Selection of calls
FUNDING OPPORTUNITIES FOR PHOTONICS
H2020, Work Programme 2016 - 2017

Information obtained from the Work Programme
published calls for 2016

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

Infrastructures, ICT, NMBP, Space, Innovation in SMEs, Societal Challenges, Fast Track to Innovation Pilots: European Commission Decision C (2015)6776 of 13 October 2015

Euratom: European Commission Decision C (2015)6744 of 13 October 2015

This document includes a selection of calls for 2016 obtained from the whole collection of calls published under H2020, 2016-17 Work Programmes. The criteria used for the selection is the relationship with Photonics Technologies, both if they are directly mentioned in the text of the call or maybe if a *photonics application* fits in some part of the call (sensing, imaging, lighting, communications, manufacturing, etc.).

It is highly recommended to read carefully the original Work Programme published and updated by the EC prior to the preparation of a proposal.

http://ec.europa.eu/research/participants/portal/desktop/en/funding/reference_docs.html#h2020-work-programmes-2016-17

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4. European Research Infrastructures (including e-Infrastructures)

INFRADEV-02-2016: Preparatory Phase of ESFRI projects

RIA ☒	IA ☒	CSA ☑

Specific Challenge:

The ESFRI roadmap, updated periodically, identifies the needs of the European scientific community in terms of research infrastructures. However, inclusion in the ESFRI roadmap does not guarantee that these needed infrastructures will be built. Before proceeding with the construction and/or implementation of the identified infrastructures, many preliminary decisions need to be taken with respect to issues such as the identification of funders, the financial plan for sustainability, the governance by involved stakeholders, the site and legal form of the managing organisation (and of the research infrastructure, if different), the architecture and the service policies. The aim of this activity is to provide catalytic and leveraging support for the preparatory phase leading to the construction of new research infrastructures or major upgrades of existing ones.

Scope: The preparatory phase aims at bringing the project for the new or upgraded research infrastructure identified in the ESFRI roadmap to the level of legal, financial, and, where applicable, technical maturity required for implementing it.

Proposal consortia should involve all the stakeholders necessary to move the project forward, to take the decisions, and to make the financial commitments, before construction can start (e.g. national/regional ministries/governments, research councils, funding agencies, in particular, but not limited to, from the countries that have already declared their commitment in the application to ESFRI). Appropriate contacts with ministries and decision-makers should be continuously reinforced, thus further strengthening the consortia. Operators of research facilities, research centres, universities, and industry may also be involved whenever appropriate. Technical work should be carried out when necessary to complete the final technical design, providing a sound technical base for establishing a cost baseline and detailed financial planning. The financial needs of the project should be mapped out to the extent necessary for funding agencies to establish their own medium- and long-term financial planning.

The preparation of the legal and financial agreements (including site, governance, internal rules, financing of the new research infrastructures) is one of the main activities and deliverables and should be finalised before the end of the project (e.g., through the signature of a Memorandum of Understanding).

The detailed list of activities that can be included in a preparatory phase proposal is given in part A of the section “Specific features for Research Infrastructures”.

Proposals will address research infrastructures which enter the ESFRI roadmap in 2016 and that are willing to set up a pan-European governance and legal structure (e.g. in the form of an ERIC or any other suitable structures).

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

Expected Impact:

Proposals will raise the technical, legal and financial maturity of projects for new or upgraded research infrastructures to the level required to enable the construction work to start.

- Funding bodies are able to take funding decisions and to conclude the legal agreements necessary for the construction of new research infrastructures.
- The technical work carried out under this topic will contribute to strengthening the technological development capacity and effectiveness as well as the scientific performance, efficiency and attractiveness of the European Research Area.
- A landscape of first-class sustainable RIs and services, open to researchers, industry, and other interested groups such as policy makers and the public, is progressively established, which will impact on the acceleration of scientific discovery as well as on innovation and competitiveness.

INFRAIA-01-2016-2017: Integrating Activities for Advanced Communities

RIA ☑ IA ☒ CSA ☒

Specific Challenge:

European researchers need effective and convenient access to the best research infrastructures in order to conduct research for the advancement of knowledge and technology. The aim of this action is to bring together, integrate on European scale, and open up key national and regional research infrastructures to all European researchers, from both academia and industry, ensuring their optimal use and joint development.

Scope:

'Advanced Communities' are scientific communities whose research infrastructures show an advanced degree of coordination and networking at present, attained, in particular, through Integrating Activities awarded under FP7 or previous Horizon 2020 calls.

An Integrating Activity will mobilise a comprehensive consortium of several key research infrastructures[1] in a given field as well as other stakeholders (e.g. public authorities, technological partners, research institutions) from different Member States, Associated Countries and other third countries[2] when appropriate, in particular when they offer complementary or more advanced services than those available in Europe.

Funding will be provided to support, in particular, the trans-national and virtual access provided to European researchers (and to researchers from Third Countries under certain conditions), the cooperation between research infrastructures, scientific communities, industry and other stakeholders, the improvement of the services the infrastructures provide, the harmonisation, optimisation and improvement of access procedures and interfaces.

To this extent, an Integrating Activity shall combine, in a closely co-ordinated manner:

(i) Networking activities, to foster a culture of co-operation between research infrastructures, scientific communities, industries and other stakeholders as appropriate, and to help develop a more efficient and attractive European Research Area;

(ii) Trans-national access or virtual access activities, to support scientific communities in their access to the identified key research infrastructures;

(iii) Joint research activities, to improve, in quality and/or quantity, the integrated services provided at European level by the infrastructures.

All three categories of activities are mandatory as synergistic effects are expected from these different components.

Access should be provided only to key research infrastructures of European interest, i.e., those infrastructures able to attract significant numbers of users from countries other than the country where they are located. Other national and regional infrastructures in Europe can be involved, in particular in the networking activities, for the exchange of best practices, without necessarily being beneficiaries in the proposal.

Proposals from advanced communities will have to clearly demonstrate the added value and the progress beyond current achievements in terms of integration and services, of a new grant. The strongest impact for advanced communities is expected typically to arise from focusing on innovation aspects and widening trans-national and virtual access provision. Furthermore, in particular for communities supported in the past under three or more integrating activities, the creation of strategic roadmaps for future research infrastructure developments as well as the long-term sustainability of the integrated research infrastructure services provided at European level, need to be properly addressed. The latter requires the preparation of a sustainability plan beyond the grant lifecycle as well as, where appropriate, the involvement of funders.

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

Integrating Activities should also organise the efficient curation, preservation and provision of access to the data collected or produced under the project, defining a data management plan, even when they opt out of the Pilot on Open Research Data. Data management (including ethics and privacy issues), interoperability, as well as advanced data and computing services should be addressed where relevant. To this extent, proposals should build upon the state of the art in ICT and e-infrastructures for data, computing and networking, working in cooperation with e-infrastructure service providers.

1 Exceptionally, the consortium may include only one research infrastructure providing access, if this facility is of a truly unique nature

2 Legal entities established in Australia, Brazil, Canada, China, India, Japan, Russia, Mexico and USA, which provide, under the grant, access to their research infrastructures to researchers from Members States and Associated countries, are eligible for funding from the Union

Integrating Activities should in particular contribute to fostering the potential for innovation, including social innovation, of research infrastructures by reinforcing the partnership with industry, through e.g. transfer of knowledge and other dissemination activities, activities to promote the use of research infrastructures by industrial researchers, involvement of industrial associations in consortia or in advisory bodies.

Integrating Activities are expected to duly take into account all relevant ESFRI and other world-class research infrastructures to exploit synergies, to reflect on sustainability and to ensure that rationally designed, comprehensive and coherent overall concepts for European Infrastructures are being pursued.

As the scope of an integrating activity is to ensure coordination and integration between all the key European infrastructures in a given field and to avoid duplication of effort, at most one proposal per area is expected to be submitted.

Further conditions and requirements that applicants should fulfil when drafting a proposal are given in part C of the section “Specific features for Research Infrastructures”. Compliance with these provisions will be taken into account during evaluation.

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

On the basis of a multiannual plan drafted taking into account the assessment and the timing of previous grants as well as strategic priorities and needs, in term of research infrastructures services, emerging from other parts of Horizon 2020, this work programme invites proposals addressing the following areas listed under the different domains. A balanced coverage of the various domains, in line with the distribution of areas per domain, is expected as outcome of this topic.

Biological and Medical Sciences

Facilities for high throughput DNA sequencing. This activity aims at integrating the key research infrastructures in Europe as well as leading-edge research infrastructures located in third countries to open them up to European researchers. Adequate consideration should be taken of the produced data and its availability for research. In this respect, synergies with other relevant ESFRI Infrastructures, in particular ELIXIR, should be duly exploited.

Vaccine infrastructures. This activity aims at bridging the 'translational gap' in biomedical research by providing academia- and SME- driven vaccine R&D with high quality services to support vaccine formulation, access to GMP (Good Manufacturing Practices), preclinical studies including relevant animal models, vaccine trials, compilation of regulatory dossiers and advice on production issues like upscale and quality control. Both human and veterinary vaccines, for prophylactic and therapeutic applications, should be addressed. Furthermore, work shall be carried out towards integration with the ESFRI Infrastructures EATRIS and INSTRUCT to ensure sustainability of the trans-national access services. Synergies with other relevant ESFRI Infrastructures, such as ECRIN, should be duly exploited.

Experimental facilities for animal disease and infectiology (including zoonoses). A project under this topic must provide and facilitate access to the key experimental facilities under BSL3 conditions in Europe for animal and zoonotic infectious diseases. It will also include key collections of samples necessary for research on animal and zoonotic infectious diseases. The project should aim to integrate these facilities and resources with a long term perspective. It should also develop the necessary collaborations outside Europe, towards a global sharing of available resources.

Centres for replacement, reduction and refinement (3 Rs) of non-human primate testing. This activity aims at integrating the key non-human primate centres in Europe promoting 3 Rs, i.e. replacement, reduction, and refinement. The proposal will contribute to the objective of 3Rs, reinforcing the implementation of ethical and good practices at European level, and the protection of animals used in scientific experiments, as framed by the directive 86/609/EEC, and by the Commission proposal for its revision, COM(2008)543. The proposal should also develop the necessary collaborations outside Europe.

Facilities and resources for plant phenotyping. This activity aims at providing and facilitating access to the key research infrastructures in Europe for high throughput plant phenotyping. It should aim to integrate these facilities and resources with a long term perspective, improving coordination, as regards standards, protocols, access modalities, etc. The project should also develop the necessary collaborations outside Europe, towards a coordinated development of such facilities and resources. The facilities should enable more efficient European research to be conducted in plant genetics, plant physiology and bio-ecology, under controlled conditions.

Marine biological stations. This activity aims at improving and further integrating access to a wide range of marine biology and ecology resources for research, including: marine biodiversity and associated historical time-series data; culture collections of marine biological resources; marine model organisms, including specific genetic resources; up-to-date equipment for biological research (“omics”); and rare and unique facilities for experimental

biology and ecology. It should also stimulate knowledge and technology transfer to industry and to public policy-makers. Synergies with relevant ESFRI Infrastructures, in particular EMBRC, should be duly exploited.

Research Infrastructures for the control of vector-borne diseases. This activity aims at integrating specialised facilities in Europe for the study of insect-transmitted disease with the objective to validate and roll out new control measures targeting insect vectors that pose the greatest threats to human health and animal industries. These facilities, supporting research and product development, include P3 secure insectaries for research on vectors and pathogens, large scale production of mosquitoes, facilities for the testing and evaluation of insecticides, and facilities for high-throughput genetic analysis of insect vectors and pathogens. The facilities of this activity and associated networking and research activities will play a critical role in consolidating European leadership in the field of insect vector biology and disease control. Synergies with relevant ESFRI Infrastructures such as ELIXIR should be duly exploited.

Energy

Research Infrastructures for research on biomass conversion and biorefinery. This activity aims at integrating the key research infrastructures in Europe for the advanced conversion technologies of biogenic feedstock. Research Infrastructures to be integrated would be laboratory and pilot-scale installations as well as demonstration plants (facilities like furnaces, gasifiers, fermenters, biorefineries, etc.) for carrying out research in the fields of: combustion and thermal gasification of solid fuels, modelling, gas cleaning, second and third generation biofuels with emphasis on marine biomass, anaerobic digestion, biomethane production from organic waste and green biorefinery (sustainable processing of biomass into a marketable spectrum of products). The issue of the use of new feedstock is an integral part of the activity. This activity will support the European Strategic Energy Technology Plan (SET-Plan, COM (2007)723).

Research Infrastructures for offshore renewable energy. This activity aims at integrating the key research infrastructures in Europe for research, development and testing of offshore wind and ocean energy systems including electrical sub systems and grid integration through a range of TRLs (from laboratory scale TRL 1/2 through to open ocean at TRL 6/7). Trans-national access should open existing pilot and demonstration plants as well as laboratory scale installations from wave basins to large scale open sea test sites. This activity will support the European Strategic Energy Technology Plan (SET-Plan, COM (2007)723) including emerging concepts of multi-purpose platforms.

Environmental and Earth Sciences

Research infrastructures for terrestrial research in the Arctic. This activity should integrate, as an international network for terrestrial research and monitoring in the Arctic, key research stations and large research field sites throughout the circumpolar Arctic and adjacent northern countries, aiming at implementing capacity for research, monitoring and education. The project should include work on best practises for managing stations, and (international) logistics. The network should link with marine and atmospheric networks, aiming at close cooperation.

Research Infrastructures for earthquake hazard. This activity aims at integrating the key research infrastructures in Europe for natural and anthropogenic earthquake risk assessment and mitigation. More integrated services from seismic and engineering infrastructures would contribute to supporting the reduction of vulnerability of European citizens and constructions to earthquakes. International collaboration activities and the further integration of the research field are encouraged. Synergies with relevant ESFRI Infrastructures, in particular EPOS, should be duly exploited.

Mesocosms facilities for research on marine and freshwater ecosystems. This activity aims at integrating leading mesocosm infrastructures in Europe enabling in particular research on impact of climate change, pollution and other disturbance on ecosystems, from Mediterranean to Arctic.

Atmospheric simulation chambers. This activity should further integrate key instrumented environmental chambers and improve access to them for atmospheric research, including model development, while expanding to larger scientific communities and interdisciplinary research fields. It is expected that this community work towards close cooperation with relevant ESFRI Infrastructures. By developing their complementary nature, the different research infrastructures should answer broad scientific needs such as studies of the impact of atmospheric processes e.g. on regional photochemistry, global change, as well as cultural heritage and human health effects. Building on the former integrating initiatives, the development of a strategic integrating structure should also be considered.

Research infrastructures for forest ecosystem and resources research. This activity aims at integrating and facilitating broad access to forest research facilities and methodologies with a view to enabling, coordinating and harmonising research and monitoring including investigation of the biological effects of air pollution and mitigation and adaptation to climate change. Access should be provided to data on genetic and species diversity in forest

ecosystems. Support for development of forest management approaches should be part of the project, taking into account environmental and land use changes and the bio-economy.

Sites, experimental platforms and data collections of anthropogenic impacts for ecosystem functioning and biodiversity research. This activity aims at bringing together highly instrumented experimental, analytical and modelling facilities, looking at all major European ecosystem types and all major pressures on them. It will optimise the collaborative use of these sites by a large scientific community. Efficient methods and techniques will be implemented for rapid data sharing and processing at the European level. Synergies with relevant ESFRI Infrastructures such as ANAEE should be duly exploited.

Multidisciplinary Marine Data Centres for ocean and marine data management. This activity aims at providing and facilitating access to the key data centres in Europe for in-situ and remote sensing data for marine research (including coastal research). It must present a long-term sustainable perspective on the integration of these facilities and related resources. It should enhance and innovate the services offered to an expanded multidisciplinary community and promote the adoption of the developed protocols and standards for interoperability to other key downstream initiatives in the field. Synergies with relevant ESFRI Infrastructures should be duly exploited.

Mathematics and ICT

Integrating activity for facilitating access to HPC (High Performance Computing) centers. This activity aims at furthering the services harmonisation and enhancement of national and regional High Performance Computing Centres of pan-European interest and at enlarging the European HPC user base preparing it to the use of the top end HPC resources such as PRACE (Partnership for Advanced Computing in Europe). It will widen trans-national access to HPC resources across different disciplines and for a wide range of applications including advanced simulation and modelling.

Material Sciences and Analytical facilities

Research Infrastructures for advanced spectroscopy, scattering/ diffraction and imaging of materials. This activity aims at integrating the key research infrastructures in Europe to offer electronic, X-ray, optic and magnetic inspection techniques, and their combinations, for the analysis and engineering of novel materials ranging from hard to soft matter. Such infrastructures would allow the detailed understanding and optimisation of the physical, chemical and biological properties of the materials.

Synchrotron radiation sources and Free Electron Lasers. This activity should provide and facilitate access of a wide range of user communities to the key research infrastructures in Europe based on Synchrotron and Free Electron Laser light sources. It aims to further integrate these facilities and resources with a long term perspective. It should also stimulate new scientific activities taking full advantage of new experimental possibilities offered by new light sources such as the European X-Ray Laser ("XFEL").

Facilities for research on materials under extreme magnetic conditions. This activity aims at integrating key research facilities for high magnetic fields. The activity should enable a wider research community to perform experiments in physics and materials science.

Infrastructures for Neutron Scattering and Muon Spectroscopy. This activity should provide and facilitate wider access to the key research infrastructures in Europe for Neutron scattering and Muon Spectroscopy. It must present a long-term sustainable perspective on the integration of these facilities and related resources. The activity should also stimulate new scientific activities taking full advantage of new experimental possibilities offered by the future European Spallation Source ("ESS").

Physical Sciences

Research Infrastructures for advanced radio astronomy. This activity should provide and facilitate access to the key research infrastructures in Europe for advanced radio astronomy, including Very Long Baseline Interferometry. It must present a long-term sustainable perspective on the integration of these facilities and related resources. A project under this topic should also stimulate new scientific activities aimed at taking full advantage of new possibilities which will be offered by relevant initiatives on the ESFRI Roadmap.

Research Infrastructures for optical/IR astronomy. This activity should provide and facilitate access to the key research infrastructures in Europe for optical and infrared astronomy. It must present a long-term sustainable perspective on the integration of these facilities and related resources. Furthermore, it should also stimulate new scientific activities aimed at taking full advantage of new possibilities which will be offered by relevant initiatives on the ESFRI Roadmap.

Research Infrastructures for hadron physics. This activity must provide and facilitate access to key research infrastructures in Europe for studying the properties of nuclear matter at extreme conditions, turning advances in hadron physics experimentation into new applications. It must present a long-term sustainable perspective on the integration of relevant facilities and related resources. Furthermore, it should also target new users and stimulate

new scientific activities aimed at taking full advantage of new possibilities which will be offered by relevant initiatives on the ESFRI Roadmap, in particular FAIR.

Particle Accelerators. A project under this topic should facilitate access to state-of-the-art facilities to develop new techniques for improving the performance of existing and future accelerators. It should include accelerators for nuclear and particle physics and accelerator-based photon sources. It must present a long-term sustainable perspective on the integration of relevant facilities and related resources. A project under this topic should complement and further new scientific activities aimed at taking full advantage of new possibilities which will be offered by relevant initiatives on the ESFRI Roadmap.

Social Sciences and Humanities

Access to European Social Science Data Archives and Official Statistics. A project under this topic should aim at a further improvement of the researcher's access to official statistics. Work should address technologies for secured trans-national access to sensitive data. Synergies with relevant ESFRI Infrastructures, in particular CESSDA, should be duly exploited.

Research infrastructures for the study of poverty, working life and living conditions. The aim of this activity is to bring together research infrastructures serving European and international research in the fields of poverty, working life, and living conditions. It will compile historical data, and provide instruments for the analysis of the effects of employers' behaviour and the evaluation of labour market and social policies targeted to vulnerable groups as well as offer training to researchers interested in the use of these instruments.

Expected Impact

- Researchers will have wider, simplified, and more efficient access to the best research infrastructures they require to conduct their research, irrespective of location. They benefit from an increased focus on user needs.
- Operators of related infrastructures develop synergies and complementary capabilities, leading to improved and harmonised services. There is less duplication of services, leading to an improved use of resources across Europe. Economies of scale and saving of resources are also realised due to common development and the optimisation of operations.
- Innovation is fostered through a reinforced partnership of research organisations with industry.
- A new generation of researchers is educated that is ready to optimally exploit all the essential tools for their research.
- Closer interactions between larger number of researchers active in and around a number of infrastructures facilitate cross-disciplinary fertilisations and a wider sharing of information, knowledge and technologies across fields and between academia and industry.
- For communities which have received three or more grants in the past, the sustainability of the integrated research infrastructure services they provide at European level is improved.
- The integration of major scientific equipment or sets of instruments and of knowledge-based resources (collections, archives, structured scientific information, data infrastructures, etc.) leads to a better management of the continuous flow of data collected or produced by these facilities and resources.
- When applicable, the integrated and harmonised access to resources at European level can facilitate the use beyond research and contribute to evidence-based policy making.
- When applicable, the socio-economic impact of past investments in research infrastructures from the European Structural and Investment Funds is enhanced.

INFRAINNOV-02-2016: Support to Technological Infrastructures

RIA ☒	IA ☒	CSA ☑

Specific Challenge

Pan-European Research Infrastructures use more and more sophisticated technologies that can only be hosted in large-scale platforms combining R&D (Research and Development), integration and validation. These platforms can be viewed as Technological Infrastructures: they form a distributed network across Europe and provide Research Infrastructures with advanced key technologies and integration services. They also provide longer-term visibility and involvement of industry in scientific and technological advancements and therefore ensure greater socio-economic impact. The coordination of Technological Infrastructures working in a given technological domain and their networking will contribute to harmonise their operation conditions and increase their operation efficiency. This will permit the creation of a more efficient integrated ecosystem between academic laboratories, focussed on technological R&D needs of Research Infrastructures, large companies as well as SMEs, motivated by

the innovative environment and the market opportunities created by the Research Infrastructure needs. Being focussed on innovation and on higher Technology Readiness Level (TRL) than usually targeted by Research Infrastructures, i.e. from TRL4 (technology validated in lab) to TRL6 (technology demonstrated in relevant environment), these networks of Technological Infrastructures should contribute to bridging the gap between the academic world and industry, and to the training of high-level engineers and technological scientists in Europe.

Scope

Funding will be provided for the coordination and networking of Technological Infrastructures involving research infrastructures, industry and SMEs.

Proposals should address:

- the definition of key techniques and trends which are crucial for the further development of Research Infrastructures, in close partnership with the industrial partners, especially with innovative SMEs;
- the definition of roadmaps and/or strategic agendas together with industrial sector actors for key technologies for R&D and for the construction and upgrade of Research Infrastructures as well as for key technologies to be explored by industries;
- the identification of the domains of societal applications and potential markets beyond Research Infrastructures;
- the implementation of a strategy addressing the training of young engineers, technicians and scientists in an environment of strong industrial relevance and scientific excellence;
- the exchange of good practices between user communities and managers of research infrastructures as regard benchmarking performance of technology platforms, harmonisation of tests, standards, reference materials, interoperability and data handling.

Proposals should cover a broad technological domain of interest for pan European Research Infrastructures such as but not restricted to components for accelerator based facilities, laser, high-field magnets, vacuum and cryogenic systems, or components for oceanic investigation.

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

Expected Impact

The implementation of a coordinated ecosystem of Technological Infrastructures as key components of the European Research Infrastructure landscape, will help ensure both the scientific competitiveness of European Research Infrastructures in the long-term and the further development of innovative companies.

In particular this activity will:

- Establish technology roadmaps and identify market opportunities shared between Research Infrastructures and Technology Infrastructures and socio-economic partners for a better positioning of Europe in the global Research Infrastructure sector;
- Facilitate the creation of both large and viable markets and structuring industrial partners in a critical mass to enable European industry to respond to demands from international Research Infrastructures;
- Established links between universities and industrial companies of such a technology cluster to ensure the dissemination of the acquired knowledge and the training of top-level engineers and technicians;
- Support the integration of research infrastructures into local, regional and global innovation systems; the competitive nature of such a technology cluster-based approach will facilitate the development of synergies and complementarities across Europe and avoid duplication of work.

5.i. Information and Communication Technologies

ICT-02-2016: Thin, Organic and Large Area Electronics

RIA ☑	IA ☑	CSA ☒

Specific Challenge

Thin, Organic and Large Area Electronics (TOLAE) is an emerging technology with high growth potential, well suited for applications that need large area and/or flexibility or stretchability. To be able to fully benefit from the opportunities brought by this technology and widen the scope of its applications, improvements are sought on features such as reliability, manufacturability and performance. The main challenge is to develop and also

demonstrate prototypes of innovative TOLAE-enabled solutions with the above characteristics. This can be addressed in two complementing ways, hybrid integration bringing new opportunities for traditional electronics on flexible substrates and improving readiness of TOLAE technologies for use in dedicated applications.

Scope

a. Research and Innovation Actions

Advancing the readiness of TOLAE technologies and/or hybrid integration for use in applications.

Actions will address the development of advanced materials, technologies and scalable manufacturing processes (ranging from vacuum deposition to printing under ambient conditions) and/or the hybrid integration of micro/nano-electronics (including thin silicon) and photonics components. Focus is on conformable, flexible or stretchable substrates (such as paper, plastic, metal foil, glass or textile). The goal is to have reliable TOLAE-enabled devices with more functionality, better performance and longer lifetime that are ready for use in applications with high growth or high volume potential.

Actions may include related work on design and modelling tools in particular addressing variability issues in printing, interfacing of hybrid integration and reliability. Work could also address specific needs for textile electronics.

Actions should demonstrate strong industrial and user commitment, be driven by user requirements and include validation of the results for the chosen applications. They should include standardisation and address the value chain, as appropriate.

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.

b. Innovation Actions

Proposals should cover one or both of the following themes:

- Set-up and validation of pilot line for Hybrid Systems

The objective of the pilot line is to provide design and development services in particular for SMEs. Focus is on manufacturing of Hybrid Systems where conventional micro-/nano-electronics and photonic components are integrated on flexible substrates. The action should be driven by stakeholders able to set-up and run the pilot line. Proposals should describe the business cases and exploitation strategy for the industrialisation of the pilot line and the pilot line should be open access by offering services to external users under fair conditions. There should be a strong commitment to manufacturing in Europe. The pilot line could make use of existing (research or industrial) pilot lines.

- Demonstration of TOLAE-enabled product prototypes

The objective is to develop and demonstrate innovative product prototypes enabled by TOLAE technologies in automotive, healthcare, smart packaging and buildings[3]. Proposals may include small scale pilot manufacturing.

The action should build a dedicated innovation value chain (preferably covering the full value chain).

The action should target medium- to high-volume markets, be driven by concrete business cases and address user needs. They should include exploitation strategies for the targeted products with strong commitment to industrialise and manufacture them in Europe.

