:	Smart, green and integrated transport
Call Title:	2018-2020 Digitising and Transforming European Industry and Services: Automated Road Transport
Call Identifier:	H2020-DT-ART-2018-2019-2020
Topic Title:	Developing and testing shared, connected and cooperative automated vehicle fleets in urban areas for the mobility of all
Topic Identifier:	DT-ART-04-2019
Type of Action:	IA Innovation action
Deadline(s):	25-04-2019 (single-stage)

Participant Portal Weblink:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/dt-art-04-2019.html>

Specific Challenges: Shared, connected and cooperative automated vehicles may become a game changer for urban mobility. They can provide seamless door to door mobility of people and freight delivery services, which can lead to healthier, more accessible, greener and more sustainable cities, as long as they are integrated in an effective public transport system. Since a few years the development of shared automated vehicle pilots are emerging around the world. Today, most of these pilots are small-scale and involve either on-demand ride services or low-speed shuttles operating in controlled environments. In order to accelerate the uptake of high quality and user oriented mobility services, based on shared, connected and cooperative automated vehicles, there is a need for demonstrating these services in real life conditions to test the performance, safety and viability of these systems and services and to prove that they are attractive for and accepted by users. Furthermore, the potential impacts on reducing CO2 emissions and pollutants, safety and overall transport system costs need to be assessed.

Scope:

The proposed actions should include all the following aspects:

- Thorough analysis of new, emerging business/operating models and related technologies for shared, connected and cooperative automated vehicle fleets that are complementing existing high-capacity public transportation systems.
- Design innovative shared, connected, cooperative and automated vehicle concepts (road vehicles at SAE level 4 and higher) and the associated new business/operating models addressing user and customer needs, including cultural aspects, for mobility of people and/or delivery of goods. Specific user

needs in different regional and operating environments and for different user groups, e.g. elderly, children and users with disabilities should be considered and attractiveness and acceptability by all users should be ensured. The potential of combining automated urban delivery and people transportation should be addressed.

- Test robustness, reliability and safety of shared highly automated vehicle fleets that are operating in semi-open or open environments focusing on the interaction with other road users, including pedestrians, cyclists and public transport systems. The fleets should consist of electrified vehicles. Synergies with advanced energy efficient, smart and multimodal mobility concepts should be actively developed. Fleet management should include operational optimisation as well as energy management. Fleet tests should consider the entire "functional urban area" and explicitly include feeder services and other collective transport options in peri-urban and low-density urban areas.
- Vehicles should use connectivity technologies to allow communication and cooperation between vehicles, infrastructure and with other road users and to enable automated, smart mobility services, innovative fleet management concepts and higher performance of automated vehicle functions. Proposals should make the best use of EGNOS and Galileo which significantly improve the vehicle positioning availability and reliability. The development of solutions for the next generation of cooperative services^[1] by efficiently combining C-ITS and automation for smart, smooth, safe and efficient traffic flows (including the development and testing of "open message definitions" for all C-ITS stakeholders) would be an asset.
- Identify and provide for the needs of vulnerable road users (including their potential re-definition to include non-connected users, out-of-position passengers in automated cars, cyclists, pedestrians, etc.) resulting from this new automated/mixed environment (use of standard & highly automated vehicles).
- Develop architecture, functional and technical requirements for ICT technologies, for secure data collection and processing needed for the operation of connected and cooperative automated vehicles. Develop ways to enhance the optimised use of big data in (road) transport for implementing smart and safe mobility solutions, innovative traveller services and (city) traffic management.
- Fulfil all security requirements to protect the shared automated vehicles to any threats and avoid any conscious manipulations of the information enabling automated driving.
- Assess and demonstrate benefits of the pilot implementation on energy efficiency, traffic flow, safety, user appreciation etc, based on holistic modelling solutions.

In line with the Union's strategy for international cooperation in research and innovation, international cooperation is encouraged. In particular, proposals should consider cooperation with projects or partners from the US, **Japan**, South Korea, Singapore, and/or Australia. Proposals should foresee twinning with entities participating in projects funded by US DOT to exchange knowledge and experience and exploit synergies. Twinning with **Japan** is also encouraged.

The Commission considers that proposals requesting a contribution from the EU between EUR 15 and 30 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: Proposals will test the overall mobility impact, in particular, how shared mobility solutions using connected and cooperative automated vehicles can contribute to a more sustainable, inclusive, and safe mobility system and help residents of a city/region (in particular less mobile persons, elderly and children) to increase mobility and improve urban freight transport efficiency. Proposed actions will help to reduce the total number of passenger cars and goods km in cities, overall CO₂ and air pollutant emissions and energy consumption. They will improve market opportunities for SME's and new-entrants by addressing and developing innovative cross-sector business models. Actions will create strategic partnering opportunities between public agencies and the private sector for developing sustainable and scalable business models. They will also support the accelerated deployment of electrified vehicles for shared automated mobility services and integrated strategies for a smart and multi-modal mobility system and urban development, including land use and ITS and infrastructure development.