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 and 8 million would allow this area to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. In case of proposals covering one theme, one action for each theme will be selected.

Expected Impact

Proposals should describe how the proposed work will contribute to one or more of the following impact criteria, as appropriate, and provide metrics, the baseline and targets to measure impact.

a. Research and Innovation Actions

- Increased readiness of TOLAE technologies, in particular on functionality, performance, manufacturability and reliability, and wider exploitation of TOLAE in concrete applications with high-growth or high volume potential;
- Improved business opportunities and value creation in Europe by strengthening cooperation along the value chain.

[3] Demonstration of wearable solutions for healthcare and well-being are addressed under topic IoT-01 Large Scale Pilots.

b. Innovation Actions

- Fabrication of reliable hybrid systems with short time-to-market and higher investment in advanced manufacturing capabilities;
- Market introduction of innovative and competitive TOLAE-enabled products targeting medium- to high-volume applications in automotive, healthcare, smart packaging and buildings;
- Industrial leadership in TOLAE technology, improved business opportunities in Europe and strengthening Europe's position in growing market segments.

ICT-03-2016: SSI - Smart System Integration

RIA ☑ **IA** ☒ **CSA** ☑

Specific Challenge

The challenge is to be able to develop and manufacture smart objects and systems that closely integrate sensors, actuators, innovative MEMS, processing power, embedded memory and communication capabilities, all optimising the use of supply power. This will require technology breakthroughs notably in integration, miniaturisation with additional functionalities and mastering complexity. This will result in highly reliable, resilient and resource efficient digital and heterogeneous smart objects and systems that could easily be made interoperable within systems of systems. As dependency on these smart objects and systems increases, reliability and security will become critical differentiating factors as well as low power consumption, energy harvesting and the capability to operate under various and harsh conditions.

Scope

a. Research and Innovation Actions

The aim is to make technological breakthroughs and their validation in laboratory environments of the next generations of miniaturised smart integrated systems, including micro-nano-bio systems (MNBS). Proposals are expected to address the integration of new or most advanced technologies such as micro and nano-electronic, micro-and nano-electro-mechanical, micro-fluidic, magnetic, photonics, bio-chemical and microwave and related materials in miniaturised and highly reliable multi-functional smart integrated systems.

Proposals will address industrial-relevant technological developments, modelling and validation that will enable solutions in particular for health and well-being, automotive, food, telecommunication, safety and security, environmental monitoring, manufacturing or energy. Ethical issues will be paid due attention when considering the enabled solutions. The target is TRL 2 to 4, tackling hard technology challenges with results ready for full scale deployment in the next 5 years.

The work will complement the ECSEL JU support that focuses on higher TRLs.

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.

b. Coordination and Support Actions

The objective is to complement R&I activities by structuring industrial cooperation and facilitating end-user adoption for the next generations of miniaturised smart objects and systems. Proposals should include one or more of the following actions:

- Understand the emerging needs of end users and changing requirements for customer acceptance, including public procurers needs for MNBS solutions. The variety of users' needs and customers, induced by age, gender and other factors, will be taken into account.
- Support the industrial smart systems integration stakeholder community by translating industry needs into Strategic Research and Innovation Agendas, and defining measures for standardisation, regulation, policy initiatives, harmonisation and skills development
- Communicate and demonstrate the benefits and potential of miniaturised smart systems integration to users, public procurers, investors, regulators…
- Strengthen the networking and cooperation between the industrial smart systems integration stakeholder community in Europe and support to international collaboration
- Foster cooperation and clustering between projects and monitor technology advances and developments in the field

The Commission considers that proposals requesting a contribution from the EU of between EUR 0.5 and 1 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.

a. Research and Innovation Actions

- Availability of new generations of miniaturised smart systems with significant improvements in performance (including in terms of size, cost and affordability, reliability and robustness, low power consumption and energy autonomy and user acceptability);
- Reinforced industrial technology leadership in next generation smart systems with high market potential;
- Business growth and increase competitiveness by strengthening cooperation along the value chain;
- Increased industrial investment in smart system integration technologies;
- Strengthening Europe's position in the manufacturing of miniaturised smart systems;
- Provide innovative solutions for addressing societal needs and expectations in particular for the health and well-being, safety and security and environment.

b. Coordination and Support Actions

- Strengthened cooperation between the multi-disciplinarily miniaturised smart systems research and innovation stakeholders;
- Better connected smart systems technology developers and users community in selected sectors;
- Strengthened smart systems integration ecosystems and better addressing public procurers needs.

ICT-29-2016: Photonics KET 2016

RIA ☑	IA ☑	CSA ☑

Specific Challenge

Europe's photonics industry is facing fierce global market competition and has to cope with a very high speed of technological developments in the field. Further major S&T progress and research and innovation investments are required for sustaining Europe's industrial competitiveness and leadership in photonic market sectors where Europe is strong (e.g. in laser-based manufacturing, medical photonics, sensing, lighting) and to exploit new emerging market opportunities.

Moreover, Europe is experiencing the existence of many fragmented and rather uncoordinated developments between many different national and regional players. Europe suffers also from a slow innovation process for turning many good R&D results into innovative products ('Valley of Death'). This requires a joined-up approach, covering missing links in the value chain, such as assembly and packaging of photonics components. Finally, Europe needs to better exploit the large enabling potential of photonics in many industrial sectors and in solutions addressing major societal challenges such as health and well-being, energy efficiency or safety. Europe also needs to better exploit the innovation leverage potential of the innovation clusters and national platforms. The new trend in society of makerlabs and the efforts to create more interest in STEM (Science, Technology, Engineering and Mathematics) need to be exploited to generate an increased awareness of and improved skills in photonics.

In order to capitalise on the opportunities coming from advances in Photonics for laser-based production, a topic addressing these is proposed in collaboration[4] with Factories of the Future topic FOF-13-2016 - Photonics Laser-based production.

Scope

a. Research and Innovation Actions

Application driven core photonic technology developments for a new generation of photonic devices (including components, modules and sub-systems): Actions should demonstrate strong industrial commitment, be driven by user needs and concrete business cases supported by strong exploitation strategies, and cover the value/supply chain as appropriate. Actions should address manufacturability and validation of results for the target applications and should include standardisation activities as appropriate. Actions may also include the related materials. Focus is on one of the following themes:

[4] The Photonics PPP contributes 10M€ funding to this topic in the FoF Work Programme.

i. **Biophotonics: advancing imaging for in-depth disease diagnosis:** The objective is to develop innovative, compact, easy to operate non- or minimally invasive functional imaging systems that are multi-band and multimodal (including photonics in combination with non-photonic techniques) to support the in vivo diagnosis of age and life-style related diseases like cancer, cardiovascular, osteoarticular, eye diseases and various neuro-pathologies, after a positive screening. The imaging system must be either label-free or based on already/rapidly safety-approved labels, and should either address unmet medical needs or support a diagnostic approach which is significantly superior to existing approaches. Physicians/clinicians must be closely involved from requirement specifications to the validation. Validation in clinical settings should be included, but clinical trials are excluded.

ii. **Breakthrough in miniaturization of SSL light engines and systems***:* Research into breakthrough miniaturization of SSL (LED and OLED) light engines and systems allowing for new types or revolutionary designs of luminaires and lamps with new form factors and expanding application fields, such as in automotive, signalling, wearables, and through the integration into building materials in the construction sector. Research on the integration of driver electronics and system and functionality aspects may be included.

iii. **Pervasive high-specificity and high-sensitivity sensing for a safer environment***:* Breakthrough advances in cost-effective, compact, high-performance (both in specificity and sensitivity) photonic devices (including sources) for pervasive (i.e. large area coverage) near- and mid-infrared sensing applications (spectral range of 2 to 12 µm) for a safer environment, such as monitoring of water or air quality at large scale. Specificity and sensitivity levels should at least respect regulatory requirements. Actions should include validation of the device and proof of its suitability for the targeted application. Research on application related computation, communication and sensor system/network level aspects should be excluded, while development necessary for validation can be included. Hybrid solutions where the core photonic technology is complemented with other technologies are allowed.

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. Minimum one action per theme will be selected.

b. Innovation Actions

Focus is on one of the following themes:

i. **Application driven core photonic devices integrated in systems:** Focus is on **microdisplay-based immersive, augmented and virtual reality visualisation systems**. Actions should address validation and demonstration of new micro-display based visualization systems for key applications in e.g. healthcare, maintenance & training, entertainment, tourism or sports. This may include wearable systems, as well as larger projection systems. Actions should also include standardisation activities. They should demonstrate strong industrial commitment, be driven by user needs and concrete business cases supported by strong exploitation strategies, and cover the whole value/supply chain and the end-user.

ii. **Pilot line for Assembly and Packaging**[5] : The objective is to set-up a pilot line for the assembly and packaging of integrated photonic components. The pilot line should offer generic solutions for a wide class of PICs (Photonic Integrated Circuits) as well as for the more demanding requirements of some selected PIC-based product groups of strategic interest to European industry. It should cover all stages of manufacturing through to testing. From technical as well as from user perspective, it should provide a low entry barrier access to low and medium production volumes, although the available processes should be suited also for scaling to high volume production. The action may include also process and equipment optimisation and qualification, and should include a validation of the pilot line offer with involvement of external users through pre-commercial pilot runs. A credible strategy to future full-scale manufacturing in Europe is expected. The action should deliver the additional knowledge and experience needed for this, be driven by the key stakeholders able to set-up and run such pilot lines, and cover the value chain as appropriate.

The Commission considers that proposals requesting a contribution from the EU between EUR 2 and 4 million (for theme b.i), and between EUR 6 and 14 million (for theme b.ii) would allow these themes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. Minimum one action per theme will be selected.

c. Coordination and support actions

i. **Coordination of regional photonics strategies:** The objective is to stimulate collaboration of photonics clusters to extend the range of Go-To-Market services for SMEs (including access to finance) through exchanging and adopting best practises, to network the SMEs with potential collaborators, business partners and customers, and to

[5] Wherever appropriate, actions could seek synergies and co-financing from relevant national/regional research and innovation programmes, or from structural funds addressing smart specialisation. Actions combining different sources of financing should include a concrete financial plan detailing the use of these funding sources for the different parts of their activities.

coordinate regional, national and European strategies and financial resources to the benefit of the local ecosystem and the regional smart specialisation strategies. Actions should build on on-going support actions in this field.

ii. **Photonics enhanced MakerLabs**[6] **:** The objective is to raise awareness, support hands-on learning and enhance skills of students, technicians and young professionals interested in photonics by extending existing facilities in order to provide access to photonic components, photonics-based equipment and related support services.

The Commission considers that proposals requesting a contribution from the EU of up to EUR 1.5 million would allow these themes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. Minimum one action per theme will be selected.

Expected Impact

Proposals should describe how the proposed work will contribute to the listed corresponding expected impacts and provide metrics, the baseline and concrete targets.

a. Research and Innovation Actions

i. Biophotonics: advancing imaging for in-depth disease diagnosis

- Substantially improved in-depth diagnosis and more effective treatment of age and life-style related diseases;
- Secured and reinforced industrial leadership in the biophotonics related market for Analysis and Diagnostic Imaging Systems.

ii.. Breakthrough in miniaturization of SSL light engines and systems

- Improved cost/performance ratio and higher energy efficiency of miniaturized SSL light engines and systems;
- Innovative lighting, expanding application fields and markets for lighting solutions and maintained European industrial leadership in the global lighting market.

iii. Pervasive high-specificity and high-sensitivity sensing for a safer environment

- Better and pervasive environmental sensing and a safer environment;
- Secured and reinforced industrial leadership in sensing applications for the environment.

b. Innovation Actions

i. Microdisplay-based immersive, augmented and virtual reality visualisation systems

- Major benefits for the users and end-markets from immersive, augmented and virtual reality visualisation systems;
- Increased market presence in augmented and virtual reality visualisation systems.

ii. Pilot line for Assembly and Packaging

- Industrial assembly and packaging of integrated photonic components in Europe and providing cost effective assembly and packaging solutions for SMEs;
- Strengthening Europe's position in the manufacture of integrated photonic components and covering the full value chain in Europe.

c. Coordination and support actions

i. Coordination of regional photonics strategies

- Improved coordination of strategies and resources within Europe and effective reinforcement of the European photonics sector.

ii. Photonics enabled MakerLabs

- A larger and better skilled photonics workforce and improved innovation capacity in photonics.

[6] Wherever appropriate, actions could seek synergies and co-financing from relevant national/regional research and innovation programmes, or from structural funds addressing smart specialisation. Actions combining different sources of financing should include a concrete financial plan detailing the use of these funding sources for the different parts of their activities.

5.ii. Nanotechnologies, Advanced Materials, Biotechnology and Advanced Manufacturing and Processing

NMBP-03-2016: Innovative and sustainable materials solutions for the substitution of critical raw materials in the electric power system

RIA ☑ IA ☒ CSA ☒

Specific Challenge

The ambition of the European Union to achieve a secure, competitive and sustainable energy system by 2050 has become a priority. The electric power system will play a pivotal role in the overall energy mix, with particular challenges to achieve a balance between electricity supply, conversion, transport and use of energy. Critical raw materials[7] (CRM) can become a bottleneck to the supply-chain of the different technologies used in the electric power system with implications for materials demand under different scenarios described in the EU Energy Roadmap 2050.

Even if recycling rates for some of these materials could be optimised to the highest possible extent, the overall increasing demand for CRM urges the roll-out of substitution-based solutions within the next decade.

This specific challenge is covered by the Priority Area “Substitution of raw materials” of the European Innovation Partnership (EIP) on Raw Materials.

Scope

Proposals should deliver innovative, sustainable and cost effective materials solutions for the substitution of (i) heavy rare earth elements used in permanent magnets; and/or (ii) CRM used in energy storage applications; and/or (iii) CRM used in catalysts for applications to generate electricity; and/or (iv) CRM in materials used in photovoltaic cells. Substitution of CRM in electronics or lighting applications is excluded.

In order to ensure the industrial relevance and impact of the research efforts, the cost effectiveness and commercial exploitation potential of the proposed solutions compared to state-of-the-art solutions currently available on the market should be convincingly assessed in the proposal. The sustainability of the materials solutions should be analysed through a life-cycle assessment. Recycling/reuse should be addressed.

Where relevant, proposals should contribute to the "Expert network on critical raw materials". Refer to the part on 'Climate action, environment, resource efficiency and raw materials' of this Work Programme, topic SC5-15a-2016.

The implementation of this topic is intended to start at TRL 3 and target TRL 5.

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, in particular with Japan[8]. The quality of the international cooperation will be reflected in the evaluation of the proposal, under the criteria 'Excellence' and 'Impact'.

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

- A strongly reduced or completely eliminated CRM content in the proposed solution(s) while keeping up or improving the materials performance levels as specified in the relevant parts of the SET-Plan Integrated Roadmap and its Annexes, available at: https://setis.ec.europa.eu/set-plan-process/integrated-roadmap-and-action-plan
- A risk mitigation strategy from future bottlenecks in the material supply-chain of energy technologies used in the electric power system;
- Contribute to achieving the objectives of the EIP on Raw Materials, In particular, a substantial contribution to the demonstration of substitutes in targeted applications of critical raw materials.

7 The 2014 revision of the list of critical raw materials for the EU can be found at http://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical/index_en.htm

8 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_03_GeneralInfo.html.

NMBP-17-2016: Advanced materials solutions and architectures for high efficiency solar energy harvesting

RIA ☒ IA ☑ CSA ☒

Specific Challenge

High efficiency solar energy harvesting (high-efficiency photo-voltaics (PV) or concentrated solar power (CSP)) is an important building block in installing a secure, competitive and sustainable energy system. Increased efforts have to be made to make these technologies cost competitive under suitable electricity market conditions. Novel functional materials and material combinations throughout the solar system manufacturing chain enhance the efficiency of solar energy harvesting beyond that of the current state-of-the-art technologies. These new materials and processes allow the European materials supply sector to expand its industrial leadership towards the next generation of solar energy harvesting which is expected to reach the markets beyond 2020.

Scope

Proposals should develop durable materials solutions for novel high efficiency solar (PV or CSP) technologies, to enhance system conversion efficiencies, while preserving lifetime and ensuring materials resource efficiency. Activities related to concentrated PV are out of scope of this topic. Research efforts must focus on delivering advanced materials (including but not limited to particles, thin films, nanostructures, heat transfer fluids, phase change materials and receptors), and/or their combinations into innovative device architectures. The proposed solutions need to demonstrate their added value in terms performance or unique application options and their viability in terms of manufacturability, yield and stability. Finally, the high efficiency concepts should be assessed for technical and economic viability and developed towards readiness for upscaling the materials production.

This topic calls for proposals with focus on advanced materials solutions and architectures. A complementary topic is published in the "Secure, clean and efficient energy" part of this Work Programme (LCE-7a/b-2016-2017: Developing the next generation technologies of renewable electricity and heating/cooling), calling for proposals on solutions with a technology-approach.

The implementation of this topic is intended to start at TRL 4 and target TRL 6.

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

The performance levels of the proposed materials solution(s) should be in line with those specified in relevant parts of the SET-Plan Integrated Roadmap and its Annexes, available at https://setis.ec.europa.eu/set-plan-process/integrated-roadmap-and-action-plan

- A deeper understanding of the material and interface characteristics and their long-term performance;
- The demonstration of device designs and fabrication processes for high efficiency technologies of at least 22% efficiency at cell level and above 18 % efficiency at module level;
- The demonstration of material manufacturing readiness to accomodate emerging and/or novel high efficiency technologies with a potential levelized cost of electricity of 0.05 – 0.10 €/kWh (PV) for an irradiation range of 2000 – 1450 kWh/(m²a) and 0.10 – 0.15 €/kWh (CSP) for a direct normal irradiation in the range of 2700 – 2100 kWh/(m²a) in 2020.

Proposals should include a business case and exploitation strategy, as outlined in the Introduction to the LEIT part of this Work Programme.

NMBP-21-2016: ERA-NET on manufacturing technologies supporting industry and particularly SMEs in the global competition

ERA-NET Cofund ☑

Specific Challenge

Pooling resources can foster the competitiveness of Europe's advanced manufacturing industry, by the co-funding of manufacturing research projects performed by transnational consortia involving enterprises and their strategic partners. A strategic and industry relevant approach is needed in order to address key manufacturing priorities, covering the entire value chains and gathering national and regional research and innovation capacities, thereby mobilising all relevant European stakeholders and in particular SMEs.

Scope

The proposed ERA-NET aims to coordinate the research and innovation efforts of the participating Member States, Associated States and Regions in the field of advanced manufacturing, continuing the activities started by MANUNET and followed by MANUNET II, supporting in particular SMEs and with a special focus on the key areas of new production processes, adaptive manufacturing systems and technologies for the factory of the future, and to implement a joint transnational call for proposals (resulting in grants to third parties) with EU co-funding to support multi-national innovative research initiatives in this domain.

Coordination with the relevant players at European level such as those in the Factories of the Future cPPP and relevant European Technology Platforms is expected and the strong involvement in the transnational projects of SMEs with innovation potential is encouraged.

International cooperation on R&I issues on manufacturing at global level should be properly addressed and the potential participation in the proposed ERA-NET of regions from third countries with local funding programmes on manufacturing is encouraged.

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

No more than one action will be funded.

Prospective participant organisations should note that the impact of this ERA-NET could be enhanced by using resources coming through the European Structural and Investment Funds (provided that the appropriate policy measures together with the corresponding national contribution for them have been foreseen in the relevant Operational Programme). In such a case, participants should understand that ESI Funds cannot replace partly or wholly the expected national contribution(s) for matching the expected Horizon 2020 grant. However ESI Funds (together with national funds) can be used for enhancing the impact of the ERA-NET mobilising additional national funds for this purpose.

Expected Impact

- Synergies and coherence in key fields of advanced manufacturing research at national and regional level;
- Input to strategy and policy in the domain of advanced manufacturing
- Creation of a sustainable cooperation structures at regional, national and transnational level supporting research and innovation in key priority areas of the manufacturing sector in Europe.

NMBP-26-2016: Analytical techniques and tools in support of nanomaterial risk assessment

RIA ☑	IA ☒	CSA ☒

Specific Challenge

Nanomaterials are very diverse groups of materials with greatly varying properties. Thorough physico-chemical characterisation of nanomaterials, in their pristine forms but also in the tested environment, is nowadays being recognised as essential for sound assessment of their biological and environmental properties. In order to enable prediction of impacts, itself nowadays a pre-requirement for insuring industrial activity, a classification based on key parameters or biological interactions should be established and scientific foundations established on very well defined and characterised systems. Yet, suitable analytical techniques, instrumentation and equipment for the testing of nanomaterials properties, skilful operators, and inter-laboratory studies that would establish confidence are still lacking, even in the “simple”, and most addressed, case of particle size distribution measurements which many laboratories struggle to tackle adequately when confronted with poly-dispersed materials. At the lower limits of the nano-scale these same problems aggravate further. An additional factor is the high cost of the available techniques something that hinders smaller laboratories, innovation oriented SMEs, and discourages start-ups.

Scope

The objective is to develop new, or further improve, relevant analytical methods and corresponding equipment, relevant to hazard and exposure testing strategies, that enable characterisation of ensembles of nanomaterials particle sizes, complex shapes, surface area and surface chemistry, coating stability or multiple composition (multicomposites engineered nanomaterials), including the necessary building up of confidence through benchmarking. The analytics could also enable studying the longer term fate of particles following their interactions with in complex matrices, i.e. in living systems, or longer term environmental fate, e.g. after wear and tear or weathering.

Established methods, including related equipment, should be brought to Technology Readiness Level 6 and beyond, whereas those based on new concepts are expected to reach TRL 5.

This topic is part of the open data pilot.

This topic is particularly suitable for SMEs and for international cooperation.

The Commission considers that proposals requesting a contribution from the EU between EUR 5 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.

Expected Impact

- Enable the identification of key descriptors that can be used to reveal correlations associated with health and environmental impacts and meaningful basis for grouping, read-across and QSARs purposes;
- Increased confidence in nanosafety studies and findings through sound physico-chemical characterisation methods and standard operating procedures;
- Reduced costs related to the physico-chemical characterisation of nanomaterials in relevant environments;
- On top of safety related objectives, proposals should seek synergies with applications of the methods in other areas such as quality control, product traceability, labelling and counterfeiting.

NMBP-36-2016: Policy support for Industry 2020 in the circular economy

RIA ☒ **IA** ☒ **CSA** ☑

Specific Challenge

Following the recent crisis, a key European priority is re-industrialisation, that is, the re-introduction and expansion of industry. Industry, and the manufacturing sector in particular, is important for Europe because it can create sustainable growth and jobs.

New digital technologies and advances in key enabling technologies provide unique opportunities for productivity gains as well as addressing new markets. A key feature in the latest industrial revolution is the linking of the physical and digital worlds through 'cyber-physical systems', which has the potential of making European industrial system truly flexible, resilient, resource efficient, human centred and highly competitive. Europe has to build on its strong capacities in all key enabling technologies (KETs); capitalise on digital technologies and systems; and bring smart manufacturing to innovative enterprises as well as traditional industries, including SMEs.

A re-industrialisation of Europe will have positive effects also in the context of the circular economy. New technologies help to make products, services, manufacturing and processing cleaner, safer, and more flexible in responding to customers' needs; and they help to use materials and energy as efficiently as possible and to reduce waste and emissions. Europe has stringent legislation for clean industry, including rules to reduce greenhouse gas emissions and to foster energy efficiency. The more production is transferred back to Europe, the cleaner industry becomes.

At the same time, a fit-for-purpose eco-system needs to be created around these innovative technologies, to allow industry to be globally competitive and sustainable.

Scope

Proposals should assess the contribution of relevant EU projects in the area of KETs, e.g. pilot lines and demonstrators, to the vision of re-industrialisation in the context of the circular economy, as outlined in the specific challenge.

Proposals should build on the roadmaps of relevant European initiatives, such as the Factories of the Future and Sustainable Process Industries cPPPs, as well as relevant EU, national and regional initiatives supporting the transformation towards a more sustainable and competitive EU manufacturing industry.

Proposals should provide the evidence for the impact of R&I on industrial innovation and investments, growth and jobs, identifying also appropriate policy and public actions to further foster private investment into industrial and manufacturing.

Deliverables are expected in all of the following specific areas:

- A new vision for the EU industry-related to the circular economy in an international context, taking into account the SMEs dimension;
- An insight into high value-added production in competing economies, and the competitive position of European R&D&I in the NMBP areas, which can help EU industry benefit from international cooperation;
- An understanding of the interdependencies between science, technology, the economy and society, which are associated to the technology driven paradigm change in production and consumption;
- Concrete evidence and cases for the needs and framework conditions for industry and SMEs to invest and expand in Europe;

- An inventory of strategies for potential large-scale industrial investments in Europe to deploy technological advances in new products and services on the market, taking into account public and private funding and financing possibilities including through Important Projects of Common European Interest and the European Fund for Strategic Investments;
- An assessment of the contribution to this vision of relevant EU projects in the area of KETs, e.g. pilot lines and demonstrators; and
- Promotion of the results of NMBP projects in this context.

The analysis and strategy work should also take into account "future of work" and social aspects as well as managers' and consumer behaviour aspects. Appropriate contributions from Social Sciences and Humanities (SSH) are therefore essential to the success of these activities.

Complementarity should be sought between this work and the work in the ICT part of Factories of the Future (notably topic FoF-12-2017 on ICT Innovation for Manufacturing SMEs (I4MS)) in the effort of supporting the transformation of the EU's industrial fabric.

The Commission considers that proposals requesting a contribution from the EU between EUR 1000000 and 1500000, and having a duration not exceeding 18 months, would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

No more than one action will be funded.

Expected Impact

- Improved understanding of the current situation and future perspectives for integrating key enabling technologies, in order to shape the future of the EU industry ensuring sustainable growth and jobs;
- Significant increases in public and private investments in Europe's manufacturing industry;
- Evidence for policy and other measures needed to improve the eco-system around the key enabling technologies, to help EU industry re-invest in Europe.

5 iii. Leadership in Enabling and Industrial Technologies - Space

COMPET-1-2016: Technologies for European non-dependence and competitiveness

RIA ☑ IA ☒ CSA ☒

Specific Challenge

The space sector is a strategic asset contributing to the independence, security and prosperity of Europe and its role in the world. Europe needs non-dependent access to critical space technologies, which is a conditio-sine-qua-non for achieving Europe's strategic objectives. "Non-dependence" refers to the possibility for Europe to have free, unrestricted access to any required space technology. Whenever possible multiple (>1) sources for the critical technologies shall be promoted across Europe. Reaching non-dependence in certain technologies will open new markets to our industries and will increase the overall competitiveness of the European Space sector.

Scope

Research in technologies for European non-dependence and competitiveness has been undertaken within the frame of the Joint EC-ESA-EDA Task Force on Critical Technologies for European non-Dependence, launched in 2008. The Joint Task Force recently updated the list of actions for 2015-2017[9].

Activities shall address technologies identified on the list of Actions for 2015/2017 focusing on those areas that have not so far benefitted from prior Framework Programme funding and representing the highest potential for being implemented through the types of action available in Horizon 2020.

Accordingly, the following priority technologies have been identified:

- U14 - Active discrete power components.
- U18 - Enhanced performance and space qualified detectors.
- U19 - High speed DAC-ADC based on European technology.

[9] Excerpt from "Critical Space Technologies for European Strategic Non-Dependence – Actions for 2015/2017" (http://ec.europa.eu/growth/sectors/space/research/horizon-2020)

- U20 - Very high performance microprocessors.
- U22 - ASICS: Deep Sub-Micron (DSM).
- N27 - RF components.

Technological spin in and/or bilateral collaborations should be enhanced between European non-space and space industries and proposals are expected to provide advanced critical technologies that are of common interest to different space application domains (e.g. telecom, Earth-observation, science, etc.), or even with applicability to terrestrial domains.

Proposals should strive to go beyond the present state-of-the-art or, preferably, the expected state of the art at the time of completion if alternative technologies are being developed outside Europe. High level specifications and key requirements can be found in the list of actions for 2015-2017.

Proposals should include a work package dedicated to the development of a commercial evaluation of the technology, and should address how to access the commercial market with a full range (preload) of recurring products.

A maximum of one proposal per identified priority technology line will be selected for funding.

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

In projects to be funded under this topic participation of industry, in particular SMEs, is encouraged.

Expected Impact

- Reduce the dependence on critical technologies and capabilities from outside Europe for future space applications, as identified in the list of Actions for 2015/2017 as part of the Joint EC-ESA-EDA task force on Critical Technologies;
- Develop, or regain in the mid-term, the European capacity to operate independently in space, e.g. by developing in a timely manner reliable and affordable space technologies that in some cases may already exist outside Europe or in European terrestrial applications;
- Enhance the technical capabilities and overall competitiveness of European space industry satellite vendors on the worldwide market;
- Open new competition opportunities for European manufacturers by reducing the dependency on export restricted technologies that are of strategic importance to future European space efforts;
- Enable the European industry to get non-restricted access to high performance technologies that will allow increasing its competitiveness and expertise in the space domain;
- Improve the overall European space technology landscape and complement the activities of European and national space programmes;
- Greater industrial relevance of research actions and output as demonstrated by deeper involvement of industry, including SMEs, and stronger take-up of research results;
- Fostering links between academia and industry, accelerating and broadening technology transfer.

COMPET-2-2016: Maturing satellite communication technologies

RIA ☑ IA ☒ CSA ☒

Specific Challenge

Today, it is a critical challenge for Europe to establish a level playing field with its global competitors and support activities to bridge the digital gap across European regions and deliver broadband and telecommunications services to under-served areas and populations.

In the mid to long-term, the competitiveness of the space sector and its ability to serve EU policies, notably the Digital Single Market, depends on the continuous integration of pertinent technologies and the availability of demonstrated/validated systems and sub-systems. While European companies have managed to capture a significant share of the global commercial telecommunications satellite market, technological advances must consolidate competitive positions. An objective of the sector is to move towards the Terabit satellite systems (space and ground segment). Other approaches target constellations in lower Earth orbit.

Scope

The aim of this topic is to demonstrate, in a relevant environment, technologies, systems and sub-systems for satellite communications. The proposed work should address and demonstrate significant improvements in

miniaturisation, power reduction, efficiency, performance, flexibility, resilience, versatility, security and/or increased functionality and should demonstrate complementarity to activities already funded by Member States and the European Space Agency (e.g. the ARTES programme).

Proposals that demonstrate technologies targeting TRL 6 are welcome.

In this context, proposals are sought with relevance for space in the following fields:

- Advanced communication technologies for feeder or service links, preparing satellite networking in the Terabit-throughput including optical communication and RF communication at high frequencies (Q/V/W). Optical communication technologies will indicatively include laser communication terminals for ground and satellite segment. This could include transmitter and receiver technologies, hybrid RF-photonic technologies, pointing and tracking approaches, ground station design, site diversity technique to adapt to weather conditions, turbulence mitigation techniques (like Adaptive Optics, Predistortion and Transmitter Diversity), gateway management and interface with ground networks.
- Photonics technology (for high capacity reconfigurable payloads).
- Active antennas building blocks at different frequencies up to Ka/Ku bands and higher, GaN SSPA - Solid State Power Amplifier.
- Flexible repeater (equipment enabling flexible frequency plans, flexible channelization, evolution to new RF bands such as Q- and V-band, etc.).
- Reconfigurable coverages, flexible interbeam connectivity, antijamming and interference mitigation techniques, on-board spectrum monitoring, interference management and support for full duplex relaying.
- New generation of waveforms and related protocols, as well as photonic building blocks and technologies, devoted to seamless integration of SatCom Systems with terrestrial networks (including hybrid terrestrial-satellite network architectures) with specific focus on mobile machine to machine (m2m) applications, high-security communication services, future internet architectures, SDN and Cloud Computing paradigms, and security needs.
- End to end system enablers in telecommunications: technical enablers to increase the security, efficiency and performance of satellite-based communications solutions for weather conditions adaptation and optimisation of EO data distribution.

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

In projects to be funded under this topic participation of industry, in particular SMEs, is encouraged.

Expected Impact

- Increase the maturity level of key satellite communication technologies with clear and measurable progress over the state of the art in terms of step changes in technical capabilities, as evidenced by improvements in performance.
- Contributing by 2020 to a more competitive positioning of satellite communication manufacturers in the marketplace, in terms of their penetration in new or emerging markets.
- Greater industrial relevance of research actions and output as demonstrated by deeper involvement of industry, including SMEs, and stronger take-up of research results.
- Fostering links between academia and industry, accelerating and broadening technology transfer.

COMPET-4-2016: SRC - Space Robotics Technologies

RIA ☑ IA ☒ CSA ☒

Specific Challenge

The overall challenge of this strategic research cluster (SRC) is to enable major advances in space robotic technologies for future on-orbit satellite servicing (robotics and rendezvous), and the exploration of the surfaces of the other bodies in our solar system.

This specific challenge consists of designing, manufacturing and testing of reliable and high performance common robotic building blocks for operation in space environments (orbital and/or planetary), which will be useful for the SRC (demonstrations of on-orbit satellite servicing and planetary surface exploration). It can also be useful for (i) the wider European space robotics goals; and (ii) potential spin-off and spill-over effects to other areas of robotic activity on Earth (such as automotive or underwater but not limited to those).

Through the mastering of common building blocks, which allow inexpensive re-use across multiple applications, European actors will have a competitive advantage and industrial partnering will be facilitated. For the common building blocks to be successful, particular effort must be made in systems engineering, system performance analysis, reliability, availability, maintainability and safety improvement, rather than an approach based on pure technology development.

Scope

Proposals shall address one of the following six specific robotic building blocks:

a) Space Robot Control Operating System: an open source space robot control operating system (RCOS) that can provide adequate features and performance with space-grade Reliability, Availability, Maintainability and Safety (RAMS) properties. RCOS control any robot/spacecraft systems whether for orbital or planetary applications, for all phases and modes of the mission.

b) Autonomy framework Time/Space/Resources planning and scheduling: a software framework for the development of highly autonomous space robotics missions. In these a robot system, given a high level goal, will (re)plan, schedule and oversee the execution of elementary actions to attain the goal, considering Time/Space/Resources constraints, interleaving planning with execution and providing formal verification capabilities of the functional layer.. The activities will comprise planning/scheduling capabilities to decompose high level commands into sub-tasks; resource management to fulfil in a dynamic way the high level mission/goals; Fault management with reconfiguration capability; Interaction management with other robotic systems to allow cooperation and tasks sharing, guidance, navigation and control to attain execution.

c) Common data fusion framework: a software framework implementing data fusion techniques for various sensors such as LIDAR, Imagers, radar, sonar, IMUs, and sun sensors capable of localising robots in natural and man-made environments, geometrical/topological reconstruction of environment, map making. Robots need to perceive their environment and to understand where they are with respect to their operational goals. No single sensor can convey reliably localisation and mapping information in all conditions of space.

d) Inspection Sensor Suite: a suite of perception sensors that allow localisation and map making for robotic inspection of orbital assets (under space representative conditions and taking into account in-orbit inspection scenario requirements) and for planetary surface exploration. The activities comprise the identification of suitable sensors which may include imaging sensors for inspection operations, stereo imaging sensors, holographic sensors, zoom cameras for inspection and proximity operations, infrared sensors, imaging radar and LIDAR as well as illumination integrated solution considering data processing, realisation of common interfaces for data provision, mechanical and electrical integration.

e) Modular interfaces for Robotic handling of Payloads: a set of interfaces (mechanical, data, electrical, thermal) that allow coupling of payload to robot manipulators and payload to other payload (or to a platform) enabling manipulation of payload by robots in orbital and planetary environment assembly of structures out of elemental blocks, spacecraft deployment aid.

f) Validation Platforms and Field Tests: test vehicles (platforms or facilities) and validation environment for common testing of building blocks reference implementations. Relying upon existing assets, this would include the provision of test means (e.g. rovers, robots, dynamic robotics, RVD facilities), the support for integration in these of common building blocks, instrumentation and the execution of tests in realistic or analogue environments.

A detailed description of the above building blocks is included in the corresponding guidelines[10].

Each common building block shall be validated in a test scenario by means of a reference implementation (the specific prototype).

A minimum of one proposal per building block (a)-(f) will be selected for funding.

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 and 3.5 million for specific building blocks (a)-(e) and in the range of EUR 1 million for the specific building block (f) would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Grants awarded under this topic will be complementary to each other ("complementary grants"). In order to ensure a smooth and successful implementation of this Strategic Research Cluster (SRC), the beneficiaries of complementary grants ("complementary beneficiaries") shall conclude a written "collaboration agreement". The respective options of Article 2, Article 31.6 and Article 41.4 of the Model Grant Agreement will apply.

Expected Impact

For each specific building block, the expected impacts are:

[10] http://ec.europa.eu/growth/sectors/space/research/horizon-2020

a) Technologies compliant with very high standards of RAMS which can be usable in future space robotics missions;

b) Technologies useful for space robots (especially the planetary ones) requiring autonomy to cope with the potential inability to communicate to the Earth and in terrestrial applications needing autonomy for environmental monitoring and security purposes;

c) Navigation/localisation and map making applications for robots whether in space or on planetary surfaces while coping with the performance and reliability issues of sensors;

d) Availability of a standard reliable sensor suite which will be an enabler for space robotics missions in general;

e) Experimentation on deployment of very large structures (e.g. antenna reflectors and active telescope mirrors);

f) Validation of common building block in the most relevant environment with minimal duplication of means and activities.

COMPET-5-2016: Scientific Instrumentation

RIA ☑ **IA** ☒ **CSA** ☒

Specific Challenge

Support the development of scientific instrumentation for science and exploration missions (including planetary exploration missions) enabling increased cooperation between scientists, engineering teams, industry and SMEs across Europe.

Scope

Scientific instrumentation is understood in this context as mission payloads that perform scientific tasks. Proposals may cover different stages of development of scientific instrumentation from concepts, to breadboarding and prototype demonstration. Proposals are particularly welcome that develop novel and advanced technologies, such as new sensors and other sub-systems that may be used in scientific instrumentation. Projects supported through this call should address planned and future European scientific and exploration missions, as well as collaboration in the context of third country missions as a European contribution to global efforts.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1.5 and 3 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact

The integration of scientific teams with engineering and industrial teams will stimulate new and improved instrumentation designs and lead to potential opportunities for spin-in/spin-out effects between space and non-space technology fields. This research topic should attract also active participation of researchers in academia and SMEs.

Type of Action

Research and Innovation action

7. Innovation in SMEs[11]

SMEInst-01-2016-2017: Open Disruptive Innovation Scheme

SME instrument phase 1 ☑ **SME instrument phase 2** ☑

Specific Challenge

The challenge is to provide support to a large set of high risk innovative Startups and SMEs in the ICT sector. Focus will be on companies proposing disruptive ICT concepts, products and services applying new sets of rules, values and models which ultimately create new markets (e.g. by tackling non consumption) or disrupt existing markets.

The objective of the ODI is threefold:

1. Nurture promising innovative and disruptive ideas;

2. Support their prototyping, validation and demonstration in real world conditions;

3. Help for wider deployment or market uptake.

[11] all SMEInst-xx-2016-2017 share scope and expected impact

Proposed projects should have a potential for disruptive innovation and fast market up-take. In particular it will be interesting for entrepreneurs and young innovative SMEs, including start-ups that are looking for swift support to their innovative ideas.

SMEInst-02-2016-2017: Accelerating the uptake of nanotechnologies advanced materials or advanced manufacturing and processing technologies by SMEs

SME instrument phase 1 ☑ **SME instrument phase 2** ☑

Specific Challenge

Research results should be taken up by industry, harvesting the hitherto untapped potential of nanotechnologies, advanced materials and advanced manufacturing and processing technologies. The goal is to create added value by creatively combining existing research results with other necessary elements[12], to transfer results across sectors where applicable, to accelerate innovation and eventually create profit or other benefits. The research should bring the technology and production to industrial readiness and maturity for commercialisation after the project.

SMEInst-04-2016-2017: Engaging SMEs in space research and development

SME instrument phase 1 ☑ **SME instrument phase 2** ☑

Specific Challenge

To engage small and medium enterprises in space research and development, especially those not traditionally involved in it and reduce as much as possible the entry barriers to SMEs for Horizon 2020 funding. The actions under this topic could cover any aspect of the Specific Programme for Space (Horizon 2020 Framework programme and Specific programme). However, it is considered that actions in the areas of applications, especially in connection to the flagship programmes Galileo and Copernicus, spinning-in (i.e. application of terrestrial solutions to challenges in space) and the development of certain critical technologies could be adequately suited for this call.

SMEInst-05-2016-2017: Supporting innovative SMEs in the healthcare biotechnology sector

SME instrument phase 1 ☑ **SME instrument phase 2** ☑

Specific Challenge

The healthcare biotechnology sector offers huge business and commercial opportunities; however it also requires heavy and risky investments which are often lacking in Europe, hampering the development of the industry.

The challenge includes either:

a) Cell technologies in medical applications (all phase 1 and phase 2 deadlines in 2016 and 2017)

Cell technologies include cell manufacturing (culture, multiplication, scale-up and automation), preservation, banking and transport; identification, cell sorting and delivery, imaging, tracking, process and quality control; genetic engineering and gene editing; production of therapeutic biomolecules. The medical applications of cell technologies include diagnostics and biosensors; cell and gene therapy, tissue engineering, bio-artificial organs, haematology, immunotherapy, and vaccine and antibody production; predictive toxicology, synthetic biology, and modelling development and disease processes.

However, the diversity, complexity and variability of living cells pose challenges for bringing safe, reliable, regulatory-compliant and cost-effective products to the market and to the patient. SMEs developing cell-based products and processes have limited financial resources to take the critical steps to move from proof of concept to practical application while at the same time addressing considerations such as scale-up/scale-out, automation, logistics, regulatory pathways and business models.

Particular attention should be given to dialogue with regulators and compliance with safety and regulatory requirements, such as those pertaining to cell procurement, GMP, ethics, clinical trials, ATMPs and medical devices.

The challenge addresses cells from any eukaryotic source though their eventual application must be to human medicine.

Or:

b) Clinical research for the validation of biomarkers and/or diagnostic medical devices (only at the first cut-off date in 2017 and for phase 2 applications - phasing out of the topic PHC-12-2014/2015 introduced in the Work Programme 2014-2015)

[12] ttp://ec.europa.eu/enterprise/policies/innovation/files/swd-2012-458_en.pdf.

Biomarkers are used in clinical practice to indicate both normal and pathological conditions. They are also used for predictive or prognostic purposes. They are being used increasingly in medicine and many potential new biomarkers are proposed every year. However, only a few of these have been validated for clinical use. To achieve validation a robust analytical method is required and a link to a pertinent clinical process or endpoint needs to be demonstrated.

This validation process should provide evidence for high analytical value, appropriate sensitivity and specificity, and clinical validity. Particular attention should be given to validation of biomarkers with potential for rapid uptake into clinical practice. Both in vivo and in vitro potential biomarkers are eligible. Priority is given to the validation of disease-related biomarkers (i.e. diagnostic, susceptibility/risk, monitoring and prognostic biomarkers). Validation of the clinical performance of new diagnostic devices can also be supported, either in combination with the biomarker validation or against existing standards.

SMEInst-06-2016-2017: Accelerating market introduction of ICT solutions for Health, Well-Being and Ageing Well

SME instrument phase 1 ☑ **SME instrument phase 2** ☑

Specific Challenge

The challenge is to help overcome the current gaps in exploitation of promising research results in ICT for Health, Well-being and Ageing well and to stimulate increased availability and market uptake of relevant ICT products and services This concerns both interoperable and secure eHealth4 solutions for consumers and institutional healthcare delivery building on standards and new ICT solutions and innovation ecosystems for ageing well building on open software platforms, in order to deliver new and more efficient care to European citizens and respond to new market opportunities for SMEs.

Particular attention should be given to potential for disruptive innovation and fast market up-take in ICT for health, wellbeing and ageing well. In particular it will be interesting for SMEs and young companies that are looking for swift support to their innovative ideas.

SMEInst-09-2016-2017: Stimulating the innovation potential of SMEs for a low carbon and efficient energy system

SME instrument phase 1 ☑ **SME instrument phase 2** ☑

Specific Challenge

SMEs play a crucial role in developing resource-efficient, cost-effective and affordable technology solutions to decarbonise and make more efficient the energy system in a sustainable way. They are expected to strongly contribute to one or a combination of more than one of the challenges outlined in the legal base of the Horizon 2020 Societal Challenge 'Secure, Clean and Efficient Energy'[13], in particular with regard to:

- Reducing energy consumption and carbon footprint by smart and sustainable use (including energy-efficient products and services as well as 'Smart Cities and Communities'),
- Low-cost, low-carbon electricity supply (including renewable energy as well as carbon capture and storage and re-use),
- Alternative fuels and mobile energy sources,
- A single, smart European electricity grid,
- New knowledge and technologies, and
- Robust decision making and public engagement.

SMEInst-10-2016-2017: Small business innovation research for Transport and Smart Cities Mobility

SME instrument phase 1 ☑ **SME instrument phase 2** ☑

Specific Challenge

The European transport sector must have the capacity to deliver the best products and services, in a time and cost efficient manner, in order to preserve its leadership and create new jobs, as well as to tackle the environmental and

[13] Council decision No 2013/743/EU establishing the Specific Programme implementing Horizon 2020 - The Framework Programme for Research and Innovation (2014-2020)

mobility defies. The role of SMEs to meet these challenges in all the areas of the Transport Specific Programme[14] is critical as they are key players in the supply chains. Enhancing the involvement of weaker players in innovation activities as well as facilitating the start-up and emergence of new high-tech SMEs is of paramount importance. SMEs are pivotal for delivering the innovations needed for greater sustainable and smarter mobility, better accessibility and logistics serving business and citizens, and thus higher economic growth, in a context where the majority of population lives in urban and urbanised areas. Actions to develop new services, products, processes, technologies, systems and combinations thereof that contribute to achieving the European transport and mobility goals defined in the 2011 Transport White Paper could be particularly suited for this call.

SMEInst-11-2016-2017: Boosting the potential of small businesses in the areas of climate action, environment, resource efficiency and raw materials

SME instrument phase 1 ☑ **SME instrument phase 2** ☑

Specific Challenge

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

Innovative SMEs should be supported and guided to reach and accelerate their full green growth potential. This topic is targeted at all types of eco-innovative8 SMEs in all areas addressing the climate action, environment, resource efficiency and raw materials challenge – including but not restricted to the 2016-2017 strategic priorities of systemic eco-innovation and circular economy, nature-based solutions, climate services, sustainable supply of raw materials, harnessing GEOSS Earth observation data, cultural heritage for sustainable growth, and water – focusing on SMEs showing a strong ambition to develop, grow and internationalise. All kinds of promising ideas, products, processes, services and business models, notably across sectors and disciplines, for commercialisation both in a business-to-business (B2B) and a business-to-customer (B2C) context, are welcome.

SMEInst-13-2016-2017: Engaging SMEs in security research and development

SME instrument phase 1 ☑ **SME instrument phase 2** ☑

Specific Challenge

To engage small and medium enterprises in innovation activities in the domain of security, especially those not traditionally involved in it, and reduce as much as possible the entry barriers to SMEs for Horizon 2020 funding.

The actions under this topic should cover any aspect of the Specific Programme for "secure societies - protecting freedom and security of Europe and its citizens" (Horizon 2020 Framework programme and Specific programme):

7.1. Fighting crime, illegal trafficking and terrorism, including understanding and tackling terrorist ideas and beliefs

7.2. Protecting and improving the resilience of critical infrastructures, supply chains and transport modes

7.3. Strengthening security through border management

7.4. Improving cyber security

7.5. Increasing Europe's resilience to crises and disasters

7.6. Ensuring privacy and freedom, including in the Internet, and enhancing the societal legal and ethical understanding of all areas of security, risk and management

7.7. Enhancing standardisation and interoperability of systems, including for emergency purposes

7.8. Supporting the Union's external security policies, including through conflict prevention and peace-building

Scope

The SME instrument consists of three phases, including a coaching and mentoring service for beneficiaries. Participants can apply to phase 1 or directly to phase 2.

[14] Council Decision of 3 December 2013 establishing the specific programme implementing Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020), Part III – 4. Smart, green and integrated transport.

In phase 1, a feasibility study shall be developed in order to verify the technological/practical as well as economic viability of an innovation idea/concept with considerable novelty to the industry sector in which it is presented (new products, processes, design, services and technologies or new market applications of existing technologies). The activities could, for example, comprise risk assessment, market study, user involvement, Intellectual Property (IP) management[15], innovation strategy development, partner search, feasibility of concept and the like to establish a solid high-potential innovation project aligned to the enterprise strategy and with a European dimension. Bottlenecks in the ability to increase profitability of the enterprise through innovation shall be detected and analysed during phase 1 and addressed during phase 2 to increase the return in investment in innovation activities. The proposal should contain an initial business plan based on the proposed idea/concept. It should outline the specifications of a more elaborate business plan, which is to be the outcome of the project, and the criteria for success.

Funding will be provided in the form of a lump sum of EUR 50.000. Projects should last around 6 months.

In phase 2, innovation projects[16] will be supported that address the specific challenges identified and that demonstrate high potential in terms of company competitiveness and growth underpinned by a strategic business plan. Activities should focus on innovation activities such as demonstration, testing, prototyping, piloting, scaling-up, miniaturisation, design, market replication and the like aiming to bring an innovation idea (product, process, service etc.) to industrial readiness and maturity for market introduction, but may also include some research. For technological innovation, Technology Readiness Levels of 6 or above (or similar for non-technological innovations) are envisaged; please see part G of the General Annexes.

Proposals shall be based on an elaborate business plan. Particular attention must be paid to IP protection and ownership; applicants will have to present convincing measures to ensure the possibility of commercial exploitation ('freedom to operate').

Proposals shall contain a specification for the outcome of the project and criteria for success. They will include an explanation of how the results of the supported project are to be commercialised and of what kind of impact on the company is expected.

The Commission considers that proposals requesting a contribution from the EU of between EUR 0.5 and 2.5 million[17] would allow phase 2 to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts (higher or lower). Projects should last between 12 and 24 months.

Phase 3 of the SME Instrument aims to increase the economic impact of the funding provided by the SME Instrument phase 1&2 grants and by the business coaching. Phase 3 is not subsequent to phase 1 and/or 2, but provides specific support to SME instrument beneficiaries during and after phase 1 or 2.

All support under phase 3 of the SME instrument will be accessible through a single, dedicated entry point, which will serve as an information portal and a networking space.

This platform will offer access to two main strands of services:

- Access to markets
- Access to finance

In addition, phase 3 will create opportunities for partnering, networking and training, which are set out in the Dedicated Support Actions at the end of this call.

SME instrument beneficiaries are also offered dedicated business innovation coaching and mentoring support. This service is facilitated by the Enterprise Europe Network and delivered by a dedicated coach through consultation and signposting to the beneficiaries. The coaches are recruited from a central database managed by the Commission and have all fulfilled stringent criteria with regards to business experience and competencies.

Throughout the three phases of the instrument, the Network will complement the coaching support by providing access to its innovation and internationalisation service offering. This could include, for example, depending on the need of the SME, support in identifying growth potential, developing a growth plan and maximising it through

[15] This is not limited to the costs of acquiring and enforcing European or international IPR titles but could include auditing and risk management schemes to protect IP assets across planned supply and distribution chains and more generally IP valorisation plans to enhance return on investment and lever commercial investment into the relevant project.

[16] In the case of SMEInst-05-2016-2017, research type activities in medical application and clinical validation, including support for clinical studies and trials, will be predominant and will necessitate reimbursement at 100%. The Technology Readiness Levels indication does not apply.

[17] In the case of SMEInst-05-2016-2017, phase 2 proposals can request a contribution from the EU of between EUR 1 and 5 million.

internationalisation; strengthening the leadership and management skills of individuals in the senior management team and developing in-house coaching capacity; developing a marketing strategy or raising external finance.

Expected Impact

- Enhancing profitability and growth performance of SMEs by combining and transferring new and existing knowledge into innovative, disruptive and competitive solutions seizing European and global business opportunities.
- Market uptake and distribution of innovations[18] tackling the specific challenges in a sustainable way.
- Increase of private investment in innovation, notably leverage of private co-investor and/or follow-up investments.
- The expected impacts should be clearly described in qualitative and quantitative terms (e.g. on turnover, employment, market seize, IP management, sales, return on investment and profit).

INNOSUP-01-2016-2017: Cluster facilitated projects for new industrial value chains

RIA ☒ IA ☑ CSA ☒

Specific Challenge

To develop new cross-sectoral industrial value chains across the EU, by building upon the innovation potential of SMEs. The EU needs to support the development of emerging industries, which will provide the growth and employment of the future. The reindustrialisation of the EU's industrial base has to focus on the development of long-term internationally competitive goods and services that require combining different competences and innovative solutions. The development of new industrial value chains calls for the collaboration and integration of different innovation actors, including large enterprises and especially SMEs, across different sectors towards the implementation of a joint vision.

SMEs need help to generate, take up and better capitalise on all forms of knowledge, creativity, craftsmanship and innovation – including for the application of existing cross-cutting or emerging technologies, advanced manufacturing, ICT, eco-innovative and resource-efficient solutions, new business models, service innovation and design. The potential of clusters – that represent favourable ecosystems for innovation and entrepreneurship – need to be better exploited in this respect.