Cross-cutting Priorities: Socio-economic science and humanities, Clean Energy, International cooperation

^[1] Beyond Day 1 and Day 1.5 services, as defined in COM(2016)766, the European Strategy for C-ITS

Horizon 2020 Pillar: Societal Challenges

Programme: Smart, green and integrated transport

Call Title: Building a low-carbon, climate resilient future: Green Vehicles

Call Identifier: H2020-LC-GV-2018-2019-2020

Topic Title: InCo flagship on “Urban mobility and sustainable electrification in large urban areas in developing and emerging economies”

Topic Identifier: LC-GV-05-2019

Type of Action: IA Innovation action

Deadline(s): 25-04-2019 (single-stage)

Participant Portal Weblink:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/lc-gv-05-2019.html>

Specific Challenges: Climate change, energy security and local air pollution are some of the key questions for the 21st century. Urban areas in developing and emerging countries are major driving factors in growing global energy demand and Greenhouse Gas emissions.

Although cities cover only 2% of the earth's surface, 50% of the world's population lives in cities, but they are responsible for three-quarters of the global energy consumption as well as approximately 80% of the global greenhouse gas emissions. While the trend towards urbanisation and the associated increase of personal and freight transport creates massive challenges, in particular in developing and emerging economies, it also offers the unique opportunity to shape energy use especially in the transport and urban form towards a low carbon pathway. Moving towards sustainable mobility will also help addressing urban congestion, access to jobs and public services, and local air pollution.

This is why urbanisation requires integrated mobility solutions that bring together technology opportunities with local and national policy, including land use and mobility planning. Efficient transport and mobility, based on a balanced mix of public and private transport and dependent on the characteristics of each city, is and will continue to be the backbone of cities' growth and competitiveness.

Whereas environmental issues are very high on urban mobility agendas, the importance of transport in urban social and economic structures is often neglected in discussions. All three aspects of urban sustainability must be treated with equal importance and have to be examined in parallel.

Scope: Actions should bring together European, **Asian** (e.g. China), CELAC (Community of Latin American and Caribbean States) and African research partners, government agencies and urban authorities, private sector and civil society with relevant expertise and competence within the corresponding cooperation framework and foster participatory engagement in urban electrification in order to reduce air pollution and CO2 emissions. All types of vehicle are considered under this topic (powered 2 wheelers, cars, buses, trucks and LDV).

Proposals should address all of the following activities:

- Development of a toolbox for advanced management strategies towards a more efficient private and public electric mobility: E-mobility management strategies, focusing on smart deployment and operation of vehicles, in particular electrified vehicle, to increase mobility and energy efficiency, emission reduction and user acceptance of electrified vehicles
 - A smart and cooperative management of the vehicle in urban operation, (intermodal route planning, ecorouting eco-driving charging and parking infrastructure availability...).
 - Deployment and operation of infrastructure use charging infrastructure (conventional and wireless) and network, availability of parking places. Adaptation and integration of existing/ adapted vehicles of different types if necessary.
 - Efficient integration of the operations of different electrified road public transport, from e-bike to bus rapid transit (e- BRT) including mini-buses, taxi and mobility services on demand through smart navigation and routing, coordinated traffic management, demand-responsive service and dispatching
- Comparative demonstrations activities and pilots in cities will include at least one demonstrator in the following regions: Europe, **Asia**, Africa and CELAC (leading to a minimum of 4 city demonstrators). Demonstrations will involve local partners. Innovative concepts for electrified road public transport (passenger and freight), jointly designed through International Partnerships as a contribution to a wider sustainable mobility concept, from the perspective of a seamless mobility, taking in account the acceptance of users (travellers or freight operator).
- Implementation concepts to scale up the demonstration activities. Evaluation of the relative outputs and accordingly the development of implementation concepts to scale up the demonstration activities and exploration of the sustainable mobility planning in the city transformation process :
 - Sustainable planning of city and transportation infrastructure: link city planning with policy discussion and implementation solutions and city goals and with any Air Quality Plans
 - Dedicated plans for financing solutions, including public and private operations.
 - Regional and international replication conditions to reach out to a larger number of cities and countries

Cooperation and synergies with ongoing activities undertaken with international initiatives such as Decarbonising Transport (International Transport Forum) and

the Urban Electric Mobility Initiative (UN-Habitat) and other joint initiatives of European Member States international cooperation initiatives and the European Commission (e.g. Mobilise Your City) should be sought where appropriate.

In line with the strategy for EU international cooperation in research and innovation^[1], international cooperation is encouraged.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 15 and 18 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:

Proposals are expected to contribute to:

- Capability to quantify the potential reduction of greenhouse gas and pollutant emissions as well as traffic congestion, by demonstrating improvements that can be achieved with new urban mobility systems and electrification, for each stakeholder in the value chain (in line with the objectives set by the COP21 and the New Urban Agenda)
- UN's Sustainable Development Goals 11 "Sustainable cities and communities" and 13 "Climate Action"
- Reference models of the mobility system to provide a basis in order to assess the ability to replicate sustainable concepts by demonstrating the short- and long-term benefit for the stakeholders involved, and especially considering the relevant boundary conditions (i.e infrastructure, vehicle, usage needs and patterns, governance, financing schemes, urban organisation, etc) and how the result contributes to key EU policy goals (including climate goals and competitiveness of European industry)
- A basis for strengthening the collaboration of the European Union with **Asia** (e.g. China, India, etc), Latin America (CELAC) and Africa, which also offers both a common starting point for common future legislative efforts, as well a favourable setting for new business opportunities for innovative local and European entrepreneurs.

Cross-cutting Priorities: Open Innovation, Clean Energy, Contractual Public-Private Partnerships (cPPPs), EGVI, RRI, Socio-economic science and humanities, International cooperation

^[1] (COM (2012) 497)

Horizon 2020 Pillar:	Societal Challenges
Programme:	Smart, green and integrated transport
Call Title:	2018-2020 Mobility for Growth
Call Identifier:	H2020-MG-2018-2019-2020
Topic Title:	Future propulsion and integration: towards a hybrid/electric aircraft (InCo flagship)
Topic Identifier:	LC-MG-1-7-2019
Type of Action:	RIA Research and Innovation action
Deadline(s):	25-04-2019 (single-stage)

Participant Portal Weblink:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/lc-mg-1-7-2019.html>

Specific Challenges: This action is part of the Aviation International Cooperation Flagship called "Safer and Greener Aviation in a Smaller World" mentioned in the introduction to this work programme 2018-2020.

The third challenge of Flightpath 2050 is related to environmental protection and the security of energy supply. At the Paris climate conference (COP21), countries agreed to limit climate change to well below 2°C. Without considerable contributions from the aviation sector to global mitigation efforts, this goal cannot be achieved. Carbon Neutral Growth from 2020 is possible through a combination of non-market and market measures. Regarding aircraft technologies, there is growing evidence that indicates that for airframe as well as for Propulsion and Power Systems (PPS), the projected cumulative impact of developed technologies will fall short of the year 2035 target. These projections account for the latest developments in airframe, weight gains from more-electric aircraft systems as well as advanced gas-turbines, such as expected high thermal efficiencies through intercooling and recuperation and propulsive efficiencies from Open Rotor.

Against this background it is necessary to develop future aviation propulsion and integration technologies with emphasis on hybrid-electric and full-electric propulsion. There is also a need for establishing a common roadmap and prioritize the key enabling technologies for the hybrid/electric configurations, including energy storage (batteries), for the aviation sector.

Scope: Proposals are expected to address feasibility design studies for aircraft energy system with integrated hybrid/electric propulsion and power generation architectures as well as sub-systems enablers in the context of appropriately

projected advances in the next twenty-year framework. Each proposal may aim at several of the following areas:

- Development of tools for tightly-coupled inter-disciplinary new architectural feasibility assessment for the hybrid/electric propulsion and power systems, including detailed feasibility design studies for innovative energy distribution, use and storage solutions.
- Explore concepts on energy harvesting technologies to identifying, capturing, storing and re-using energy in flight and/or during take-off, landing, breaking and taxiing, which have potential to offer synergies with hybrid-electric architectures.
- Explore emerging storage technologies that have potential to comply with aerospace requirements (e.g. performances, safety, dispatch...) for hybrid/electric propulsion and power systems.
- Advance further Electro-Magnetic Interference solutions as well as thermal management trade-offs at system level.

Projects are expected to perform an assessment on the applicability, availability and upgrade of research infrastructures for testing and validation with focus on electrical and propulsion benches and computational tools. (incl. wind tunnels, electrical and propulsion benches and computational tools). Projects are also expected to develop updated roadmap with reference to key enabling technologies towards fully electric or hybrid-electric aircraft and explore new relevant regulatory frameworks. Proposals may include the commitment from the European Aviation Safety Agency to assist or to participate in the action.

The implementation of the proposed areas of this topic should cover TRLs ranging from 1 to 4.

In line with the strategy for EU international cooperation in research and innovation^[1], multilateral international cooperation is encouraged, in particular with countries such as **Japan**, Russia, USA and Canada.

The Commission considers that proposals requesting a contribution from the EU between EUR 3 and 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: Overall, the topic is expected to contribute to Flightpath 2050 goals, namely towards “environmental protection and the security of energy supply” as well as “maintaining global leadership”. Specific impact is expected in the following areas:

- New paradigm shift towards emission-free aviation.
- Strengthen the medium and long-term European aeronautics competitiveness.
- Engagement of European aviation research community to a highly ambitious topic.
- Establishment of roadmaps and prioritization key enabling technologies.
- Foundations for next-generation European demonstrators.

- Contribution to UN's Sustainable Development Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all.

Cross-cutting Priorities: International cooperation

^[1] (COM(2012)497)