Scope

Cross-border and cross-sectoral collaboration, innovation and entrepreneurship across different regions and value chains shall be promoted. The coordination and facilitation shall be led by cluster organisations and other intermediary organisations, by following a systemic approach that combines different resources, tools and instruments. Innovation actors, especially SMEs with mutually reinforcing competences, shall be supported in view of creating new industrial value chains that foster the development of emerging industries in Europe.

To this end, proposals shall outline a strategic vision for building new industrial value chains across the EU Member States and Associated Countries. They shall specifically focus on integrating and supporting groups of SMEs in collaboration with other innovation actors in addressing specific problems and challenges. Cluster organisations or other SME intermediaries shall be invited to set up collaboration and networking activities for SMEs and create a favourable "open space" for cross-sectoral fertilisation and value chain innovation to take place. Each proposal should demonstrate the capacity to:

1) validate ideas for structured innovation projects driven by SMEs from different sectors and countries in collaboration with other innovation actors and facilitate the coordination towards new industrial value chains through this collaboration space.

2) support innovation activities and/or channel a mix of different targeted entrepreneurial and innovation support measures (such as mentoring, coaching, innovation and technical assistance vouchers, etc.) directly to the innovation actors of the validated innovation projects to further support their development, integration and large-scale demonstration in a strategic manner. At least 75% of the total proposed budget shall be allocated to support innovation in SMEs directly, whereby the SMEs benefit by either participating in the consortium or by being supported as third party enterprises.

Background information on the systemic approach and strategic focus to be envisaged is provided to applicants.[19] Synergies with the European Structural and Investment Funds that may further support such large-scale

[18] In the case of SMEInst-05-2016-2017, the development of innovative solutions should lead to value creation through the increased use of cell-based products/processes, biomarkers and/or diagnostic medical devices in industrial or clinical settings, and should contribute to technical and regulatory progress in these domains.

demonstration projects will also be actively encouraged, notably through the engaged SME intermediaries. "Large-scale" does not necessarily refer to the amount of financial support provided for a particular project but to the extent of the roll-out of a staged process of experimentation and implementation with accompanying support that reaches out to groups of mutually reinforcing SMEs. This approach aims at "demonstrating at large scale" the potential impact of innovative solutions to specific challenges, rather than supporting isolated projects or SMEs.

For the first stage of the submission procedure, applicants should provide a concept note (of max. 10 pages), which should include a clear description of the ideas and objectives for an innovation action towards the development of new industrial value chains as well as an explanation of the main activities, implementation modalities (including for financial support to third parties, if applicable) and expected results foreseen. The concept note should further describe how the proposed systemic approach and strategic focus promises significant impact on economic growth and job; demonstrates a European dimension and added value; and has the potential to act as a catalyst by contributing to and/or leveraging other activities supported, for instance, under the European Structural and Investment Funds, e.g. in the context of smart specialisation strategies.

An estimate of the total costs of the proposed action and contribution to be requested from the Commission shall also be provided. Only proposals that pass the evaluation threshold for the first stage will be invited to a second stage of submission for a full proposal with a detailed description of the budget and activities planned to be undertaken.

The Commission considers that proposal requesting a contribution from the EU of between EUR 2.5 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.

This action allows for the provisions of financial support to third parties in line with the conditions set out in part K of the General Annexes.

Expected Impact

- Strengthen industrial leadership in the EU Member States and Associated Countries by reinforcing value chains that integrate innovative solutions in SMEs, along and across existing value chains.
- Stimulate the creation of new globally competitive industrial value chains across the EU Member States and Associated Countries to accelerate the development of emerging industries, which will boost industrial competitiveness and underpin future economic growth, jobs, and progress towards a resource-efficient economy.
- Further leverage and complement support for innovation in SMEs and other funding, which may be provided by national or regional authorities (including under the European Structural and Investment Funds) and/or by private investors (upfront or as follow-up investments), including in relation to the European Fund for Strategic Investments, Knowledge and Innovation Communities, European Technology Platforms, European Innovation Partnerships etc.
- Contribute to regional smart specialisation strategies by capitalising upon concentrated and complementary competences for the development of new industrial value chains and emerging industries with a clear EU added-value.
- Provide a clear and measurable contribution to the innovation performance of the supported SMEs in the short-term – as revealed by indicators such as numbers of new or significantly improved products (goods and/or services), processes, new marketing methods, or new organisational methods –, and to its impact on resource efficiency and/or turnover. A wider impact is also expected in the medium-term.
- Improve the business environment of the supported SMEs by establishing open collaboration spaces that can involve innovation actors from different sectors and countries. This will lead to the creation of new ideas for innovation and new collaboration partnerships, which will be subject of further development and with the potential for further impact on business turnover.

[19] Information (e.g. results from ongoing studies and expert analyses) is available at the EU Cluster Portal athttp://ec.europa.eu/growth/smes/cluster/and a background note has been made available at the topic related pages under Conditions & Documents at the Participant Portal at
http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/2350-innosup-1-2015.html

8. Health, demographic change and well-being

SC1-PM-05–2016: The European Human Biomonitoring Initiative

COFUND (European Joint Programme) ☑

Specific Challenge

A major hurdle in reliable risk assessment and management of chemicals is the lack of harmonised information about the exposure of citizens, including workers, to chemicals and their interplay with other concurrent environmental exposures and impact on health. Each individual is today exposed to a large number of chemicals in their environment, including the workplace, through the air, food, water and consumer products. For many of the chemicals, the health impact, including long-term, is still unknown. Innovative approaches are needed to enable us to decipher the potential causal associations between exposures and health effects over a lifetime and, where such links are identified, to understand the underlying mechanisms.

A first step to better assess and understand this potential impact on heath is to gather harmonised and comparable information on population exposure to chemicals in Europe through human biomonitoring (HBM), to link this information to data on exposure sources and epidemiological surveys and to promote research on the exposure-response relationships in humans.

Scope

The objective is to create a European joint programme for monitoring and scientific assessment of human exposures to chemicals and potential health impacts in Europe, building on previous activities undertaken at EU and national levels. This European Human Biomonitoring Initiative (EHBMI) should:

- be achieved through coordination of HBM initiatives at national and EU level, with a special focus on linking research to evidence-based policy making.
- build on European excellence in the field and promote capacity building and the spread of best practice.
- provide a platform through which harmonised and validated information and data collected at national level can be accessed and compared.
- support research and innovation in various ways, e.g., by improving underlying methods and procedures (e.g., for sampling, sample analysis, data analysis, and data management), by improving the understanding of the impact of the exposure on human health (e.g., development of validated exposure and effect biomarkers and establishing correlation between biomarker levels and health risks) and by improving the use of HBM data in risk assessment of chemicals and their mixtures.

The acquired knowledge should support informed decision taking and policy making in a wide variety of sectors, one of the most important being the EU chemicals legislation under REACH[20].

The governance structure of the EHBMI should allow for review of the priority setting with regards to chemicals to be investigated by the initiative, taking into account the scientific advances at national and EU level.

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

The joint programme should be structured along three main components:

- a platform providing support for field sampling and analytical work by competent national laboratories and a data infrastructure;
- a research programme to assess the impact of chemical exposure on human health; and
- an activity focused on translation of programme results into policy.

The three components must operate in close coordination, in order to address the overall priorities of the initiative.

The platform on field sampling and analytical work should include joint activities aiming at advancing, harmonising and quality assurance in field work practices and analytical methods and contribute to the development of EU reference values. Potential research aspects to be addressed are, inter alia, related to developing innovative analytical methods, including in atypical biological matrices, non-invasive technologies, new biomarkers, and reference materials. A network of reference laboratories and field survey entities of high quality must be established, engaged in capacity building across Europe and facilitating access to special equipment. Best practices

[20] http://echa.europa.eu/regulations/reach

for management of data resulting from linking analytical results and field surveys must be established, facilitating the data inclusion into the Information Platform for Chemical Monitoring Data (IPChem platform[21]) currently under development by the EU Joint Research Centre.

The EHBMI should ensure the inclusion of new HBM data and whenever possible existing HBM data to IPChem and address outstanding issues related to HBM data policy and data quality assurance. Furthermore, the consortium should ensure that the new data, relevant for policy making, produced in this initiative, will be made available to regulators at the national and EU level. For this purpose the proposal should include a draft Data Management Plan, renewed annually, detailing what data the project will generate, how it will be used and/or made accessible for regulatory purposes.

The research programme to understand the impact of exposures on human health should include joint research on correlation, integration and analysis of data from different sources, e.g., HBM data, environmental, occupational, health examination and epidemiological surveys; research on exposure mechanisms and modes of actions and research for innovative approaches to risk assessment.

The work undertaken under the science-policy interface component should aim at informing existing policy making processes (from chemicals to health) at EU and national level about the outcome of the EHBMI, exploring the possibilities and requirements for an increased use of HBM data in evidence-based policy processes and mobilising existing committees and expert/advisory groups to contribute to setting priorities.

Research activities may be supported by open calls for proposals organised by the consortium, if deemed necessary, aiming at bringing in additional expertise and engaging with the wider research community.

Dissemination, communication and training activities should be included in the initiative, in particular efforts to increase public awareness and understanding of the obtained results and their implications for policy making and self-responsible lifestyle management. A public engagement component should be included whereby citizen science approaches to human biomonitoring are explored and sought.

The minimum number of participants is five independent legal entities from different Member States or associated countries owning or managing national research and innovation programmes. In addition to the minimum conditions, other legal entities may participate if justified by the nature of the action.

Horizon 2020 contribution will be limited to a maximum of 70% of the total eligible costs of the action with a maximum of EUR 50 million of EU contribution for the expected five years duration of the action.

The Commission will only fund one proposal under this topic.

Expected Impact

- Coordinating HBM initiatives in Europe at national and EU level and spreading of best practice and capacity building.
- Advancing the understanding of the nature and level of chemical exposure of EU citizens at all ages, including workers, and the potential health risks leading to better protection of the health of EU citizens. Gender aspects should be taken into account where relevant.
- Establishing a strong EU-wide evidence base of comparable and validated exposure and health data for sound policy-making at EU and national level, based on evidence-based regulation, risk assessment and management, whilst striking an appropriate balance with industrial competitiveness.
- Preparation for a possible public-public partnership under Article 185 of the Treaty.

SC1-PM-06–2016: Vaccine development for malaria and/or neglected infectious diseases

RIA ☑ IA ☒ CSA ☒

Specific Challenge

Vaccines offer a safe and cost-effective way to protect large populations against infectious diseases. Yet, many poverty-related and neglected infectious diseases continue to escape attempts to develop effective vaccines.

Disappointing results of recent clinical trials point to bottlenecks in identifying viable candidate vaccines, which, if unaddressed, will continue to present significant risks of failure at relatively late stages of the development process.

The specific challenge will be to shift this “risk curve” in order to better select successful vaccine candidates (and discard those with a higher risk of failure) at an earlier stage of the vaccine development pipeline.

[21] IPChem aims to support a coordinated approach to collecting, storing and accessing monitoring data on chemicals and chemical mixtures in humans and in the environment: http://ipchem.jrc.ec.europa.eu/#home-page

Scope

Proposals will have to address bottlenecks in the discovery, preclinical and early clinical development of new vaccine candidates (antigens/adjuvants) for malaria and/or neglected infectious diseases[22]2. Filoviral diseases are specifically excluded from this topic.

Depending on the maturity of the research landscape for each disease, proposals may range from large research platforms developing multiple vaccine candidates and/or vaccines for multiple diseases, to proposals specifically focused on one disease.

a) The larger platforms proposals should among others:

1. Take advantage of recent advances in vaccinology (e.g. *in silico* analysis and novel *in vitro* and *in vivo* immunoscreens) or establish completely new approaches for the discovery and selection of novel, appropriately immunogenic antigens, and/or novel formulations/combinations for the generation of new vaccine candidates.

2. Include a systematic approach and define key gate-criteria for selection across each step of the research and development pipeline they address. Based on these criteria the most promising new vaccine candidates, should be able to be compared as early as possible in an objective and transparent process according to their merit in line with effective vaccine portfolio management.

b) Smaller proposals specifically focused on a single disease and/or a single vaccine candidate should adopt similarly innovative and comprehensive approaches to tackle one or more of the major bottlenecks in vaccine development for the specific disease.

For all antigen/vaccine candidates and for all diseases, it is necessary to ensure that a protective immune response (in the specific target population of the vaccine candidate) is adequately understood and that the candidate can elicit such a response.

Depending on the development stage, the downstream constraints of vaccine candidates for effective deployment and utilisation in resource-poor settings should be taken into account. This might include (as early clinical pipeline gate-criteria) considerations of the optimal route and immunization regime, field-deployment logistics (e.g. storing temperatures), as well as an evaluation of the predicted cost and affordability of final vaccine products. If relevant, an assessment of the target population risk-perception attitudes and immunization behaviours should be made and sex- and gender differences should be taken into account.

Both types of proposals should take into account existing mapping exercises on vaccine candidates, as well as the current vaccine development roadmaps and target product profiles for each disease (e.g. Malaria Vaccine Technology Roadmap).

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 and 5 million for smaller specifically focused proposals, and between EUR 15 and 20 million for the larger platform proposals, 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 should deliver new vaccine candidates or move existing ones along the vaccine candidate pipeline in support of the sustainable development goal No. 3.3, i.e. to end by 2030 the epidemics of malaria and neglected tropical disease
- This should provide reduction in the cost associated with late stage vaccine failure, increasing the number of other candidates which can be tested with the same resources, thus increasing the chance of discovery of an effective vaccine.
- Increase the number and quality of vaccine candidates for malaria and neglected infectious diseases available to proceed into further development and clinical testing, if appropriate within the context of the European and Developing Countries Clinical Trials Partnership (EDCTP2).

SC1-PM-09–2016: New therapies for chronic diseases

RIA ☑	IA ☒	CSA ☒

Specific Challenge

Chronic diseases represent a significant burden on individuals and healthcare systems in the European Union and beyond. Innovative and effective therapeutic approaches are required to provide the best quality of care when

[22] Neglected Infectious Diseases for the scope of this call: In addition to the 17 Neglected Tropical Diseases prioritized by WHO, also eligible are childhood diarrhoeal diseases and neglected viral emerging epidemic diseases.

prevention strategies fail. While considerable basic knowledge has been generated by biomedical research in recent years, the development of new therapies is stagnating, in part due to a lack of clinical validation.

Scope

Proposals should focus on clinical trial(s), supporting proof of concept of clinical safety and efficacy in humans[23] of novel therapies (pharmacological as well as non-pharmacological) or the optimisation of available therapies (e.g. repurposing) for chronic non-communicable or chronic infectious diseases. Preclinical research should be completed before the start of the project. Proposals should provide a sound feasibility assessment, justified by available publications or provided preliminary results. Gender and age must be considered whenever relevant. Due consideration should also be paid to involve patients and take their views into account wherever relevant. Rare diseases and regenerative medicine are not within the scope of this topic[24] [25].

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

Expected Impact:

- New or optimised therapeutic strategies, adapted where relevant to the different needs of men, women, children and the elderly, with the highest potential to generate advances in clinical practice and care for chronic non-communicable or chronic infectious diseases.
- Improve the therapeutic outcome of major chronic health issues with significant impact on disease burden of individual patients and health care systems.

SC1-HCO-01-2016: Valorisation of FP7 Health and H2020 SC1 research results

RIA ☒ IA ☒ CSA ☑

Specific Challenge

Over 1,000 projects have been funded under the Health theme of the Seventh Framework Programme (FP7, 2007-2013) and close to 100 projects are already supported under the Societal Challenge 1 of Horizon 2020. These projects have and will lead to breakthrough discoveries and innovations with a potential for further valorisation and exploitation. The translation of research and innovation outcomes into new diagnostics or medicines and improved health outcomes for patients is however hampered by the scattering of knowledge generated across public and private research organisations in Europe. Although Technology Transfer Offices (TTOs) have developed tools to promote their organisations' innovations, there is potential for increased critical mass and visibility of these EU FP7 Health and Horizon 2020 SC1 projects' outcomes.

Scope

The objective of this coordination and support action is to develop a European web marketplace referencing all types of innovations such as patents, licensing opportunities, prototypes, products, technologies or services with a potential for future exploitation and/or commercialisation, primarily generated by FP7 Health and Horizon 2020 SC1 programmes.

The marketplace should become a one-stop-shop between innovation providers (mainly academic research organisations) and innovation developers (such as SMEs, midcaps and larger companies, EU research infrastructures). The further assessment and/or validation of any high-value discovery shall not be performed within the framework of the proposal.

Further exploitation should be widely promoted to innovation developers; therefore the proposal should detail how it intends to incentivise academia, TTOs, SMEs and the healthcare sector at large to ensure a broad use, exploitation and feeding of the marketplace in Europe. The proposal should include a solid monetization strategy to ensure sustainability of the marketplace after the end of the project.

TTOs with proven track records in exploitation of research results as well as business development departments from healthcare companies should be involved in the consortium to ensure a coherent and consistent approach between innovation providers and innovation developers. Special attention should be given to project outcomes in low performing Member States and Associated Countries[26]. Benchmarking of existing initiatives at European,

[23] Phase 3 and phase 4 clinical trials are excluded.

[24] See topic SC1-PM-08-2017 addressing new therapies for rare diseases.

[25] See topic SC1-PM-11-2016-2017 addressing clinical research on regenerative medicine

[26] As defined by Widening Participation and Spreading Excellence: Member States below 70% of the EU average of the Composite Indicator of Research Excellence. The Composite indicator of Research Excellence (with a corrective threshold of 70% of the EU average) has been selected to distinguish those countries identified as "low R&I performing" or "widening" countries. These are:

Member States or international level (such as Enterprise Europe Network or the United States National Institutes of Health (NIH) Office of Technology Transfer) is a prerequisite. This benchmarking should contribute to identifying best practices, rightly positioning contents and services of the marketplace, as well as defining Key Performance Indicators that will be monitored throughout the deployment of the marketplace.

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.

Expected Impact

- Development of a sustainable one-stop-shop innovation marketplace promoting primarily EU FP7 Health and Horizon 2020 SC1 project outcomes
- Demonstrate clear impact of the marketplace in stimulating in- and out-licensing activity from TTOs, SMEs, and large pharmaceutical companies (ADD)
- Identify innovative, sustainable business models increasing the attractiveness of the marketplace, especially towards SMEs
- Identification and promotion of scientific discoveries as well as advice on possible value-adding strategies

SC1-HCO-02-2016: Standardisation of pre-analytical and analytical procedures for in vitro diagnostics in personalised medicine[27]

RIA ☒	IA ☒	CSA ☑

Specific Challenge

Standards are part of the knowledge economy that facilitate innovation and the adoption of new technologies. They are key elements of the competitiveness of European industry. They can improve safety and performance of products and services. Patients would benefit from the standardisation of in vitro diagnostic practice.

Progress in medical diagnostics is limited by insufficient guidelines for pre-analytical procedures and diagnostic services. The accuracy of measured values may be hampered by deficiencies of pre-analytical steps (sample collection, handling, etc.) and poor harmonisation and quality assurance of diagnostic practice (not all diagnostic laboratories are even accredited ISO15189).

Scope

Provide pan-European quality assurance schemes and guidelines for pre-analytical procedures - such as sample collection, handling, transportation, processing and storing of clinical samples - and/or harmonisation and quality assurance of diagnostic practice.

The proposal should contribute to accreditation and certification, and participate in standardization activities at European level. Interaction with the European Metrology Programme for Innovation and Research (EMPIR) should be considered as appropriate. Outcomes could be coordination of validation studies, assessment of the results of method validations, training, counselling, quality procedures and guidelines.

Involvement of industry, including SMEs, and organizations for standardisation is expected.

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

Expected Impact:

- Harmonisation and quality assurance of in vitro "diagnostic" procedures for disease diagnosis, patient stratification and/or prognosis of disease outcome leading to improved clinical decisions and health outcomes for the benefits of patients.
- Contribution to the sustainability of health care systems by reducing the number of diagnostic mistakes.
- Growth and benefit to the European diagnostics industry, in particular SMEs.

– Member States: Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Romania, Slovakia and Slovenia.

– Associated Countries (subject to valid association agreements of third countries with Horizon 2020): Albania, Bosnia and Herzegovina, Faroe Islands, Former Yugoslav Republic of Macedonia, Moldova, Montenegro, Serbia, Turkey and Ukraine.

[27] Personalised medicine refers to a medical model using characterization of individuals' phenotypes and genotypes (e.g. molecular profiling, medical imaging, lifestyle data) for tailoring the right therapeutic strategy for the right person at the right time, and/or to determine the predisposition to disease and/or to deliver timely and targeted prevention. The term "personalised medicine" is used throughout this Work Programme with this definition in mind.

9. Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy

BG-05-2016: ERA-NET Cofund on marine technologies[28]

ERA-NET Cofund ☑

Specific Challenge

Innovation related to seas and oceans can play a key role in tackling global challenges such as the scarcity and vulnerability of strategic resources and can unlock the potential of a sustainable blue economy, while factoring in environmental and climate change risks. EU intervention is needed to create the conditions for mobilising investments while avoiding the costly duplication of work.

Scope

Proposals should pool the necessary financial resources from the participating national (or regional) research programmes with a view of implementing a joint call for proposals with EU co-funding resulting in grants to third parties. In addition, proposals may involve, publicly-funded research performing organisations that will contribute with their own resources (in-kind contributions). In this case, the joint call should include a separate topic for the participating research performing organisations, so that they will implement the resulting transnational projects themselves. Their participation in the ERA-NET Cofund action must be mandated by the national/regional authorities in charge (usually the responsible ministry). Proposals should address various applications including environmentally friendly, secure and safe waterborne transport, offshore and sub-sea activities, aquaculture, biorefineries, desalination plants, etc. They should focus on overarching challenges such as: reducing underwater noise and emissions, reducing environmental impacts, minimising the carbon footprint, recycling, novel materials, advanced manufacturing technologies, sensors for navigation, observation, monitoring and the deep-sea environment. Proposals should also aim to implement other joint activities, including additional joint calls without EU co-funding, on open maritime and marine topics in line with the Strategic Research and Innovation Agenda and its Implementation Plan under the Joint Programming Initiative "Healthy and Productive Seas and Oceans" (JPI Oceans).

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

Expected Impact

To contribute to the implementation of the European Blue Growth Agenda and marine and maritime-related Directives, proposals will:

- Bring new knowledge-intensive products and services for marine and maritime activities to the market.
- Increase the resource efficiency, security, safety and environmental compliance of maritime activities.
- Help implement the European strategy on Key Enabling Technologies (KETs), in particular with regards to advanced materials and manufacturing.
- Support trans-national, pan-European research networks and synergies among national/regional and EU research programmes.
- Facilitate economies of scale and research investment efficiency by better aligning national/regional research programmes, in particular within the Joint Programming Initiative "Healthy and Productive Seas and Oceans".

BG-07-2017: Blue green innovation for clean coasts and seas

RIA ☒ IA ☑ CSA ☒

Specific Challenge

Debris, chemical and microbial pollution and algae jellyfish blooms are huge and increasing problems in the oceans, seas and coasts. For plastics alone, the economic and ecological cost is considerable when including beach clean-ups, tourism losses, and damages to the fishing and aquaculture industries. In spite of strong legislation such as EU directives, sea and coastal pollution remains high, and prevention and innovative coast and sea clean-up

[28] This activity directly aimed at supporting public-public partnerships with Member States and associated countries, technology platforms with industrial partners and earth observation networks is excluded from the delegation to REA and will be implemented by the Commission services.

schemes remain a challenge. Many solutions are available to tackle these sources of pollution, including recycling, waste water treatment, teams of collectors, and specific equipment such as skimmer boats, beach cleaning machines or algae harvesting devices. However, there is a pressing need to develop powerful innovative methods and processes to clean coasts and oceans and to restore the ecosystems to a healthy and clean state. The foremost challenge is not only to remove litter and pollution, but to transform the collected waste into a resource stream in line with the concept of the circular economy.

Scope

The proposals should be for demonstration projects to clean and lay the ground for a healthy ocean or sea and its coasts in any given large geographic area(s), including regional seas or semi-closed sea basins such as the Mediterranean. The demonstration projects should develop and scale-up innovative processes and measures to clean the selected site[29] from visible (for example floating plastics or abandoned fishing gear) and invisible litter (micro-plastics) and pollutants[30], involving local communities and actors. Collected waste materials should be adequately processed so as to enable a subsequent usage/ exploitation/ re-usage. The proposals should apply an ecosystem approach, developing forecasting tools and models to identify areas where the proposed intervention is likely to be most effective in ecological and economic terms. Social acceptance and economic impact of the envisaged measures must also be considered and promoted, for example by disseminating the project results to relevant stakeholders.

In line with the objective of the EU Strategy for international cooperation in research and innovation (COM (2012) 497), proposals addressing the Mediterranean should contribute to implement the Research and Innovation Initiative for Blue Jobs and Growth in the Mediterranean Area (The BLUEMED Initiative).[31]

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

Expected Impact

To contribute to the implementation of EU Policies such as the Marine Strategy Framework Directive and its aim to achieve a good environment status for Europe's seas and oceans by 2020, proposals are expected to:

- Develop innovative technological methods or processes for cleaning coasts and seas and transforming waste into a resource.
- Reduce cleaning up/restoration costs through cost-effective solutions, in particular through enhanced resource efficiency.
- Increase awareness and acceptance of civil society about the importance of healthy oceans and seas, devoid of litter and pollutants, in civil society.
- Progress towards reducing pollution and debris (macro, micro and nano) in regional sea basins and beyond, and towards restoring marine ecosystems.
- Improve the professional skills and competences for those working and being trained to work within the blue economy.

BG-09-2016: An integrated Arctic observation system

RIA ☑	IA ☒	CSA ☒

Specific Challenge

The Arctic is a theatre of profound transformation. Climate change is significantly affecting the extent and thickness of sea-ice, on snow cover on ice-sheet melting, on permafrost thawing, and on marine and land ecosystems. These changes are bringing with them both risks and opportunities, and an integrated and multi-disciplinary Arctic observation system is becoming essential for studying, forecasting and assessing changes that support the region's sustainable development. Improving and coordinating current capabilities for assessing and predicting Arctic environmental change requires the provision of data on a number of key variables of Arctic meteorology, climatology, oceanography, ecosystems and pollution at various scales. Monitoring and improved understanding of

[29] Each site should be substantial in size and include or be adjacent to different activities.

[30] The exact selection of pollutants and litter will depend on the area selected. However, the choice of the area must be such that several sources of pollution are addressed.

[31] The "Research and Innovation Initiative for Blue Jobs and Growth in the Mediterranean Area (The BLUEMED Initiative)" aims to advance a shared vision of a Mediterranean Sea that is healthy, productive, resilient, understood and valued so as to promote the well-being and prosperity of our citizens and future generations and boost socio economic growth and jobs. It was jointly developed by Cyprus, Croatia, Greece, France, Italy, Malta, Portugal, Slovenia and Spain and presented by the Italian Presidency during the Competitiveness Council of 04-05 December 2014. In March 2015, a Strategic Research and Innovation Agenda was developed.

the Arctic climate system and its teleconnections, as well as of ecosystem change and the socio-economic impacts on offshore operations, new shipping routes, mining activities, tourism etc. are important prerequisites for effectively assessing climate change adaptation and mitigation strategies in the Arctic and elsewhere.

Scope

An integrated Arctic observation system should close critical gaps with innovative solutions, as well as improve the integration and inter-operability of existing observation systems, also in view of data assimilation into models. The activity shall be based on co-operation between the existing European and international infrastructures (in-situ and remote including space-based) and the modelling communities, with the active participation of relevant stakeholder groups. In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), the action should contribute to implementing the Transatlantic Ocean Research Alliance, the Sustaining Arctic Observation Networks (SAON) and the Cold Region Initiative of the Group on Earth Observation (GEO). It should have links to the relevant Copernicus and European Space Agency (ESA) programmes and infrastructure in order to maximise the synergies other European efforts to develop an integrated Arctic observation system. In particular, strong coordination with the on-going Horizon 2020 project which aims to develop an Integrated Atlantic Ocean Observation System[32] should be sought and with the relevant ESFRI research infrastructures. The activity shall support and promote the integrated use of Arctic land, ocean, ice and atmosphere *in-situ* and space-based observations from Europe, the USA, Canada and other international partners. Community-based observation programmes that draw on indigenous and local knowledge should be included and should form the basis for participatory research and capacity-building within Arctic communities. The action should ensure data interoperability through internationally recognised standardisation and quality assurance/quality control (QA/QC) processes, promote database integration and allow free and open access to all data and data products, following the GEO data sharing principles. It should make best use of reference sites (supersites) and should contribute to filling *in-situ* observational gaps through novel technology development, with particular attention to the gaps that may help improve the accuracy of predictive models. In line with the strategy for EU international cooperation in research and innovation[33], actions will contribute to implementing the Transatlantic Ocean Research Alliance. Due to the specific challenge of this topic, in addition to the minimum number of participants set out in the General Annexes, proposals should benefit from the inclusion of partners from the USA and from Canada[34]. International cooperation with partners from other Arctic and non-Arctic third countries would add further value.

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

Projects funded under this topic will by default participate in the Pilot on Open Research Data in Horizon 2020, with the option to opt-out, as described in the introduction[35].

Expected Impact

- Increase temporal and geographic coverage and usefulness of observational data in the Arctic with a view to improving the assessment and prediction capacity of Arctic and planetary changes;
- Support standardisation and calibration/validation activities, and improve the inter-operability of Arctic observational data;
- Improve the sustained integration of space-based and *in-situ* Arctic observations into process models and forecast systems showing benefit to the Copernicus monitoring services;
- Contribute to the long-term improvement of Arctic observation systems and related services;
- Integrate with existing pan-Arctic monitoring networks by building additional capacity and adding monitoring parameters to current programmes;
- Improve the cost-effectiveness of data collection in support of Arctic-related economic and societal activities;
- Lead to better-informed decisions and better-documented processes within key sectors (e.g. local communities, shipping, tourism, fishing);
- Support international assessments of global challenges such as climate change, scarcity of natural resources and global scale hazards;

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

[33] (COM(2012)497)

[34] Please note that participants from developed countries are not eligible for Horizon 2020 funding.

[35] Beneficiaries of projects participating in the pilot on open research data are should follow the Global Earth Observation System of Systems (GEOSS) Data Sharing Principles and to register in GEOSS the geospatial data, metadata and information generated as part of the project. Further information on GEOSS can be found from: http://www.earthobservations.org.

- Strengthen the societal and economic role of the Arctic region and support the EU strategy for the Arctic and related maritime and environmental policies[36];
- Contribute to the GEO Cold Region Initiative and to the Transatlantic Ocean Research Alliance;
- Contribute to the ongoing and possible future OSPAR actions in Arctic waters;
- Contribute to the Sustaining Arctic Observation Networks (SAON) process;
- Contribute to the WMO Programme Year of Polar Prediction (YOPP)[37].
- Improve the professional skills and competences for those working and being trained to work within this subject area.

BG-10-2016: Impact of Arctic changes on the weather and climate of the Northern Hemisphere

RIA ☑	IA ☒	CSA ☒

Specific Challenge

The climate is changing more rapidly in the Arctic than in any other region. There is evidence that these changes strongly affect ecosystems, people and communities inside and outside of the Arctic, including in Europe and North America. A better representation of processes specific to the Arctic (e.g. related to sea-ice formation and melting) in weather and climate models is required to better constrain the role of the Arctic in the global climate system and in the generation of extreme weather events. In connection with improved observations in the Arctic (see topic BG-09), this is necessary to improve the predictability of weather and climate in the Northern Hemisphere, and of related risks.

Scope

Proposals should develop innovative approaches to improving the descriptions and modelling of the mechanisms, processes and feedback affecting Arctic climate change and its impacts on the weather and climate of the Northern Hemisphere, to further develop state-of-the-art climate models and predictions. Model performance should be assessed, and their ability to represent the links between polar and lower latitudes should be evaluated through coordinated model experiments. Actions should also explore the potential that an improved Arctic observation system – the subject of another topic in this call – would have on the accuracy of weather, and climate forecasts in the Northern Hemisphere, including Europe and North America, and also should identify gaps in data and observations. The activities should contribute to the programme of the Year of Polar Prediction (YOPP)[38] and provide input to the improvement of short- to medium-term predictions of the Copernicus Climate Change Services (C3S)[39]. Proposals should include a work-package to cluster with other projects financed under this topic and if possible also under other parts of Horizon 2020, and should build on projects funded under earlier calls. Links with projects resulting from the Belmont Forum call on climate predictability[40] are also welcome. Proposals should develop relevant forms of communication with the EU (and possibly national) services to adequately disseminate results that could be used for policy action. In line with the strategy for EU international cooperation in research and innovation[41], actions should contribute to implementing the Transatlantic Ocean Research Alliance. Due to the specific challenge of this topic, in addition to the minimum number of participants set out in the General Annexes, proposals should benefit from the inclusion of partners from the USA and from Canada[42]. International cooperation with partners from other Arctic and non-Arctic third countries is also strongly encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 7 million and EUR 8 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude the submission and selection of proposals requesting other amounts.

Projects funded under this topic will by default participate in the Pilot on Open Research Data in Horizon 2020, with the option to opt-out, as described in the introduction[43].

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[36] COM(2008) 763 of 20 November 2008; JOIN(2012) 19 of 26 June 2012

[37] http://www.polarprediction.net/yopp.html

[38] http://www.polarprediction.net/yopp.html.

[39] http://www.copernicus-climate.eu/.

[40] http://www.jpi-climate.eu/joint-actions/CPIL

[41] (COM(2012)497)

[42] Please note that participants from developed countries are not eligible for Horizon 2020 funding.

[43] Beneficiaries of projects participating in the pilot on open research data should follow the Global Earth Observation System of Systems (GEOSS) Data Sharing Principles and register in GEOSS the geospatial data, metadata and information generated as part of the project. Further information on GEOSS can be found at http://www.earthobservations.org.

Expected Impact

The project results are expected to:

- Improve capacity to predict the weather and climate of the Northern Hemisphere, and make it possible to better forecast of extreme weather phenomena;
- Improve the capacity to respond to the impact of climatic change on the environment and human activities in the Arctic, both in the short and longer term;
- Improve the capacity of climate models to represent Arctic warming and its impact on regional and global atmospheric and oceanic circulation;
- Improve the uptake of measurements from satellites by making use of new Earth observation assets;
- Lead to optimised observation systems for various modelling applications;
- Contribute to a robust and reliable forecasting framework that can help meteorological and climate services to deliver better predictions, including at sub-seasonal and seasonal time scales;
- Improve stakeholders' capacity to adapt to climate change;
- Contribute to better servicing the economic sectors that rely on improved forecasting capacity (e.g. shipping, mining);
- Contribute to the Year of Polar Prediction (YOPP) and IPCC scientific assessments, and to the Copernicus Climate Change (C3S) services.
- Improve the professional skills and competences for those working and being trained to work within this subject area.

BG-12-2016: Towards an integrated Mediterranean Sea Observing System

RIA ☑ **IA** ☒ **CSA** ☒

Specific Challenge

The achievement of economic, environmental and societal sustainability of Blue Growth in the Mediterranean area requires that we understand and are able to forecast the evolution of the ecological, social and economic processes in the region. This must take into consideration the proper functioning of vulnerable marine ecosystems and sea-related economic sectors. In the Mediterranean region, several issues are specifically acute such as the vulnerability and poor resilience of ecosystems, the over-exploitation of seabed and biological resources, the severe pollution events and limited remediation actions, the drastic climate change effects, the frequent extreme events and geohazards, and the uneven protection of coastal infrastructures and populations. The EU is committed to supporting the development of solutions to solve the above mentioned issues through several policies and international agreements such as the EU Integrated Maritime Policy (IMP), the Marine Strategy Framework Directive (MSFD), the Common Fisheries Policy (CFP), the EU neighbourhood policy, the Barcelona convention and more recently the EU BLUEMED Initiative[44]. One of the main goals of the latter is to create an interoperable, fully integrated multiplatform observing and forecasting capacity to support the conservation of biodiversity, and to forecast and manage risks and emergencies at the coast and at sea. The implementation of these policies and conventions requires a strong knowledge base and predictive capacities that are derived from Earth observation data. These observation data are, however, still very fragmented, or are even lacking for certain areas of the Mediterranean Sea, in particular in the southern part. They are also still difficult to access, partly because of the many initiatives and systems that exist. The challenge here is to conduct the research and innovation activities that are necessary for the integration of the existing Earth observation facilities and networks inthe Mediterranean Sea building on relevant initiatives such as Copernicus[45], GEOSS[46], GOOS[47], EMODNet[48], ESFRI[49] and in particular all

[44] The "Research and Innovation Initiative for Blue Jobs and Growth in the Mediterranean Area (The BLUEMED Initiative)" aims is to advance a shared vision of a Mediterranean Sea that is healthy, productive, resilient, understood and valued so as to promote the well-being and prosperity of our citizens and future generations and boost socio-economic growth and jobs. It was jointly developed by Cyprus, Croatia, Greece, France, Italy, Malta, Portugal, Slovenia and Spain and presented by the Italian Presidency during the Competitiveness Council of 04-05 December 2014.

[45] www.copernicus.eu. The Copernicus data and products, where available, should be used by the research and innovation community following the free, full and open access approach approved in the Commission Delegated Regulation (EU) No 1159/2013 of 12 July 2013. This includes the data from the Copernicus space infrastructure (Sentinel missions) and, where affordable, the Copernicus Contribution mission data, where the latter can be of use for Horizon 2020 projects developing new Copernicus Services. Applicants are advised to consult published information on the availability of Copernicus Sentinel Data, access to Copernicus Contributing Mission data at the Commission's web http://ec.europa.eu/growth/sectors/space/research/index_en.htm. Wherever possible, applicants are also encouraged to use the Earth Observation Data Warehouse (http://copernicusdata.esa.int/web/cscda/home).

[46] GEOSS – Global Earth Observation System of Systems

[47] GOOS – Global Ocean Observing System

those with strong links to marine and maritime issues, and national initiatives. This would fill out the existing observational gaps, and would help exploit the relevant data to build the necessary knowledge base and prediction capacities.

Scope

The research and innovation activities to be included in the proposal should contribute to the development of an integrated observing system for the whole Mediterranean Sea building on existing facilities (remote sensing and *in-situ*) and initiatives, and addressing both the open sea and the coastal zone. This should be based on open data and should facilitate easy access to those facilities and the data. Another focus should be on conducting the research and innovation necessary to underpin the full and open discovery and access to the ocean observations and to facilitate the interoperable exchange of ocean observation as promoted through the Group on Earth Observation (GEO) for the Mediterranean Sea. The proposal should also address observational gaps in the Mediterranean Sea, in particular those related to the *in-situ* component of the observation system. Optimising existing systems and using new ocean observation technologies make *in-situ* ocean observation and the integration of the biological dimension into observing systems more cost-effective. The proposals should also focus on the use of *in-situ* measurements to calibrate and validate relevant remote sensing data and products, including possible new products derived from space infrastructures such as the Sentinel and Earth Explorer missions that support the improvement and evolution of operational services in the Mediterranean Sea. The above activities should include the participation of international partners from the coastal states of the Mediterranean Sea.

In line with the objective of the EU Strategy for international cooperation in research and innovation (COM (2012) 497), proposals should contribute to implementing the Research and Innovation Initiative for Blue Jobs and Growth in the Mediterranean Area (The BLUEMED Initiative).[50]

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

Projects funded under this topic will by default participate in the Pilot on Open Research Data in Horizon 2020, with the option to opt-out, as described in the introduction.

Expected Impact

To contribute to the implementation of the BLUEMED Initiative's vision and its related Strategic Research and Innovation Agenda and Implementation Plan, in particular as regards the goal to develop an integrated Mediterranean observing system, proposals must:

- Provide an additional European contribution to established global observing systems e.g. Copernicus and GEOSS. Provide a Mediterranean Sea Integrated Observing system as a component for GEOSS.
- Contribute to increasing the temporal and geographic coverage of observational data in the Mediterranean Sea and identify observational gaps.
- Provide qualified data to improve the predictive capacity of model products and improve the cost effectiveness of data collection in support of ocean-related industrial and societal activities.
- Improve the knowledge base that is needed in order to cope with global challenges such as climate change, scarcity of natural resources and regional hazards; this would make it possible to make better-informed decisions within key sectors, and increase the safety of offshore activities and coastal communities.
- Improve the implementation of European maritime and environmental policies and international agreements (e.g. Marine Strategy Framework Directive, INSPIRE Directive[51] , Common Fisheries Policy, EU Integrated Maritime Policy, the Barcelona convention) by providing the knowledge base needed to support policy decisions towards the sustainable growth of the EU Mediterranean marine and maritime economy.
- Improve the professional skills and competences of those working and being trained to work within the blue economy.

[48] EMODNet – European Marine Data Observation Network

[49] ESFRI – European Strategy on Research Infrastructures

[50] The "Research and Innovation Initiative for Blue Jobs and Growth in the Mediterranean Area (The BLUEMED Initiative)" aims to develop a shared vision of a Mediterranean Sea that is healthy, productive, resilient, understood and valued so as to promote the well-being and prosperity of our citizens and future generations and boost socio-economic growth and jobs. It was jointly developed by Cyprus, Croatia, Greece, France, Italy, Malta, Portugal, Slovenia and Spain and was presented by the Italian Presidency during the Competitiveness Council of 04-05 December 2014.

[51] INSPIRE-Infrastructure for Spatial Information in the European Community

BG-13-2016: Support to the BLUEMED Initiative: Coordination of marine and maritime research and innovation activities in the Mediterranean[52]

RIA ☒	IA ☒	CSA ☑

Specific Challenge

The Mediterranean Sea is going through rapid changes in response to closely interlinked natural and anthropogenic pressures. Climate change influences its physical dynamics and hydrological structure, while nutrient and pollutant loads are flowing from growing urban areas, land and coastal activities. Increasing maritime traffic also leads to safety concerns, potential pollution and the introduction of invasive alien species. Fishing remains unsustainable. The area's marine heritage and its ecosystem services are also at risk. In addition, the geo-political complexity of the area adds further difficulties related to the establishment of favourable framework conditions to support the growth of a blue economy (e.g. in trans-border cooperation on sea-related activities, including maritime spatial planning). Within this frame, coordinated and integrated action needs to be carried out by Member States individually and among Member States together in order to create synergies and complementarities between sectors and countries. This is to provide added value to regional, national and EU investments, remove barriers, avoid duplication and reduce fragmentation, and was put forward in the Vision Statement of the 'Research and Innovation Initiative for Blue Jobs and Growth in the Mediterranean Area – The BLUEMED Initiative'[53]. This initiative and its related Strategic Research and Innovation Agenda will contribute to achieving a healthier, more productive, resilient, better known and valued Mediterranean Sea. In addition, a common marine and maritime R&I strategy needs to be further consolidated in order for it to be possible to achieve solid knowledge-based sustainable and long lasting 'Blue Growth' in the region[54].

Scope

This action is expected to contribute to the implementation of 'The BLUEMED Initiative' vision with its related Strategic Research and Innovation Agenda and Implementation Plan. This calls for the further alignment and convergence of national research and innovation activities and other relevant initiatives and investments with the different actors and across different sectors *in primis* between the European countries bordering the Mediterranean Sea coasts and the whole EU. In this context, proposals should establish and consolidate an operational network of marine and maritime research funders and other key players. Proposals should support the design and implementation of new transnational joint activities, by using the most suitable and effective collaboration methods and tools. These new activities should focus on the key challenges and other relevant issues identified in the BLUEMED Strategic Research and Innovation Agenda (SRIA) and related Implementation Plan, namely support for technology development, promotion of multidisciplinary research and an innovation-enabling environment, improving human and research infrastructures and capacities, creating a fully integrated observing and forecasting system, promoting citizen awareness and literacy on marine issues, and improving training. This action should build on past and ongoing regional, national and EU projects (e.g. SEASera ERA-NET, PERSEUS COCONET, ESFRI research infrastructures EMBRC, Euro-Argo, ICOS, EMSO etc.) and initiatives. It should integrate research, policy, industry (including aquaculture) and society (including the preservation of local coastal cultures). It should also contribute to pooling different funding streams, at national and EU level, and combine them in an effective way. Lastly, it should create the conditions for extending the initiative to the Southern Mediterranean coastal countries. Support for related events organised under the auspices of the Presidency of the Council of the European Union should be envisaged.

The Commission considers that proposals requesting a contribution from the EU of up to EUR 3 million and a foreseen duration of four years would allow this challenge to be addressed appropriately. Nonetheless, this does not preclude the submission and selection of proposals requesting other amounts or durations.

Projects funded under this topic will by default participate in the Pilot on Open Research Data in Horizon 2020, with the option to opt-out, as described in the introduction.

Expected Impact

[52] 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 REA and will be implemented by the Commission services.

[53] https://www.researchitaly.it/uploads/12471/BLUEMED_SRIA_March2015.pdf?v=7fb440d

[54] The "Research and Innovation Initiative for Blue Jobs and Growth in the Mediterranean Area (The BLUEMED Initiative)" aims to advance a shared vision of a Mediterranean Sea that is healthy, productive, resilient, understood and valued so as to promote the well-being and prosperity of our citizens and future generations and boost socio economic growth and jobs. It was jointly developed by Cyprus, Croatia, Greece, France, Italy, Malta, Portugal, Slovenia and Spain and was presented by the Italian Presidency during the Competitiveness Council of 04-05 December 2014.

To contribute to the implementation of the BLUEMED Initiative's vision, its related Strategic Research and Innovation Agenda and Implementation Plan, proposals must:

- Make the Mediterranean Sea healthier, more productive, resilient, better known and valued.
- Boost the knowledge base and contribute to creating the right conditions for developing new technologies and services and for improving human and infrastructure capacity in the Mediterranean region.
- Boost the 'blue economy' and contribute to creating more jobs in the Mediterranean region.
- Increase the competitiveness of EU researchers, industry and SMEs within the marine and maritime sectors.
- Improve the coordination and alignment of national marine and maritime research programmes.
- Maximise the impact of national and EU-funded marine and maritime research.
- Contribute to the implementation of the EU Integrated Maritime Policy, its environmental pillar the Marine Strategy Framework Directive (MSFD), the Common Fisheries Policy (CFP) and the Communication 'Blue Growth - opportunities for marine and maritime sustainable growth'.
- Improve the professional skills and competences of those working and being trained to work within the blue economy.

RUR-04-2016: Water farms – improving farming and its impact on the supply of drinking water

RIA ☑ **IA** ☒ **CSA** ☒

Specific Challenge

Agriculture is the biggest source of pesticides and nitrate pollution in European fresh waters[55]. The quality of drinking water, which matters a lot to EU citizens, and the level and cost of treatment prior to consumption depend greatly on the quality of the ground-water and surface-water used to produce it. This is partly why the Water Framework Directive (WFD), linked to the Drinking Water Directive, puts such emphasis on the protection of ground-water and surface-water resources[56]. The diffuse pollution of water sources from the pesticides and fertilisers used in farming systems has been addressed with varying degrees of success by current policy tools but clearly remains an obstacle to achieving the WFD objectives. Monitoring such pollution is also challenging because of the high number of registered pesticides, the cost of analyses and the need for samples to be taken during periods of application and use, and in various weather conditions. Additionally, the time dynamics of water resource systems entail a delay between action at the soil surface and reaction in the ground-water. Appropriate monitoring and decision-support tools are needed to help develop and implement governance models to preserve the quality of drinking water resources.

Scope

Proposals will entail a variety of case studies identifying good practices in the field of drinking-water management involving improved farming systems and land-use management; these will cover a variety of pedo-climatic conditions, vulnerable zones with different types of

farming systems, contrasting legal frameworks, larger and smaller water collection areas, including rural and urban areas and only rural areas with a focus on small water supplies, which face the biggest problems in the EU and globally. The effectiveness of various measures in mitigating diffuse agricultural pollution will be analysed. Work will include cost-efficiency analysis of mitigation measures and cost-benefit analysis for the society and the actors concerned of identified preventive and curative options for the delivery of high-quality drinking water. Transition pathways from "paying for depolluting" to "rewarding farming systems delivering water quality" options shall be investigated, taking into account various temporal and spatial scaling issues. Governance models, including private spring-water companies and public water-supply bodies, will be investigated. The project will deliver improved public policy instruments and decision support for the various alternatives, including monitoring and control tools, taking into account the necessary cooperation and regional partnerships. Proposals will develop harmonised, transparent and understandable indicators to ensure reliable and comparable data in order to involve farmers and citizens. Proposals should fall under the concept of the 'multi-actor approach'[57].

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

[55] http://ec.europa.eu/eurostat/statistics-explained/index.php/Agri-environmental_indicator_-_pesticide_pollution_of_water& Agri-environmental_indicator_-_nitrate_pollution_of_water

[56] http://ec.europa.eu/environment/water/water-framework/info/intro_en.htm

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

Expected Impact

- good cooperation between stakeholders on pesticides, fertilisers and irrigation management practices capable of reducing point source and diffuse pollution in different contexts;
- harmonised datasets on pesticide and fertiliser contamination of the drinking-water resources;
- greater involvement of farmers and other citizens in the monitoring of water quality;
- water governance models that are more conductive to the adoption and long-term durability of efficient on-farm and land-use strategies; and
- integrated scientific support for relevant EU policies (e.g. Common Agricultural Policy, Water Framework Directive, sustainable use of pesticides).

10. Secure, Clean and Efficient Energy

EE-10-2016: Supporting accelerated and cost-effective deep renovation of buildings through Public Private Partnership (EeB PPP)

RIA ☒ IA ☑ CSA ☒

Specific Challenge

Too much of Europe's building stock is inefficient in terms of energy use, with excessive heat losses through building envelopes and technical building systems. In addition, buildings need to contribute a greater share of renewable energy production. Too few buildings are undergoing deep renovation (whereby energy savings exceed 60% compared to pre-renovation levels) and such renovations are often too expensive. There is a need to demonstrate more cost-effective and practical ways of achieving deep renovation while reducing the time needed to renovate a building and at the same time promoting a holistic optimized approach that goes beyond the results of European and national projects, and the IEA report on Prefabricated Systems for Low Energy Renovation of Residential Buildings.

Scope

Proposals should demonstrate and promote innovative processes leading in practice to more cost-effective, higher quality, holistic and faster deep renovation of buildings with less disturbance of the residents. Proposals should demonstrate the contribution to an increased rate of renovation in a specific district/city/region. The building renovations may use pre-fabricated mass manufactured components or "plug and play" energy and ventilation systems, including innovations needed during the on-site phase. Proposals should consider innovative integrated packages of commercially available technologies. This typically includes actions on the building envelope and on the technical building systems both including renewable energy sources and conversion and storage technologies, in order to achieve very high energy performance. The proposals could include specific solutions for historic buildings, when applicable. Means of sharing technical information on the building over its whole life cycle could also be considered[58]. Proposals should ensure that the solutions guarantee high indoor environmental quality (thermal and visual comfort, acoustics, air quality, etc.). If necessary proposals should include smart controls to allow integration with the energy grid. Embodied energy and the possibility of reusing and recycling materials at the end of a building's life are highly relevant to the building's overall life cycle, therefore these aspects should also be taken into account.

Solutions should demonstrate the integration potential of innovative processes and explore how they could facilitate renovation. Proposals could make use of geo-clusters[59] to respond to specific needs and to demonstrate the potential for replication.

Synergies may be considered with activities initiated under the topic LCE-17-2017.

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 and 4 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 will be implemented under the PPP on Energy-efficient Buildings. The activities are expected to be implemented at Technology Readiness Level (TRL) 6-8 (please see part G of the General Annexes). Proposers should note that this topic is also complemented by other topics relating to deep renovation, including in the PPP on Energy Efficient Buildings.

[58] The use of BIM (Building Information Modelling) for documenting and sharing technical information on the building over its whole life cycle.

[59] Geo-cluster is understood as a group of districts, cities, regions or large areas of the EU (may be even covering several MS) with similar characteristics, e.g. climate, building typology, technology, market barriers, etc.

Expected Impact

Proposals are expected to demonstrate the impacts listed below, using quantified indicators and targets wherever possible:

- Net primary energy use reduced by 60% compared to pre-renovation levels;
- Cost reduction of at least 15% compared with a typical renovation (i.e. a renovation that meets current minimum requirements of existing building regulations[60]);
- Demonstration of the effectiveness of the proposed solutions to reach an increased rate of renovation of a defined building typology in a specific district/city/region.
- Reduction in time needed for renovation by a factor of 2 at least compared to typical present day renovation.

EE-11-2016-2017: Overcoming market barriers and promoting deep renovation of buildings

RIA ☒ IA ☒ CSA ☑

Specific Challenge

In order to achieve the EU 2020 energy efficiency objectives, the renovation rate needs to increase from the present level of 1.2% per annum to at least 2-3% (with a specific target for the public sector of 3%) and the energy performance of renovations needs to improve. Both the Energy Performance in Buildings Directive (EPBD) and the Energy Efficiency Directive (EED) contain several provisions in this respect. The environmental sustainability of renovation process but more importantly, the health and wellbeing of the occupants are also relevant. This might lead to consideration of aspects partially covered by different pieces of EU legislation such as REACH, the Water Framework Directive[61], the Construction Products Regulation[62], etc.

Many barriers, which are not necessarily technological, hamper the implementation of these provisions. For example: diversity and fragmentation within the building value chain; inefficient and complex renovation processes; a lack of deep renovation packages; low development and uptake of financial packages or incentives (e.g. grants, credits); unclear energy or environmental requirements in renovation grants or procurement processes; low progress in performance guarantees. There is therefore, a need to overcome these regulatory and non-regulatory barriers to facilitate the renovation of existing building stocks.

Scope

The focus of submitted proposals should be aiming at overcoming market barriers to deep renovation within the value chain. Any building type may be included (public or private, residential or non-residential).

Renovations can take place at one point in time or be staged in a step-by-step approach, but in any case they should strive to achieve "deep renovation" (at least 60% energy savings compared to pre-renovation levels) or aim towards Nearly Zero Energy Buildings (NZEB) performance. Proposals might consider integration of voluntary certification schemes along with energy performance certificate, including elements of indoor quality classification for buildings.

Proposals should address at least two of the following options (list not exhaustive):

- Support to consumers or end-users
- Support the implementation of renovation road maps resulting from the EED/EPBD
- Address the gap between designed and actual energy performance; support reliable energy performance standards, quality of certification and labelling schemes, etc.
- Increase the number of deep renovations by means of :
  - Solutions that offer affordable deep renovation to a large number of individual consumers (e.g. owners or end-users) and/or
  - Targeting large groups of building units in order to take advantage of opportunities for simplification and cost reduction and the potential for further replication.
- Support the use of existing financial mechanisms, instruments and innovative business models to address market failures, in particular split incentives.

The proposals should build on previous experience, including the outcome of Intelligent Energy Europe projects.

[60] Definition of typical renovation is based on each country's implementation of Art. 4 of the EPBD

[61] 2000/60/EC (EU Water Framework Directive) http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32000L0060

[62] Construction Products Regulation (EU 305/2011)
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:088:0005:0043:EN:PDF

Synergies may be considered with activities initiated under the topic LCE-17-2017.

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.

Expected Impact

Depending on the options chosen to address in the Scope, proposals are expected to demonstrate the impacts listed below in the participant countries (wherever possible, using quantified indicators and targets):

- Increased rate of renovation in the targeted area or sector (local, regional or national; public or private; residential; non-residential);
- Increased number of individual deep renovations (exceeding 60% energy savings compared to pre-renovation levels);
- Energy savings and renewable energy triggered through deep renovations;
- Increased compliance rate in deep renovations;
- Improved environmental sustainability of deep renovation solutions.

11. Smart, green and integrated transport

MG-1.1-2016: Reducing energy consumption and environmental impact of aviation

RIA ☑ IA ☒ CSA ☒

Specific Challenge

The reduction of energy consumption in aviation leads to high social, environmental and economic benefits and will ensure its sustainability. It leads to improved resource efficiency, reduction of CO_2 and NO_x emissions as well as decrease of the particulate matter. If no actions would be undertaken, the adverse impact of aviation on environment would significantly grow due to the expected increase of air transport traffic by 5% every year. Improvement of the environmental impact of the aircraft can be achieved for instance through better engine efficiency and advanced combustion technologies, improved aerodynamics or reduction of the weight of an aircraft.

Scope

Actions will address aircraft technologies that have high potential towards improving resource efficiency, including those related to small aircraft. For this purpose the actions should address one or several of the following areas:

—Development of novel technologies contributing to more electric aircraft, including new power electronic devices, low energy systems, advanced power generators and actuation systems as well as innovative power and power management concepts.

—Advancements in core engine technologies to develop new innovative concepts towards improving thermal efficiency by increasing the Operational Pressure Ratio.

—Development and demonstration of integrated aero-structures with self-sensing, morphing or multi-functional capabilities towards reduced weight and better aerodynamic performance as well as decreased manufacturing and operational cost.

—Development of screening and optimisation tools aiming at quantifying the added value of alternative fuels from the jet fuel as well as development of design tools aiming at assessing the impact of different fuel compositions on engine components and fuel systems.

Proposals should provide quantified assessment of the expected progress in terms of reducing energy consumption and environmental impact. Analysis of regulatory and standardisation issues should be provided and certification/qualification issues addressed.

The Commission considers that proposals requesting a contribution from the EU of between EUR 5 and 9 million each 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 mentioned in the specific challenge, reduction of energy consumption leads to improved resource efficiency, reduction of CO_2 and NO_x emissions as well as decrease of the particulate matter. Actions will contribute towards greening the aviation through increased energy efficiency of the aircraft and wider use of alternative fuels. They will mature technologies capable of:

—Bringing measurable reduction of environmental impact towards the long-term goals of reducing CO_2 by 75% and NO_x by 90% (per passenger and per kilometre) by 2050 (baseline year 2000).

—Facilitating the introduction of alternative fuels in aviation towards the long-term goal of 40% biofuels share in aviation fuels by 2050.

ART-02-2016: Automation pilots for passenger cars

RIA ☒	IA ☑	CSA ☒

Specific Challenge

It is expected that automated vehicles at automation level 3 (Conditional Automation) will enter the market by 2020 to 2025. In the past years, there have been significant efforts in research to develop the technologies for vehicles and infrastructure to enable automated driving functions. However, substantial challenges remain on the path to a European wide deployment. There is a great need to demonstrate the technological readiness, reliability and safety of the automated driving functions in a large scale pilot at European scale. Before the market introduction, it is important to test automated cars in mixed traffic situations, analyse the interaction between the driver, the cars and the traffic environment, study the behaviour of other traffic participants and get an insight into automated driving under different conditions (e.g. traffic intensity, weather, lighting, etc.). In addition these pilots should assess the viability of different business models to ensure investments are done by those benefiting the most. For implementing large scale testing, Member States may need to adapt their regulatory framework and solve liability issues in case of accidents with automated vehicles.

Scope

The action will integrate and test enabling technologies for automation level 3 (Conditional Automation) and evaluate the benefits in Field Operational Tests (FOTs) for passenger cars. Possible additional functions towards level 4 (High Automation) can also be tested, although the focus of the FOT should be on technologies for automation level 3. This needs the active involvement of all stakeholders such as car manufacturers, automotive suppliers, road users, insurance companies, road and traffic authorities, the EU Member States, etc., because the responsibility and liability of all stakeholders relating to the testing, demonstrating and use of automated cars requires clarification before market introduction. The FOTs should take place in at least 3 different countries. Automation pilots for all driving situations (i.e. from highway to urban) are within scope. If proposals include FOTs on highways, testing across borders should be considered. Consortia should commit to make the data collected during the pilots available through common data sharing frameworks in order to foster further research.

The automation pilots should consider all the following aspects:

—Demonstrate the robustness and reliability (functional safety) of technologies, systems and functions needed to support the gradual progress towards full automation, in particular from level 2 – Partial Automation (human driver monitors the driving environment) to level 3 (Conditional Automation) including possible additional functions towards level 4 (High Automation).

—Evaluate effects of automated driving systems (e.g. on traffic flow, communication, etc.) in a mixed traffic environment with automated and non-automated vehicles and under different conditions (e.g. traffic intensity, weather, lighting, etc.).

—Analyse user acceptance and behaviour; study interaction between the driver, the vehicles and the traffic environment and behaviour of other traffic participants.

—Focus on the in-vehicle evaluation of the driver under real traffic conditions in particular during the transition of control from the vehicle system to the driver and vice versa, e.g. expectations, adoption, acceptance, trust, usability driver position; human-vehicle interaction, monitoring strategies; investigate intended and unintended use of the system and possible mitigation solutions; evaluate fail operational solutions (e.g. emergency stop). Gender balanced representation of the reference group should be ensured and data analysed in a disaggregated way.

—Conduct impact assessment (e.g. safety, energy use, pollutant emissions, traffic congestion, mobility behaviour, social inclusion, use of transport services, etc.) on real world data sets.

—Establish a pan-European common catalogue on necessary characteristics of cooperative decision, planning and control algorithms, including self-adaptation and learning features and ethical questions.

—Fulfil all security requirements to protect the system to any threats and avoid any conscious manipulations of the information enabling automated driving systems.

Proposed actions may consider C-ITS communication and European GNSS as a possibility to improve the safety and reliability of automated transport systems in the future.

The size of proposals will depend on the geographical coverage of the large scale demonstrations.

Consideration should be taken of gender aspects and other demographic factors such as ageing, etc.

The Commission considers that proposals requesting a contribution from the EU of between EUR 18 to 36 million each 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 demonstrate the technological readiness, reliability and safety of the automated driving functions in a large scale pilot at European scale. They will test automated vehicles at automation level 3 (including possible additional functions towards automation level 4) in mixed traffic situations. Actions are expected to demonstrate that automated driving systems for passenger vehicles can contribute to increase road safety and transport efficiency, reduce energy use, pollutant emissions and traffic congestions, and therefore support climate action and sustainable development objectives. This action will provide significant contributions in the following areas:

—User acceptance and the interaction between the driver, the vehicles and the traffic environment (including other road users) in different real traffic conditions.

—Wider socio-economic impacts of automated driving and the benefits for the driver in terms of mobility, comfort, convenience and safety and analyse specific issues related to gender and other demographic factors such as ageing, etc.

—Uptake of new automated transport business models.

—Benefits resulting from the interaction between automated driving technologies and V2X communication (connected driving).

ART-05-2016: Road infrastructure to support the transition to automation and the coexistence of conventional and automated vehicles on the same network

RIA ☑	IA ☒	CSA ☒

Specific Challenge

The foreseen step-wise introduction of automated vehicles in traffic will face a transition period where the coexistence of conventional and highly automated vehicles will have to be managed in order to ensure an uninterrupted level of safety and efficiency. Road infrastructure will play a major role in managing this transition period.

Scope

Proposals should address several of the following aspects:

—New methods of traffic flow modelling depending from the introduction of automated vehicles.

—Design, upgrading and adaptation of “hybrid” infrastructure (able to take into account the coexistence of fully or partially automated (connected or autonomous) and conventional vehicles).

—Required forms of visual and electronic signalling and optical guidance, ensuring readability by both automated and conventional vehicles, and enabling automated driving in also adverse road weather conditions.

—Best ways to enlarge the electronic road horizon for automated vehicle ensuring timely reaction to hazards ahead via real-time warnings and information, traffic management plans, up-to-date digital maps, etc.

—New safety performance criteria for road infrastructure, with the goal to set the basis for a timely deployment of automation-appropriate infrastructure network.

Urban and extra-urban roads could be included.

Proposals are invited to take due consideration of the content of projects already funded at European level through the CEDR's Transnational Research Programme[63].

In line with the Union's strategy for international cooperation in research and innovation[64], international cooperation is encouraged. In particular proposals should foresee twinning with projects funded by US DOT[65] to exchange knowledge and experience and to exploit synergies.

[63] http://www.cedr.fr/home/index.php?id=260

[64] COM(2012)497

[65] United States Department of Transportation (http://www.dot.gov/).

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 to 5 million each 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 demonstrate how innovative modelling, design and engineering of road infrastructure will facilitate the step-wise introduction of automated driving systems taking in consideration concerns for safety performance and users' appreciation.

12. Climate action, environment, resource efficiency and raw materials

SC5-13-2016-2017: New solutions for sustainable production of raw materials

RIA ☑ IA ☒ CSA ☒

Specific Challenge

The EU is highly dependent on raw materials that are crucial for a strong European industrial base, an essential building block of the EU's growth and competitiveness. Securing the sustainable access to raw materials, including metals, industrial minerals and construction raw materials, and particularly Critical Raw Materials (CRM), for the EU economy is of high importance. However, the EU is confronted with a number of technological challenges along the entire raw materials production value chain of primary and secondary raw materials. There is also a need for clean and sustainable raw materials production solutions to avoid environmental damage.

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

Scope

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

Assessment of the related environmental and safety risks and a plan to communicate the added value of the proposal to the local communities and society for improving public acceptance and trust should be addressed by all the proposals. Participation of civil society[66] from the start of exploration until after-mining activities in a process of co-design, co-development and co-implementation is strongly encouraged.

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

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

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

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

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

a) Sustainable selective low impact mining (2016): Proposals should develop new sustainable selective low impact technological solutions for mining of small mineral deposits (including those with chemically complex ore-forming phases) on the land. The proposals have to clearly show integration of mining solutions with the processing and/or metallurgy steps in order to justify economic viability of the overall process. Proposals should include the participation of technology oriented SMEs, as far as possible.

b) New technologies for the enhanced recovery of by-products (2016): Proposals should evaluate the potential by-products existing in primary or secondary raw materials (usually accompanying the major constituents at low concentrations) and should develop energy-, material- and cost-efficient new mineral processing and/or metallurgical technologies and processes to increase the selectivity and the recovery rates of valuable by-products, particularly Critical Raw Materials. The importance of the targeted sources of by-products for the EU economy has to be duly demonstrated in the proposal.

[66] See the paragraph on engaging society in the introduction to this Work Programme

c) New sensitive exploration technologies (2017): Proposals should develop new and more sensitive environmentally sound exploration technologies and solutions (such as remote sensing technologies, innovative multi-method approaches to reprocess existing or new geophysical data) able to identify targets for detailed exploration on the land with lower costs, leading to finding new deposits and to re-assessing the mineral potential for the EU. Any of the metallic, industrial and/or construction minerals could be targeted. The importance of the targeted raw materials for the EU economy has to be duly demonstrated in the proposal. Proposals should include the participation of technology oriented SMEs, as far as possible. Sea exploration is not targeted by this call.

Expected Impact

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

a)

- achieving the objectives of the EIP on Raw Materials, particularly in terms of ensuring the sustainable supply of raw materials to the EU and improving supply conditions within the EU;
- pushing the EU to the forefront in the area of sustainable mining technologies and solutions through generated know-how (planned patents, publications in high impact journals[67] and joint public-private publications etc.);
- unlocking substantial reserves of new or currently unexploited resources within the EU;
- improving the economic viability of small industrial mining operations;
- improving in the longer term the competitiveness of and creation of new jobs in mining and/or equipment manufacturing industries;
- safeguarding environmental stability and improving the health and safety performance of the operations;
- improving the awareness, acceptance and trust of society in a sustainable raw materials production in the EU;

b)

- achieving the objectives of the EIP on Raw Materials, particularly in terms of ensuring the sustainable supply of raw materials to the EU and improving supply conditions within the EU;
- pushing the EU to the forefront and improving the competitiveness and creation of new jobs in processing, refining, equipment manufacturing and downstream industries through generated know how (planned patents, publications in high impact journals and joint public-private publications etc.);
- increased process selectivity, broader range and higher recovery rates of valuable, particularly Critical Raw Materials;
- unlocking substantial reserves of new or today unexploited resources within the EU;
- increased economic performance in terms of higher material-, energy- and cost-efficiency and flexibility in minerals processing, metallurgical or recycling processes;
- improving the environmental performance of the operations, including a reduction in waste and emissions generation and a better recovery of resources from generated waste;
- improving the health and safety performance of the operations;
- improving the awareness, acceptance and trust of society in a sustainable raw materials production in the EU;

c)

- achieving the objectives of the EIP on Raw Materials, particularly in terms of ensuring the sustainable supply of raw materials to the EU and improving supply conditions within the EU;
- pushing the EU to the forefront in the area of sustainable exploration technologies and solutions through generated know how (planned patents, publications in high impact journals and joint public-private publications etc.);
- increasing the reserves of various primary raw materials within the EU;
- reducing the exploration costs for the industry through new cost-effective exploration technologies, while safe-guarding environmental stability;
- in longer term improving the competitiveness of and creating added value and new jobs in raw materials producing, equipment manufacturing, information and communication technologies and/or downstream industries;
- improving the awareness, acceptance and trust of society in a sustainable raw materials production in the EU.

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

SC5-14-2016-2017: Raw materials Innovation actions

RIA ☒	IA ☑	CSA ☒

Specific Challenge

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

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

This specific challenge is addressing development of the "innovative pilot actions"[68] which is one of the major targets of the European Innovation Partnership (EIP) on Raw Materials.

Scope

The main objective is to develop innovative pilots demonstrating clean and sustainable production of non-energy non-agricultural raw materials in the EU from primary and/or secondary sources.

All proposals should cover all the following points:

- justify relevance of selected pilot demonstrations, finishing at Technology Readiness Levels (TRL) 6-8, in different locations within the EU (and also outside if there is a clear added value for the EU economy, industry and society);
- facilitate the market uptake of solutions developed through industrially- and user-driven multidisciplinary consortia covering the relevant value chain;
- include an outline of the initial exploitation and business plans (with indicated CAPEX, OPEX, IRR and NPV[69]) with clarified management of Intellectual Property Rights, and commitment to the first exploitation;
- consider standardisation aspects when relevant;
- assess health, safety and environmental risks and their management for all proposed actions to avoid environmental damage and maintain overall ecological stability;
- include a plan to communicate the added value of the proposal to the local communities and society for improving public acceptance and trust should be addressed by all the proposals. Participation of civil society from the start of exploration until after-closure activities in a process of co-design, co-development and co-implementation is strongly encouraged.

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

Within the projects funded, additional or follow-up funding should be sought, be it private or public, including from relevant regional/national schemes under the European Structural and Investment Funds (ESIF), in particular under the European Regional Development Fund (ERDF), or other relevant funds such as the Instrument for Pre-accession Assistance (IPA II). To achieve this, projects could seek contact with ERDF/IPA managing authorities and with the authorities who developed the Research and Innovation Smart Specialisation Strategies (RIS3). The responsible regional/national authorities could then take an interest in the projects and their expected results. They could engage in the use and deployment of the novel solutions resulting from projects e.g. through pre-commercial public procurement or public procurement for innovative solutions. The project proposals could already indicate which interested regions/countries or other partners have been pre-identified for contact during the project. Please note, however, that reference to such additional or follow-up funding will not lead automatically to a higher score in the evaluation of the proposal.

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

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

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

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

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

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

a) Intelligent mining on land (2016): Proposals should develop and demonstrate new intelligent mining systems to avoid exposure of workers in dangerous operations, to increase efficiency and profitability, and to minimise environmental impacts of the mining operations. Any of the metallic, industrials and/or construction minerals could be targeted. The importance of the targeted raw materials for the EU economy has to be duly demonstrated in the proposal.

b) Processing of lower grade and/or complex primary and/or secondary raw materials in the most sustainable ways (2017): Proposals should demonstrate new systems integrating relevant processing and refining technologies for better recovery of minerals and metals from low grade and/or complex ores, industrial or mining wastes at increased efficiency in terms of better yield and process selectivity. The importance of the targeted raw materials and their sources for the EU has to be demonstrated in the proposal. The solution proposed should be flexible enough to adapt to different ore grades and should be supported by efficient and robust process control.

c) Sustainable metallurgical processes (2017): Proposals should develop innovative metallurgical systems integrating pyro-, hydro-, bio-, and/or electro-metallurgical and/or electrochemical technologies, in order to enhance the production efficiency, metal recovery and selectivity from primary and/or secondary raw materials.

Expected Impact

Projects are expected to justify and provide evidence that they:

a)

- contribute to achieving the targets of the EIP on Raw Materials, particularly in terms of innovative pilot actions on mining for innovative production of raw materials;
- have a market potential and the competitive technology advantage that will be gained through the pilot leading to expanding the EU business and to be implemented across the EU after the project is finished;
- push the EU to the forefront in the area of mining technologies and solutions through generated know how (planned patents, publications in high impact journals and joint public-private publications etc.);
- lead to unlocking substantial reserves of new or today unexploited resources within the EU.
- create added value and new jobs in raw materials producing, equipment manufacturing, information and communication technologies and/or downstream industries;
- lead to improving the health and safety performance of the operations;
- avoid environmental damage and maintain overall ecological stability;
- improve awareness, acceptance and trust of society in a sustainable raw materials production in the EU;

b)

- contribute to achieving the targets of the EIP on Raw Materials, particularly in terms of innovative pilot actions on processing and/or recycling for innovative production of raw materials;
- improve economic viability and market potential that will be gained through the pilot, leading to expanding the business across the EU after the project is finished;
- create added value and new jobs in raw materials producing, equipment manufacturing and/or downstream industries;
- optimise raw materials recovery (increased yield and selectivity) from low grade and/or complex and variable primary and/or secondary resources;
- push the EU to the forefront in the area of raw materials processing technologies and solutions through generated know how (planned patents, publications in high impact journals and joint public-private publications etc.);
- lead to unlocking substantial reserves by giving economic viability to new or today unexploited resources within the EU;
- improve the environmental performance, including reduction in waste generation and a better recovery of resources from generated waste;
- improve the health and safety performance of the operations; improve the awareness, acceptance and trust of society in a sustainable raw materials production in the EU;

c)

- contribute to achieving the targets of the EIP on Raw Materials, particularly in terms of innovative pilot actions for innovative production of raw materials;
- improve economic viability and market potential that will be gained through the pilot, leading to expanding the business across the EU after the project is finished;
- optimise metal production (increased yield and selectivity) from primary and/or secondary resources, while keeping competitive process performance in terms of resource and energy efficiency;
- push the EU to the forefront in the area of metals processing and refining technologies and solutions through generated know how (planned patents, publications in high impact journals and joint public-private publications etc.);
- create added value and new jobs in metallurgy, equipment manufacturing and/or downstream industries;
- improve the environmental (control of emissions, residues, effluents), health and safety performance of the operations;
- improve the awareness, acceptance and trust of society in a sustainable raw materials production in the EU.

SC5-16-2016-2017: Raw materials international co-operation

RIA ☒ **IA** ☒ **CSA** ☑

Specific Challenge

Many countries are facing similar challenges in the field of mineral raw materials as the EU, including dependence on supply of raw material from international markets, shortage of knowledge on raw materials and their flows for decision making by authorities, industry, financial sector etc. Understanding of the global nature of raw materials value chains and ensuring sustainable supply of primary and secondary raw materials for the EU requires knowledge of materials flows at a global level and relevant skills. At present, there is a shortage of specialists in the EU in some areas related to primary and secondary raw materials production and raw materials markets. This is a challenge that needs to be addressed at the EU level together with the relevant countries around the world having expertise in the field. In addition, the global nature of raw materials value chains requires common approach and solutions at a global level in order to ensure fair and unrestricted access to raw materials worldwide. There is therefore a need for a more active involvement of the EU in relevant initiatives and closer collaboration with competent international organisations in the field of raw materials.

Scope

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

a) Demand-supply forecast and raw materials flows at global level (2016): Proposals should develop a common methodology to mineral raw materials flows at global level which could be agreed and used at international level. As a pilot case, focus should be on critical raw materials and in particular the ones used in low-carbon technologies. The methodology should incorporate models on demand-supply forecast in order to allow for dynamic analysis of global materials flows. Proposals should provide recommendations and feed into future policy developments.

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

Proposals should build on the outcomes of the Study on Data Inventory for a Raw Material System Analysis and on related studies performed by the International Resource Panel.

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

b) Advancing the idea of a World Forum on Raw Materials (2016): With a view to contributing to the fair and unrestricted access to raw materials worldwide, this action should cover all the following points:

- develop an EU-based platform of international key experts and stakeholders that would advance the idea of a World Forum on Raw Materials and enhance the international cooperation among G20 Member countries as well as the other third countries active in the mining and other raw materials sectors.
- foster sharing of experience with a view to increasing understanding of all aspects of trade in raw materials and strategies to leverage natural resources for wider growth and development in close co-operation with the OECD to contribute to the OECD policy dialogue.
- where appropriate explore and foster synergies with the relevant EU Member States initiatives;
- identify common needs and threats, and develop and promote on international fora recommendations on

possible actions to consolidate the efforts of the countries involved towards a more joint and coherent approach towards raw materials policy and investment;

- involve relevant organisations, in particular OECD, International Study Groups, CONNEX, the Intergovernmental Forum on Mining, UNEP Resource Panel, in the planned activities.

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

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

c) International network of raw materials training centres (2017): Proposals should create a self-sustainable long-term lasting international network of training centres for professionals. The proposals should involve educational and research institutions in the EU and the leading counterparts in third countries, based on specific country expertise in the primary and secondary raw materials sectors. The network should map skills and knowledge in the EU and the third countries, identify key knowledge gaps and emerging needs, develop roadmap for improving skills and knowledge, as well as establish common training programmes in the raw materials sectors.

In line with the EU's strategy for international co-operation in research and innovation (COM(2012)497), international collaboration is required. Where appropriate, synergies with the relevant EU Member States initiatives are to be explored and fostered.

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

Expected Impact

The project is expected to contribute to:

a)

- implementation of the Raw Materials Initiative[70] and achieving the objectives of the EIP on Raw Materials, in particular in terms of establishing and maintaining strong and sustainable relationships with the countries concerned, in particular with Japan and US;
- better informed decision-making by authorities and companies at the EU and global levels;
- better understanding of global raw materials flows and market trends.

b)

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

c)

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

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

13. Europe in a changing world – inclusive, innovative and reflective Societies

ENG-GLOBALLY-09-2016: Centres/Networks of European research and innovation[71]

RIA ☒ IA ☒ CSA ☑

Specific Challenge

To create a network of centres in the world's most dynamic and innovative countries and regions that will connect and support European researchers and entrepreneurs globally, in order to strengthen the position of Europe as a world leader in science, technology and innovation.

Scope

To establish new centres, or networks of centres, building where possible on existing European science, technology and innovation structures located in international partner countries and regions in order to ensure economies of scale while avoiding unnecessary duplication. These centres/networks will engage in activities such as:

- Networking services including partnering events, workshops, boot camps, venture capital pitching events, best practice exchange, visits and tours etc.;
- Advice and support to European academic as well as industrial/private sector actors on how to internationalise by engaging in research and innovation in the international partner country/region; this may be based on studies, analysis and monitoring work, including on local conditions in the country/region, e.g. on local innovation and market framework conditions, on links between business needs, the labour market and training/education etc.;
- Advocacy towards international partner countries/regions in favour of open and responsible research and innovation;
- Providing work space, infrastructure and secondment opportunities to private and public European organisations that want to be represented in the partner country in an economic way while enjoying the synergies of co-location with other representatives of European organisations;
- Design and piloting of public/private funding mechanisms aiming at increasing alternative methods of finance of the Centres/Networks based on a demand driven set of services;
- Promotion, awareness raising and training activities, e.g. on European science, technology and innovation strengths and actors, on cooperation opportunities, on the international dimension of Horizon 2020, on opportunities offered by national programmes etc.

Proposed work shall seek to establish the centres/networks and ensure their initial operational phase. Establishment shall take place in accordance with a business model that shall aim to finance, in the medium term (at the latest by the end of the grant), part of the activities of the centre/network through service contracts with private and public clients. The services offered should be open on equal terms to all EU Member States and Associated Countries and their organisations.

Each proposal shall target one country and region that is an established or emerging science, technology or innovation leader; proposals addressing all or part of Brazil, China and the USA are strongly encouraged without excluding other countries with similar characteristics.

Consortia shall ensure adequate involvement of European stakeholders from existing structures or representations in the addressed partner countries/regions. Proposals should build on previous work of bilateral and regional international cooperation projects where appropriate.

A maximum of one proposal will be supported per international partner country or region. The Commission considers that proposals requesting an EU contribution of around EUR 3 million for a duration of 3-4 years would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Under this topic, legal entities established in the target country/region are eligible for funding from the Union.

Expected Impact

- Reinforced cooperation between European research and innovation organisations and researchers and those

[71] This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders. It is excluded from the delegation to Research Executive Agency and will be implemented by the Commission services.

of the Union's international partners;

- Higher visibility and prestige for European research and innovation and its actors in international partner countries/regions;
- Stronger presence of European organisations in the science and innovation environment of the partner country/region;
- Improvements in the framework conditions for international cooperation in research and innovation;
- Enhanced impact of results from research and innovation projects, including those under Horizon 2020, through increased access to excellence and to markets across the world.

CULT-COOP-08-2016: Virtual museums and social platform on European digital heritage, memory, identity and cultural interaction.

RIA ☑ **IA** ☒ **CSA** ☑

Specific Challenge

ICT changes the way cultural digital resources are created, disseminated, preserved and (re)used. It empowers different types of users to engage with cultural digital resources, for example through web discovery interfaces representing a wealth of information from collections (archives, scientific collection, museums, art galleries, visual arts etc.) enabling their re-use and re-purposing according to users' needs and inputs. The Virtual Museum (VM) is not a real museum transposed to the web, nor an archive or a database of virtual digital assets but a provider of information on top of being an exhibition room. VM provide opportunities for people to access digital content before, during and after a visit in a range of digital 'encounters'. Virtual museum is technologically demanding especially in terms of virtual and augmented reality and storytelling authoring tools which must covers various types of digital creations including virtual reality and 3D experiences, located online, in museums or on heritage sites. The challenge will be to give further emphasis on improving access, establishing meaningful narratives for collections and displays and story-led interpretation by the development of VM. It will also address the fundamental issues that are required to make this happen e.g. image rights, licencing and the ability of museums to support new ICT technology.

The emergence of new social paradigms in the area of European Heritage induce the creation of specific social platforms that will encourage an active participation of a large number of stakeholders aiming at a better understanding of the European cultural heritage. Moreover it should facilitate and support a better understanding of the past to better build our future. The challenge is to support the multidisciplinary awareness needed for providing a comprehensive framework for the accessibility, preservation, participatory and sustainable management of cultural resources and assets, based on a holistic, social understanding of European culture and cultural heritage. This challenge will contribute to the debate over these issues and opportunities by facilitating an open dialogue on how technological changes, new business models and scientific progress impact and accelerate developments, including social change, determine policy changes, and support new investments (both private and public) involving diverse actors with different stakes and agendas.

Researching digital cultural heritage is of key, long-term importance to Europe in order to form a robust knowledge base on how cultural heritage may develop in the 21st century. This will enable creative and innovative partnerships between museums, creative industries and public-domain areas such as education with transfer value to other socio-cultural areas and will advance strategies for heritage institutions, including museums, to harness transversal citizen resources and thus enhance their benefit to wider society.

Scope

a) Research and Innovation Actions

European cultural heritage is being radically transformed with the wide adoption of digital media used for engagement, participation and inclusion. Researching these transformations encompass the engagements of citizens in their own formation of heritage and the options for heritage institutions to capitalize on the new forms of communication and interaction.

The real potentiality of a virtual museum is in the creation of a personalized, immersive, interactive ways to enhance our understanding of the world around us. The audio-visual narrative is one of the best means to effectively communicate about objects in a museum to the ordinary visitor. Therefore, actions will focus on the development of highly innovative technologies, methods and ICT tools to significantly improve the 'digital encounter' including quality of images, sonic narratives, the display and interactivity with digital objects. Besides, actions should research and create new ways of personalised storytelling, interactivity and adaptive guidance, bridging the physical and the digital world. The technology resulting from the research should be validated in real life environments. During test and validation phases, due attention has to be paid to scalability, portability,

transmedia and interoperability of the technologies proposed and the support needed when implemented. Furthermore, social media tools should be integrated into the VM platform in order to facilitate exchange of information among users.

The Commission considers that proposals requesting a contribution from the EU in the order of EUR 2.5 million would allow this specific challenge to be addressed appropriately. This does not preclude submission and selection of proposals requesting other amounts.

b) Coordination and Support Action[72]

The scope of this action is to develop and maintain a sustainable platform engaging a large number of key actors, stakeholders and communities of practices on how to improve the collaboration and comprehension among the entire community, in order to build up a common roadmap for future activities and explore how these new encounters can be evaluated to understand the models. The platform should engage - and be open to all - practitioners and stakeholders wishing to contribute to decision making processes, agree on objectives and priorities, share experiences, policies and practices. Partnership and collaboration between public and private stakeholders should be encouraged. The platform will concretise its action through the organisation of workshops, conferences or any other awareness-raising actions.

The Commission considers that proposals requesting a contribution of EUR 1 million would allow this specific challenge to be addressed appropriately. This does not preclude submission and selection of proposals requesting other amounts.

Expected Impact

Virtual Museums and Social Platform are accessible for everyone, breaking the restrictions of geography and time. VM & SP will help to increase European citizens' curiosity for art and their understanding of cultural heritage. VM & SP will support access to culture and citizens' engagement with culture in less developed regions.

Researchers and scholars will benefit from the new possibilities to shape, access and study European Culture.

Synergies between virtual and traditional museums and cultural institutions will support the economic growth of the sector as measurable impacts will be achieved beyond the beneficiaries of the funded projects.

14. Secure societies – Protecting freedom and security of Europe and its citizens

CIP-01-2016-2017: Prevention, detection, response and mitigation of the combination of physical and cyber threats to the critical infrastructure of Europe.

RIA ☒ IA ☑ CSA ☒

Specific Challenge

Disruptions in the operation of our countries' infrastructure may put at risk the functioning of our societies and their economies. Such disruptions may result from many kinds of hazards and physical and/or cyber-attacks on installations and systems. Recent events demonstrate the increased interconnection among the impact of hazards, of the two kinds of attacks and, conversely, the usefulness for operators to combine cyber and physical security-solutions to protect installations of the critical infrastructure of Europe: A comprehensive, yet installation-specific approach is needed to secure the integrity of existing or future, public or private, connected and interdependent installations. Since the global financial crisis has imposed unprecedented budgetary restrictions on both the public and private sectors, new security solutions must be more efficient and cost-effective than the ones currently available.

Scope

Proposals should focus on one of the following critical infrastructures: Water Systems, Energy Infrastructure (power plants and distribution), Transport Infrastructure and means of transportation, Communication Infrastructure, Health Services, Financial Services.

Proposals should cover: prevention, detection, response, and in case of failure, mitigation of consequences (including novel installation designs) 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 not only address in details all aspects of both physical (e.g. bombing, plane or drone

[72] This activity is directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders. It is excluded from the delegation to Research Executive Agency and will be implemented by the Commission services.

overflights and crashes, spreading of fires, floods, seismic activity, space radiations, etc.) and cyber threats and incidents, but also systemic security management issues and the combinations of physical and cyber threats and incidents, their interconnections, and their cascading effects. Innovative methods should be proposed for sharing information with the public in the vicinity of the installations, and the protection of rescue teams, security teams and monitoring teams.

Only the installations not covered in 2016 will remain eligible in 2017. A list of topics that remain eligible in 2017 will be published in due time in the section "Topic Conditions & Documents" for this topic on the Participant Portal.

The participation of SMEs is strongly encouraged.

In line with the EU's strategy for international cooperation in research and innovation[73] international cooperation is encouraged, and in particular with international research partners involved in ongoing discussions and workshops, with the European Commission. Legal entities established in countries not listed in General Annex A and international organisations will be eligible for funding only when the Commission deems participation of the entity essential for carrying out the action.

The outcome of the proposal is expected to lead to development up to Technology Readiness Level (TRL) 7; please see part G of the General Annexes.

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

A maximum of one project will be selected per critical infrastructure listed in the “Scope” section of this topic over the 2016-2017 period.

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.

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.
- In situ demonstrations of efficient and cost-effective solutions.
- 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 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.

Contributions to relevant sectorial frameworks or regulatory initiatives.

[73] COM(2012)497

SEC-01-DRS-2016: Integrated tools for response planning and scenario building

RIA ☒ IA ☑ CSA ☒

Specific Challenge

At present, the wide range of sectors, disciplines and actors involved in disaster risk management are not sufficiently interlinked, which prevents efficient response planning and the building of realistic multidisciplinary scenarios. Integrated tools need to be developed to support such actions. Stronger partnerships among research, policy, (research or monitoring) institutes, industry/SMEs communities and practitioners, in particular first responders, are required for better preparedness of societies to cope with complex crisis situations.

Scope

Disaster risks (natural, accidental, or intentional) should be addressed in the context of:

- the EU Civil Protection Mechanism (Decision 1313/2013), which paves the way for reinforced cooperation in civil protection assistance interventions for the protection primarily of people, and also of the environment and property in the event of natural and man-made disasters, emergency situations in case of mass events, acts of terrorism and technological, chemical, biological, radiological or environmental accidents;
- the IPCC[74] recommendations in relation to extreme climatic events;
- the Sendai Framework for Disaster Risk Reduction at international level.[75]

Response to emergency situations resulting from the materialisation of such risks requires inter-organisational coordination among many actors, and efficient coordination requires improved response planning and scenario building. This can only be achieved through the integration of support tools that can be used operationally by a large variety of decision-makers, back-office experts, and first responders. Such tools can build upon previous and ongoing FP7 projects and preliminary results from H2020 actions to avoid duplication, and should be demonstrated in representative and realistic environments and situations involving firefighting units, medical emergency services, police departments, and civil protection units.

The participation of SMEs is strongly encouraged.

In line with the EU's strategy for international cooperation in research and innovation[76] international cooperation is encouraged, and in particular with international research partners involved in ongoing discussions and workshops, with the European Commission. Legal entities established in countries not listed in General Annex A and international organisations will be eligible for funding only when the Commission deems participation of the entity essential for carrying out the action.

The outcome of the proposal is expected to lead to development up to Technology Readiness Level (TRL) 7 or 8; please see part G of the General Annexes.

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

Expected Impact

Short term

- More efficient response capacity of the EU and between neighbouring countries in particular in the frame of the "request for assistance" mechanism
- Improved strategy for response planning and scenario building in the EU and beyond (in particular in the context of the Sendai Framework for Disaster Risk Reduction)

Medium term

- Enhanced autonomy, mobility (i.e. long range, quick deployment) and resilience of rescue and first aid organisations in case of natural or man-made disasters, including in remote regions or in case of emergency situations during mass events
- Updated knowledge of existing relevant capabilities, and of best practices and lessons learned from similar, past incidents
- Enhanced understanding of human factors in relation with events affecting critical infrastructure

74 Intergovernmental Panel on Climate Change COM(2012)497

75 http://www.wcdrr.org/uploads/Sendai_Framework_for_Disaster_Risk_Reduction_2015-2030.pdf

76 Intergovernmental Panel on Climate Change COM(2012)497

- Development of new tools, and adaptive networking of existing technologies (e.g. self-deploying infrastructure and autonomous sensors including passive sensors early warning systems, satellite-based integrated monitoring, system networks for recovery) that are useful for response planning and scenario building, including e.g. modular concepts and systems based on renewable energies, robust and flexible autonomous systems for transport and rescue missions, electric vehicles, emergency aircraft load planning optimisation, mobile power systems, new resilient electrical energy storage systems, mobile laboratories, autonomous system entities (land- and air-based) etc. using data exchange standards, demonstrating a high level degree of interoperability, the ability to be used in all-hazards approaches (man-made and natural disasters, and their combination), and compliant with EU guidelines and recommendations
- Development of scenarios developed in specific geographical areas with the direct involvement of local authorities and end-users
- Development of novel visual interfaces and user-friendly tools enhancing stakeholders and population awareness and involvement
- Consolidation of the methodology for cross-border (regional and Pan European) single and multi-risk scenario-building.
- Enhanced cooperation between autonomous systems entities: satellite-, sea-, land- and air-based systems, including but not limited to the Copernicus, Galileo and EGNOS systems, from different agencies and of a large variety of capabilities, and costs
- Assessment of the societal acceptance of such tools, also from an ethical point of view.
- Greater cooperation among actors involved in crisis management
- Stronger involvement of practitioners (e.g. first responders and monitoring institutes) in validating and testing of tools, concepts and methodologies

SEC-03-DRS-2016: Validation of biological toxins measurements after an incident: Development of tools and procedures for quality control

RIA ☒ IA ☑ CSA ☒

Specific Challenge

Recent incidents in Europe and worldwide recalled that biological toxins can be produced by laypersons or acquired illegally and intentionally released in a criminal act to harm people. While different technologies are available for toxin detection and analysis, recent findings have shown that the comparability of analytical results from different laboratories is poor, which cast severe doubts about the validation of current methods and about the overall validity of analytical data. This means that in case of a bioterrorist act using compounds such as e.g. ricin (or others such as abrin), saxitoxin, botulinum, neurotoxins, enterotoxins, etc. there is no guarantee that decisions to react are made based on data meeting basic quality requirements. The lack of quality assurance/quality control tools (e.g. certified reference materials of ricin, botulinum, etc.) and standard operating procedures hampers the validation and the EU-wide comparability of biological toxin measurement data. There is therefore a need to develop an EU-wide approach for enhancing validating analytical capacities for biological toxin measurements in case of bioterrorism threats, similarly to what exists regarding chemical threats.

Scope

The large variability among families of biological toxins complicates their measurement and unambiguous identification in human specimens, and environmental or food samples. Toxins are rapidly metabolised and degraded after incorporation, limiting the time window for successful identification and forensic analysis. Proposals should develop quality control tools, as well as the Standard Operating Procedures necessary for establishing a mechanism to systematically validate laboratory-based measurement techniques, including sample preparation strategies and analyses made in-situ issued by mobile and quickly deployable laboratories, which should be proposed for adoption at EU level.

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

Expected Impact

Short term:

- Development, production and certification of reference materials for biological toxin determinations as a basis for strengthened validation capacities;
- Establishment of a stepwise learning inter-laboratory programme enabling relevant laboratories to improve

their analytical skills and development and testing of an European Proficiency Testing (EPT) scheme from sampling to detection;

Mid term:

- Improved capabilities for the validation and testing of existing and emerging techniques, including sample preparation strategies, mobile laboratories for in-situ analyses and technical approaches for forensic analysis, for the detection and identification of biological toxins; Replacement of old "gold standards" employing animal experiments with death as endpoint for detection of potent biological toxins, by modern, in vitro methods as requested by EU regulations;

Long term:

- Based on the outcome of the EPT scheme, development of Standard Operational Procedures for the validation of analytical techniques, including in-situ techniques for biological toxin determinations in human specimens, environmental and food samples

SEC-14-BES–2016: Towards reducing the cost of technologies in land border security applications

RIA ☑	IA ☒	CSA ☒

Specific Challenge

Border management in European Union context means first and foremost the enforcement of the common policies and implementation of the common rules. As international travel flows continue to rise, there is growing pressure to process large volumes of people at border crossing points without delays. At the same time, the smuggling of people across the borders is growing. However, the external land borders of the European Union (and border crossing points) present a wide range of challenges, ranging from those relevant to Nordic Countries, to those in the Mediterranean.

The European Border Surveillance System (EUROSUR) is establishing a mechanism for Member States' authorities carrying out activities at the European Union external border to share operational and situational information and pictures. But without investments in technology and information systems, it is simply not feasible to manage borders and border crossing points. Whilst technology offers great potential to meet the dual objective of enhancing border security while facilitating cross-border travel, its costs are often prohibitive, especially in the light of the current national budgets. Furthermore, the broad variety of heterogeneous IT applications and systems deployed for land border security makes their management increasingly complex and costly. Innovative, cost-efficient technologies are needed, or existing ones need to become more affordable, to meet border authorities and practitioners' requirements, and budgetary constraints.

Scope

The cost of a broad variety of technologies could be made more affordable, in priority those used at border crossing points bearing the heaviest burden (based on the analysis of flows of people and of smuggling methods, associated risks, and bottlenecks in surveillance and/or control.)

The relevant border authorities are in the best position to identify the most relevant portions of the EU land borders that could benefit from more cost-effective solutions.

Cost reduction may result from: merging several advanced technologies into novel border security solutions; trade-off against performance; optimizing the use of technologies where they are most effective at mitigating risks further to specific risk analysis; achieving greater interoperability among systems; enabling the early provision of data in advance to the time of crossing.

The availability or scarcity of human resources and of space, the need for portable and versatile solutions are other parameters to be taken into account when considering the added value and cost of novel technologies solutions, including in terms of societal and ethical value and cost. In particular, the design of more homogeneous IT platforms, sharing an interface common to all operational databases and border security applications, is desirable to make their management less resource intensive.

Overlap with the work being undertaken by border surveillance authorities in the context of the EWISA project[77] should be avoided, whilst compatibility with previous results from FP7 or H2020 projects is encouraged.

Whereas activities will have an exclusive focus on civil applications, coordination with the activities of the European Defence Agency (EDA) may be considered with possible synergies being established with projects funded by the

[77] http://cordis.europa.eu/project/rcn/192052_en.html

EDA programmes. The complementarity of such synergies should be described comprehensively. On-going cooperation should be taken into account.

Proposers for this topic should look for an enhanced SME participation.

The outcome of the proposal is expected to lead to development up to Technology Readiness Level (TRL) 6; please see part G of the General Annexes.

Indicative budget: The Commission considers that proposals requesting a contribution from the EU of € 5million would allow for this topic to be addressed appropriately. Nonetheless this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact

Short/Medium term:

- Novel technologies, tools and systems (higher TRLs) demonstrating very substantial cost-reduction compared to existing technologies, tools and systems.
- Cost-reduction shall be assessed through the comparative testing of technologies, tools and systems in quasi-operational scenarios. Cost vs. benefit analysis must take account of functional needs, conditions of use, maintenance costs, performance and quality, impact on operating procedures, impact on travellers, training requirements for new skills, etc.

SEC-20-BES-2016: Border Security: autonomous systems and control systems

RIA ☒ **IA** ☑ **CSA** ☒

Specific Challenge

Low levels of situational awareness on the EU borders, high at sea and on unpopulated or scarcely populated land areas, are important factors of cost of border air, surface (land and sea) and underwater. Similarly the objects of their surveillance may be vessels, land vehicles, aircrafts, and underwater vehicles used, for instance, for smuggling and trafficking. Only enhanced command and control systems using advanced 3D computer graphics technology may allow to represent accurately the position of surveillance assets – including autonomous agents – and external objects in such complex environments.

Scope

The proposed action should cover one of the following sub-topics:

Sub-topic: 1.Autonomous surveillance

Autonomous agents should be adaptable: in order to deal, where applicable, with extreme and diverse weather and sea condition, including in the Artic region; interconnected: interoperable and capable of exchanging information among themselves and with the system's ground segment; tele-operable from the ground.

They should support missions ranging from surveillance to detection of marine pollution incidents, and including early identification and tracking of illegal activities and illegal communication.

They should operate as single units, but also in homogeneous or heterogeneous groups i.e. mixing aerostats, aerial vehicles with fix, rotary wings (or tilt-rotor), unmanned surface vehicles (USV), unmanned under-surface vehicles (UUSV), unmanned ground vehicles (UGV) with different types of sensor and communication suites on board, customized according to operational and environmental needs and addressing cross-cueing.

Autonomous agents should exchange information at tactical level and interface with each other and with command and control systems as they exist, today, at different levels.

Sub-topic: 2.Enhanced command and control systems for the surveillance of borders in a 3D environment Autonomous surveillance

Enhanced command and control systems should integrate:

- air surveillance technologies (including radar technologies for the detection of low flying aircrafts);
- coastal and underwater surveillance technologies (including coastal radar, maritime patrol aircraft (MPA), light patrol aircrafts, unmanned aerial vehicles (UAV), Patrol Vessels, UUV, etc.);
- ground surveillance technologies (including UGV);
- satellite-based services;
- maritime information services;
- 3D cartography and bathymetry servers;
- 3D modelling of situational picture based on 3D computers graphics engines;

- augmented reality technologies;
- mobile devices and handsets such as tablets and smartphones.

The participation of SMEs is strongly encouraged.

In line with the EU's strategy for international cooperation in research and innovation[78] international cooperation is encouraged, and in particular with international research partners involved in ongoing discussions and workshops, with the European Commission. Legal entities established in countries not listed in General Annex A and international organisations will be eligible for funding only when the Commission deems participation of the entity essential for carrying out the action.

The outcome of the proposal is expected to lead to development up to Technology Readiness Level (TRL) 6 or7; please see part G of the General Annexes.

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

Expected Impact

- Further development of the European Border Surveillance System (EUROSUR);
- Provision of more information that may be exchanged across sectors and borders through the Common Information Sharing Environment (CISE);
- New technologies for autonomous surveillance systems;
- Improved, cost-effective and efficient unmanned platforms for border surveillance systems, and the detection of marine pollution incidents;
- Adaptation of long-tested technologies to the specific requirements of borders control area;
- Agents and command and control systems interoperable with existing, multi-country European infrastructure.

DS-01-2016: Assurance and Certification for Trustworthy and Secure ICT systems, services and components

RIA ☑	IA ☑	CSA ☑

Specific Challenge

The constant discovery of vulnerabilities in ICT components, applications, services and systems is placing our entire digital society at risk. Insecure ICT is also imposing a significant cost on users (individuals and organisations) who have to mitigate the resulting risk by implementing additional technical and procedural measures which are resource consuming.

Smart systems, highly connected cyber-physical systems (CPS) are introducing a high dynamism in the system to develop and validate. Hence, CPS are evolving in a complex and dynamic environment, making safety-critical decisions based on information from other systems not known during development.

Another key challenge is posed by domains, such as medical devices, critical infrastructure facilities, and cloud data centres, where security is deeply intertwined and a prerequisite for other trustworthiness aspects such as safety and privacy.

The challenges are further intensified by the increasing trend of using third party components for critical infrastructures, by the ubiquity of embedded systems and the growing uptake of IoT as well as the deployment of decentralized and virtualized architectures.

In order to tackle these challenges, there is a need of appropriate assurances that our ICT systems are secure and trustworthy by design as well as a need of certified levels of assurance where security is regarded as the primary concern. Likewise, target architectures and methods improving the efficiency of assurance cases are needed in order to lower their costs.

Scope

a. Research and Innovation Actions - Assurance

Providing assurance is a complex task, requiring the development of a chain of evidence and specific techniques during all the phases of the ICT Systems Development Lifecycle (SDLC for short: e.g. design verification, testing, and runtime verification and enforcement) including the validation of individual devices and components. These techniques are complementary yet all necessary, each of them independently contributing towards improving

[78] COM(2012)497

security assurance. It includes methods for reliability and quality development and validation of highly dynamic systems.

Proposals may address security, reliability and safety assurance at individual phases of the SDLC and are expected to cover at least one of the areas identified below, depending on their relevance to the proposal overall objectives:

- Security requirements specification and formalization;
- Security properties formal verification and proofs at design and runtime
- Secure software coding;
- Assurance-aware modular or distributed architecting and algorithmic;
- Software code review, static and dynamic security testing;
- Automated tools for system validation and testing;
- Attack and threat modelling;
- Vulnerability analysis;
- Vendor (third-party) application security testing;
- Penetration testing;
- Collection and management of evidence for assessing security and trustworthiness;
- Operational assurance, verification and security policy enforcement;
- Adaptive security by design and during operation.

Proposal should strive to quantify their progress beyond the state of the art in terms of efficiency and effectiveness. Particular importance within this context should be placed on determining the appropriate metrics.

Proposals should take into account the changing threat landscape, where targeted attacks and advanced persistent threats assume an increasingly more important role and address the challenge of security assurance in state-of-the-art development methods and deployment models including but not limited to solutions focussing on reducing the cost and complexity of assurance in large-scale systems.

Proposals should include a clear standardisation plan at submission time.

The Commission considers that proposals requesting a contribution from the EU between EUR 3 and 4 million would allow this specific challenge to be addressed appropriately.

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

The outcome of the proposals are expected to lead to development up to Technology Readiness Level (TRL) 3 to 5; please see part G of the General Annexes.

b. Innovation Actions – Security Certification

Proposals should address the challenge of improving the effectiveness and efficiency of existing security certification processes for state-of-the-art ICT components and products including the production and delivery of the corresponding guidance materials.

In terms of effectiveness, proposals should address, amongst other factors, emerging threats, compositional certification and reuse of components in the context of certified systems and certification throughout the operational deployment of a product or a service.

In terms of efficiency, proposals should strive to reduce the cost and duration of the certification process.

Proposals may address security certification in any area of their choice. Consortia submitting proposals are expected to approach the selected topic as widely as possible including all necessary actors – e.g. industry, academia, certification laboratories - and involve the relevant certification authorities from at least three Member States in order to achieve added value at a European level.

Proposals are encouraged to work towards moderate to high assurance level protection profiles as a way to validate their results.

The Commission considers that proposals requesting a contribution from the EU between EUR 3 and 4 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

The outcome of the proposals are expected to lead to development up to Technology Readiness Level (TRL) 6 to 7; please see part G of the General Annexes.

c. Coordination and Support Actions

To complement the research and innovation activities in security assurance and certification in this topic, support and coordination actions should address the following:

Building trustworthiness: economic, legal and social aspects of security assurance and certification

- Study in depth the economic and legal aspects related to assurance and certification (including European-wide labelling), EU and International regulatory aspects;
- Explore and identify the interplay of relevant social, cultural, behavioural, gender and ethical factors with ICT systems with regards to their trustworthiness and security, actual or perceived
- Identify barriers and incentives in the market for certified products in the consumer and/or enterprise market;
- Produce a comprehensive cost/benefit model for security assurance and certification;

Engage with multidisciplinary communities and stakeholders.

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

Expected Impact

- European ICT offering a higher level of assurance compared to non-European ICT products and services.
- ICT products and services more compliant with relevant European security and/or privacy regulations.
- ICT with a higher level of security assurance at marginally additional cost.
- Facilitation of mutual recognition of security certificates across the EU.
- Increased market uptake of secure ICT products.
- Increased user trust in ICT products and services.
- Reduction of negative externalities associated with deployment of insecure ICT.
- More resilient critical infrastructures and services.
- Progress beyond the state-of-the-art in the effectiveness and efficiency of the areas addressed by the proposals.

17. Cross-cutting activities (Focus Areas)

PILOTS-01-2016: Pilot lines for manufacturing of materials with customized thermal/electrical conductivity properties

RIA ☒	IA ☑	CSA ☒

Specific Challenge

Advanced functional materials with customized thermal/electrical conductivity properties provide new opportunities in manufacturing.

The improved properties of sustainable advanced functional material with customized thermal/electrical conductivity properties will benefit end user industries in many sectors, Applications areas are wide ranging, and may include new manufacturing processes such as additive and 2D/3D printing processes and roll-to-roll or other large scale manufacturing processes.

The need for such materials, affordable, industrially robust and environmental friendly, calls for the upscaling of these widely researched materials and their manufacturing processes. This should ensure the further integration of the nano-enabled multifunctional materials into practical large-scale applications, and drastically exceed the current use in niche-markets.

Scope

The proposed pilot lines should address the development, upscaling and demonstration in relevant industrial environments.

They should use existing pilot lines as a starting point for development, incorporating new materials and methods and/or instrumentation with real time characterization for measurement, analysis and monitoring at the nanoscale to characterise relevant materials, process properties and product features.

The aim is to increase the level of robustness and repeatability of such industrial processes; to optimise and evaluate the increased performance of production lines in terms of productivity and cost-effectiveness; and finally to assess the sustainability, functionality and performance of the produced new materials.

Proposals should address the complete research-development-innovation cycle and obstacles remaining for industrial application, and involve a number of relevant materials producers and users, also considering the needs of SMEs.

Technology transfer should be considered and prepared through technology services at affordable costs, facilitating the collaborating with EU SME and large industries, and the rapid deployment and commercialisation of the new technology.

Examples of possible applications include multifunctional composites and polymeric materials for applications such as sensors, integrated electronics, lighting protection, thermal layers, thermoelectric components including inks, high-voltage insulators, and providing anti-pollution, noise, thermal or anti-scratch properties and/or sensing, health assessment and self-healing functions, etc.

Non-technological aspects key for the marketing of such products (e.g. standardization, regulatory issues, user acceptance, HSE aspects, LCA) need to be considered.

Activities are expected to focus on Technology Readiness Levels 4 to 6, and target Technology Readiness Level 7. This topic addresses cross-KET activities.

The Commission considers that proposals requesting a contribution from the EU between EUR 5 and 8 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact

The improved properties of advanced functional material with customized thermal/electrical conductivity properties can benefit end user industries such as automotive, aerospace, consumer durables, electrical and electronics, safety, healthcare, and energy.

Enhanced manufacturing capacities in Europe and/or enhanced market opportunities for European enterprises. These impacts should be addressed in particular in the outline of the business case and exploitation strategy to be submitted with the proposal. The expected content of this outline is further detailed in the LEIT introduction, section 6.

Impact should be presented at three levels:

1. Impact on the consortium materials producers and users, and other involved industries, demonstrated in the form of reduced costs and full consideration of environmental and safety legislation,

2. Other existing or new materials manufacturers, describing the expected impact from further integration of the nano-enabled multifunctional materials into practical large-scale applications with producers outside the consortium,

3. Global impact in form of direct or derived benefits from competitive advantage of the new materials in products.

The impact will also be improved by a contribution to training and knowledge dissemination for building an educated workforce.

Overall the action is expected to help driving the demand in Europe as well as support the penetration of new markets worldwide. This should include clear benefits to manufacturers, including SMEs, and new entrants into the market should be expected.

PILOTS-02-2016: Pilot Line Manufacturing of Nanostructured Antimicrobial Surfaces using Advanced Nanosurface Functionalization Technologies

RIA ☒ IA ☑ CSA ☒

Specific Challenge

Infections by pathogenic microorganisms adhering on various surfaces kill worldwide more people than any other single cause.

These diseases are of particular significance in hospitals (surfaces/furniture, medical devices/implants, surgery equipment, health care products and hygienic applications) as well as in water purification systems, textiles, food packaging and storage, domestic appliances, etc.

Alternatives to antibiotics to control infectious biofilms are required, due to the increasing prevalence of antibiotic resistant bacterial strains. The increasing demand for superior quality medical devices and improved sanitation calls for the development of nano-enabled surfaces with antimicrobial functionality.

Nanotechnologies for water treatment units in industrial environments is another example where innovation is required in addressing environmental factors, decisive for industrial competitiveness.

Also food safety issues are of increasing public health concerns. Protection and preservation of food by using active and intelligent packaging materials is a promising route to prevent foodborne illness outbreaks and reduce food waste caused due to early spoilage.

Addressing these challenges calls for the industrial upscaling of manufacturing processed for generation of nanostructured and/or functionalised antimicrobial surfaces and biomaterials having anti-biofilm activity, and eventually including smart sensing and environment dependent functionalities. Technologies that are affordable and industrially robust are required. This should ensure the further integration of the nano-enabled multifunctional materials into practical large-scale applications, and drastically exceed the current use.

Scope

The proposed pilot lines should address the development, upscaling and demonstration in relevant industrial environments of reliable materials and manufacturing processes to obtain nanostructured surfaces with antimicrobial, biocompatible, anti-adhesive properties.

They should use existing pilot lines as a starting point for development, incorporating new materials and methods and/or instrumentation with real time characterization for measurement, analysis and monitoring at the nanoscale to characterise relevant materials, process properties and product features.

The aim is to increase the level of antimicrobial effectiveness, robustness and repeatability of such industrial processes; to optimise and evaluate the increased performance of production lines in terms of productivity and cost-effectiveness; and finally to assess the functionality and performance of the new materials/products.

Proposals should address the complete research-development-innovation cycle and obstacles remaining for industrial application, and involve a number of relevant materials producers and users, also considering the needs of SMEs.

Specific aims of the proposed actions could be

- The fabrication of new antimicrobial surfaces, or the improvement of existing ones via the application of surface coatings, or the modification of the surface architecture, in order to eliminate or substantially reduce the extent of bacterial attachment on these surfaces are foreseen. A multi-functional approach should be followed for the development/modification of the nanostructured surfaces ((i.e. prevention of adhesion combined with killing of microorganisms and evt. combined with smart sensing functionalities)

Technology transfer should be prepared through technology services at affordable costs, facilitating the collaborating with EU SME and large industries, and the rapid deployment and commercialisation of the new technology, including for example industries or municipalities located in deserted zones or islands etc.

Non-technological aspects key for the marketing of such products (e.g. standardization, regulatory issues, user acceptance, HSE aspects, LCA) need to be considered.

Activities are expected to focus on Technology Readiness Levels 4 to 6, and target

Technology Readiness Level 7. This topic addresses cross-KET activities.

The Commission considers that proposals requesting a contribution from the EU between EUR 5 and 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

Societal challenges in the healthcare, water and food processing fields are addressed. Medical and healthcare are obvious markets, but it is also expected to see contributions to solving other social challenges such as sustainable solutions for availability of clean water or improving on food safety.

Improved hygiene in hospital environments and prevention of cross-infections will show economic and social benefits of scale, resulting from such reduced needs for treatment of infectious diseases acquired during hospitalization.

Adding anti-microbial, anti-adhesion functionalities to water treatment equipment or food packaging is another potential area where benefits can be derived from reduced operational costs and increased water or food quality.

The aim is to facilitate the manufacturing and use of these surfaces and their production, and establish process control and characterization approaches for an industrial production. Direct benefit to the involved industries should be demonstrated in the form of reduced costs and full consideration of environmental and safety legislation.

Enhanced manufacturing capacities in Europe and/or enhanced market opportunities for European enterprises. These impacts should be addressed in particular in the outline of the business case and exploitation strategy to be submitted with the proposal. The expected content of this outline is further detailed in the LEIT introduction, section 6.

The impact should be presented at three levels:

1. Impact on the consortium materials producers and users, and other involved industries, demonstrated in the form of reduced costs and full consideration of environmental and safety legislation.

2. Other existing or new materials manufacturers, describing the expected impact from further integration of the nano-enabled multifunctional materials into practical large scale applications with producers outside the consortium,

3. Global impact in form of direct or derived benefits from competitive advantage of the new materials in products.

The impact will also be improved by a contribution to training and knowledge dissemination for building an educated workforce.

Overall the action is expected to help driving the demand in Europe as well as support the penetration of new markets worldwide. This should include clear benefits to manufacturers, including SMEs, and new entrants into the market should be expected.

FOF-01-2016: Novel hybrid approaches for additive and subtractive manufacturing machines

RIA ☑ **IA** ☒ **CSA** ☒

Specific Challenge

Manufacturing has been using for the production of goods and wares many different processes that can be classified as subtractive or additive processes. Traditional machines have been normally focused on only a single type of these processes but there is a new generation of machines that combines the features of individual manufacturing processes into a single platform.

These hybrid manufacturing processes can enable a high-value and sustainable manufacturing by keeping the advantages of the single processes in a single machine whilst reducing their disadvantages. Nevertheless, the enhanced features of the hybrid machines bring as well an increasing process complexity and higher costs of production that impact the final price in the market of the produced items. High added value products with complex structures can balance out those production costs.

New hybrid machines, equipped with both subtractive and additive manufacturing technologies, can be a game changer to create new opportunities and applications for Additive Manufacturing (AM). The great potential of AM is in most of the cases limited by the subtractive post-processing steps needed to ensure optimal tolerances and surface finish. These hybrid combinations can also enable the production of larger items than in AM single machines and have a large potential for repair applications.

Scope

Proposals should address the development of advanced All-in-one machines that enable the production of a part/product directly from a CAD model in a short time and without the need of post-processing steps. A variety of Additive Manufacturing technologies and different materials can address this challenge by means of new and/or innovative processes.

- Develop new machine concepts and designs into a single set-up processing and process control.
- Full integration and automation of the subtractive and additive processes in the machine
- Increased build rate of the machine in comparison to the separate processes
- Production of parts/products that are functional and with the final desired accuracy, surface-finish and tolerances and material efficiency
- Properties of the new components after the manufacturing process

The proposal must include at least one demonstrator in real industrial settings in order to show the industrial viability of the solution.

Activities are expected to focus on Technology Readiness Levels 4 to 6.

The involvement of SMEs is encouraged.

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

The developed novel hybrid approaches should lead to a remarkable impact in the following terms:

- 20% reduction in time and cost, with respect to the current additive and subtractive processes.
- 15% increase in productivity for high-volume AM production, with respect to the current additive and

subtractive processes.

- More flexibility and robustness of the machines to adapt with customisation and changing market needs
- Reduction of inventory because of the making of products on-demand
- Reduction of work floor space
- Create localised manufacturing environments and reduce supply chains length
- Contributions to standardisation and certification for new hybrid procedures.

The role of SMEs and their potential as manufacturers and end-users for the developed machines needs to be considered, in order to ensure the access to existing and new markets.

Proposals should include a business case and exploitation strategy, as outlined in the Introduction to the LEIT part of this Work Programme.

This topic complements other call topics in this area funded under FoF-13-2016

FOF-02-2016: Machinery and robot systems in dynamic shop floor environments using novel embedded cognitive functions

RIA ☒	IA ☑	CSA ☒

Specific Challenge

Current production shop floors are organised in a fixed combination of sequential automated and manual tasks. Each station, in which one or more tasks are performed, is designed for optimal productivity, and the whole linear sequence of operations is as well optimised for productivity. This paradigm is efficient when production is set to the maximum capacity and the same tasks are repeated in the same way in each cycle. However, this does not scale well to other situations. The complexity and cost of shop floor organization increases dramatically when it comes to flexible production or logistics, as for example when mixing different product models, and the cost for introducing a new product reference is also very high. Moreover, this model lacks the capacity to react to unexpected technical problems that may arise.

Future shop floors have to endorse flexibility and define networks in which a tight collaboration between humans, machines and robots is key for performance e.g. maintenance operations and changes in product set-up. Therefore the shop floors must be supported by enhanced perception capabilities including the ability to reason over the perceived environment. By using novel embedded cognitive functions, machinery and robots should be able to collaborate as network agents in a realistic semi-structured environment, being able to adapt their behaviour in order to give a response to unforeseen changes or situations.

Furthermore, the cognitive capabilities will allow the machinery and robots to evolve from being programmed for a dedicated task to the handling of a multitude of different tasks.

Scope

Research activities should address at least three of the following areas:

- Perception as an integrated cognitive capability, considering collaborative perception (counting not only with on-board sensors, but also with the sensing capabilities available in the whole shop floor), scene understanding, reasoning and acting (active perception).
- Perception as a way to create intelligent, dexterous "universal" devices for handling or manipulation of products or tools (e.g. handling of soft or shape changing objects, non-task dedicated devices)
- Mobility as a key factor for flexibility: machinery and robot systems should not only be able to autonomously navigate in realistic changing scenarios, but also develop the competences to switch from environment level navigation to the accurate positioning required to complete the operations.
- Methods and technologies to eliminate physical barriers such as safety guarding or enclosures have already been developed, but lack in inherent safety of the overall system. Cognitive capabilities in order to guarantee safety at all times, including when the system is down (e.g. maintenance, failure) should be researched so that it is possible to open the way to certification.
- Adaptation through context awareness and reasoning, aiming at making machinery and robots aware of their surroundings, so that they can perceive and obtain information on the non-programmed and non-expected situations, and adapt their behaviour in order to better handle them, while taking into account safety aspects.
- Life-long learning and knowledge sharing tools, reducing to the minimum the initial programming efforts, and reusing the acquired abilities and competences over the existing machines.

Robots and machines should not be considered as individual agents, but will have to be part of an overall interactive network which should be defined and possibly standardised.

Proof of concept in terms of at least one demonstrator should be delivered before the end of the project, excluding commercially usable prototypes, but convincingly demonstrating scalability towards industrial needs taking into account age and gender aspects, and making a clear case for the safety of the worker under all circumstances.

Activities are expected to focus on Technology Readiness Level 5 to 7 and to be centred around TRL6.

This topic addresses cross-KET activities.

The Commission considers that proposals requesting a contribution from the EU between EUR 4 and 6 million would allow this specific challenge to be addressed appropriately.

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

Expected Impact

The developed machinery and robot systems should lead to a significant impact in the following areas:

- Automation of previously manual production in order to bring European production plants in cheap labour countries back to Europe
- Strengthen global position of European manufacturing industry through the introduction of the new technologies related to machinery and robots with enhanced capabilities
- Strengthen the innovation potential of European manufacturing industry through the creation of new products made possible with the new developed technologies
- Reduction of 20% of set-up and new product adaptation costs, increasing efficiency
- Significant improvement in the adaptability of manufacturing systems.

In order to ensure a high impact, both standardisation and certification activities have to be addressed in the proposal.

Proposals should include a business case and exploitation strategy, as outlined in the Introduction to the LEIT part of this Work Programme.

This topic complements other call topics in this area funded under FOF-12-2017 a.ii and LEIT-ICT Robotics topics

FOF-03-2016: Zero-defect strategies at system level for multi-stage manufacturing in production lines

RIA ☒	IA ☑	CSA ☒

Specific Challenge

The current trend in multi-stage manufacturing is towards more complex, distributed and faster evolving manufacturing facilities. To develop a zero-defect strategy to cope with increasing competition and sustainability related issues, plants should be designed and managed using best practices from emerging key enabling technologies. Manufacturing processes have to be environmental friendly and safe and deliver high quality products adapted to customer requirements, whilst minimising costs.

Within a context of market globalisation, the quality of products has become a key factor for success in manufacturing industry. The growing unpredictability of demand necessitates continuous adjustments in production targets. The increasing interest in sustainable production places a premium on reducing material waste, re-works, rejects and stocks and has led to a demand for the development of zero-defect strategies at system level.

Scope

Proposals should develop tools and methods for multi-stage manufacturing production with the aim of preventing defect generation and propagation as part of a system-level zero-defect strategy. In this context, integrated production and quality control strategies able to achieve the desired production rate for high quality products need to be developed. They should include both tools to prevent the generation of defects at single stage level and tools to prevent the propagation of defects to downstream stages.

Quality control tools should be supported by distributed on-line data gathering systems, on-line inspection tools, on-line defect management policies (i.e. on-line re-work or workpiece repair), inter-stage information and part flow control strategies and selective inspection policies to achieve higher control of the most critical stages in the system. The final aim is to achieve production system configurations that profitably exploit the quality/productivity trade-off at system level whilst reducing complexity.

Research activities should cover several of the following fields in a multidisciplinary approach:

- Methodologies and strategies for integrating production and quality systems into the multi-stage

manufacturing process.

- Knowledge management tools to facilitate problem resolution, alarm triggering, transferring knowledge from one process or product variant to another and early detection based on lessons learnt, previous alarm activations, trends, etc.
- On-line inspection Tools for understanding, monitoring, analysis and real-time fault diagnosis of industrial process operation and product quality.
- Development of system-level zero-defect strategies to prevent the generation of defects at single stage level and propagation of defects to downstream stages.
- Distributed on-line data gathering systems and on-line defect management policies.
- Inter-stage information and part flow control strategies and selective inspection policies.

Activities are expected to focus on Technology Readiness Levels 5 to 7 and to be centred around TRL6.This topic addresses cross-KET activities.

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

Expected Impact

The developed zero-defect strategies at system level should lead to a significant impact in the following terms:

- Achievement of zero defects in a multi-stage production line
- Reduction of production costs by 15%
- Increased production flexibility. Higher production rates by 15%
- Reduction of waste and scrap by 10%
- Wide adoption of the new strategies in the existing manufacturing systems.

Proposals should include a business case and exploitation strategy, as outlined in the Introduction to the LEIT part of this Work Programme.

FOF-04-2016: Continuous adaptation of work environments with changing levels of automation in evolving production systems

RIA ☑	IA ☒	CSA ☒

Specific Challenge

Despite high automation levels in factories today, humans remain central to manufacturing operations.

In the past, and due to human flexibility, workers were expected to adapt to machine requirements. However, today's machines increasingly allow these roles to be reversed with automation systems becoming ever more adaptable to the capabilities of workers, and work organisation becomes more flexible in terms of time and place. Furthermore, higher levels of product customisation and variable requirements, call for new adaptive human-centred automation approaches, complementing the cognitive capabilities of humans by advanced sensing and the higher precision of machines.

Modern manufacturing system design builds on an optimal and continuous distribution oftasks between humans and machines for higher performance, adaptability and quality.

Scope

Research activities should address all of the following areas:

- Determination of adequate levels of automation for optimal flexibility, agility and competitiveness of highly customised production. Adaptive automation systems should accommodate to the worker's skills and flexibility needs, be it by compensating limitations (e.g. due to age or inexperience) or by taking full advantage of the worker's experience;
- Methods and tools for a continuous adaptation of workplaces to the physical, sensorial and cognitive capabilities of workers (especially of older and disabled people in those workplaces) and their socio-economic needs, by taking into consideration "safety and health at work" requirements. An adequate methodology to measure "worker satisfaction" should be developed and tested. The underlying theoretical framework should in particular involve knowledge from a socio-organisational and psychometrics perspective, including the engagement of workers in the design and adaptation of their workplace to ensure attractiveness;
- Exploit technologies such as virtual (and/or augmented) reality to support process and workplace simulations

and industrial social networking with rich user experience for knowledge capture and decision support with a strong focus on usability, user acceptance and training.

This topic requires a user-driven approach through a collaborative effort between social scientists and engineers to (a) come to an adequate understanding of "worker satisfaction" and the relevant quantitative indicators, and to (b) introduce the concept of "usability" of machines by the worker on the shop floor (particularly concerning elderly, disabled or other target groups with special needs) thus contributing to improving worker safety and health.

Age and gender aspects should be taken into account.

Activities are expected to focus on Technology Readiness Levels 4 to 6.

This topic addresses cross-KET activities.

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

The developed new technologies should lead to a remarkable impact in the following terms:

- 20% increase in adaptability, e.g. product customisation capability;
- 10% quality increase in total system (human and automation) performance, e.g. quality or productivity;
- Increased worker satisfaction and strengthened global position of industry in Europe through higher social acceptance levels.
- Wide adoption of the new developments in advanced manufacturing systems.

Proposals should include a business case and exploitation strategy, as outlined in the Introduction to the LEIT part of this Work Programme.

FOF-05-2016: Support for the further development of Additive Manufacturing technologies in Europe

RIA ☒	IA ☒	CSA ☑

Specific Challenge

Additive Manufacturing (AM), including 3D-Printing, is one of the potential game changers that, for some applications, has already reached a tipping point of maturity. European companies are still strong in some areas but this position requires high levels of continuous innovation, especially where competitors are fast approaching. There are also other areas that are comparatively less developed and where the technology transfer and adoption is not functional, leading to a slow uptake of the results.

Despite the EC support, in the global picture the competitiveness of the European companies is threatened by important investments at international level. Moreover, some of the more fundamental aspects in order to take advantage of this promising technology still need to be addressed.

It is necessary to identify current bottlenecks and barriers to further development of AM technologies in Europe. Furthermore the stakeholders also need to be mobilised in order to exploit the business opportunities that AM provides, facilitating the take-up of this technology in Europe, with a focussed promotion and support strategy for Additive Manufacturing technologies.

Scope

The proposals should address most of the following aspects:

- Identification of gaps and opportunities for further research and innovation, as well as non-technological gaps in order to develop policy framework recommendations (e.g. regulation, standardisation, public procurement).
- Community building activities (think-and-do-tank) and actions to foster dialogue and collaboration across levels (stakeholders and governance) and with key strategic partners, the Member States and the European Commission. This broad multi-stakeholder community (science, policy, business, society) at local, regional, national and EU level will enable the launching of innovation partnerships for developing and testing of AM.
- Assessment of the current regulatory and IPR frameworks, micro- and macro-economic assessment of opportunities and risks and its impact on social aspects and labour market benefits.
- Productivity and resource efficiency gains through AM and its impact on European competitiveness through localised manufacturing, where more goods will be manufactured on demand, individually designed and close to their point of consumption.

- Identification of current bottlenecks for the transferability of new technologies across sectors.
- Development of best practices to help stakeholders to achieve large scale deployment.
- Identification of bottlenecks that prevent the stimulation of investments in new AM technologies and promote successful innovative AM solutions.
- Support information exchange and collaboration between EU funded projects which address the same AM areas to exploit synergies, particularly through SMEs.
- Development of new integrated design and manufacturing paradigms, where the time to replan, reprogramme and evolve in the shop floor production is reduced.
- Building skills capacity for innovation and competitiveness, engaging with academia for the development of learning resources adaptable to different learning approaches and curricula at undergraduate, master, and life-long learning levels.
- Assesment of the current regulatory and IPR frameworks; anti-counterfeiting features, particularly where high value and/or safety critical components are being manufactured; micro- and macro-economic assessment of opportunities and risks; and its impact on social aspects and labour market benefits.

Proposals should include the organisation of workshops with top-ranked international experts and EC services from the various disciplines aiming at the elaboration of a future AM roadmap, as well as an International Conference on AM at the end of the project.

In order to ensure the industrial relevance and impact of the research effort, the active participation of industrial partners represents an added value to the activities and this will be reflected in the evaluation, under the criteria Implementation and Impact.

The Commission considers that proposals requesting a contribution from the EU between EUR 750000 and 1000000 would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

No more than one action will be funded.

Expected Impact

- The proposals are expected to have an impact on the European AM community in the following ways:
- Create a network of research and industry partners for further RTD and industrial innovation and contribute to the sharing of European best practices.
- Create links and foster collaboration with relevant European initiatives and activities, e.g. Additive Manufacturing Platform within the ManuFuture ETP and the Vanguard Initiative.
- Speeding up industrial exploitation and take up of results of AM and facilitate cross-sectorial technology transfer.
- Early awareness of key innovation developments and anticipation of business trends and market prospects.
- Training and educational skills capacity in the AM community, both at academic and professional level.
- Enabling regulatory authorities to address better the relevant issues based on a thorough assessment of the current legal framework, IPR management and standardisation needs.
- Rationalising the process to deliver standardisation mandates to the European Standards Organisations.
- Favour investment of financial players in additive technologies application.

FOF-13-2016: Photonics Laser-based production

RIA ☑ **IA** ☑ **CSA** ☒

Specific Challenge

Laser-based manufacturing has become very competitive and is one of the back-bones of modern production technologies. Highly accurate mass production is available for a wide range of products in a wide range of industries. Whilst laser processing is highly flexible, the change from one production lot to the next usually requires operator intervention, reconfigurations and costly down times to adjust current processing tools to the new task. The trend to individualisation requires a high degree of digitization as well as tools and systems which are highly autonomous and automated to reduce production time and costs.

Additive manufacturing (AM) offers a number of advantages over conventional manufacturing including the unprecedented freedom of design for example in terms of geometry, material composition and intrinsic properties of the work piece. Whilst laser-based AM is used for prototyping and has begun to penetrate some smaller markets, it is not yet competitive on a larger scale especially with respect to production speed and costs. In order to

increase the productivity of laser-based AM and to bring it a significant step further towards industrial manufacturing a better mastering of all stages of the process chain and their interaction is necessary.

Scope

a. Research and Innovation Actions

From "design to piece" – Excellence in laser-based additive industrial manufacturing[79]: From Design to the final work piece, the topic addresses laser-based additive industrial manufacturing of metallic materials. All process chain steps may be addressed, for example CAD, modelling of the additive process, the additive process itself including the use of several materials in a single work piece, process control and quality assurance, the combination of additive and subtractive processes, surface finish and precision, etc. Materials for AM and their quality control are considered as a step. Proposals must cover at least two important steps in the process chain and the relevant links between them. The goal is to significantly improve the overall performance in terms of speed and costs whilst producing high quality work pieces. Standardisation aspects should also be addressed as appropriate. Proposals should be driven by concrete business cases and include the relevant partners of the value chain and proposals should contain an outline business case and industrial exploitation strategy, as outlined in the Introduction to the LEIT part of this Work Programme.

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

b. Innovation Actions

Rapid individualised laser-based production: Develop and set-up efficient, highly flexible high throughput pilot facilities on the basis of existing processes for laser-based production and to validate them in real settings. This will require advances in a number of aspects, including intelligent networking and machine cooperation, data handling, modelling, work piece handling, beam delivery, integration of different processes, monitoring, process control etc. Actions must be industry driven and include the key stakeholders running the pilot facility. Proposals should contain an outline business case and industrial exploitation strategy.

The Commission considers that proposals requesting a contribution from the EU 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 describe how the proposed work will contribute to the following impact criteria and provide metrics, the baseline and targets to measure impact.

a. Research & Innovation Actions

- Reinforced industrial leadership in laser-based Additive Manufacturing.
- Substantially improved production speed, improved productivity and substantially reduced costs of laser-based Additive Manufacturing.

b. Innovation Actions

- More efficient, more flexible and higher throughput of individualised laser-based production.
- Improved competiveness and strengthened Europe's market position of laser-based manufacturing industry (equipment and suppliers) and the end-user industry.

SPIRE-01-2016: Systematic approaches for resource-efficient water management systems in process industries

RIA ☒	IA ☑	CSA ☒

Specific Challenge

Nowadays, 12% of water utilisation in the EU is devoted to industrial use. Since water is a scarce resource, it is crucial for the European industry to change the current paradigm and develop more sustainable and efficient water technologies, which is also an important element for increasing its competitiveness, because a significant amount of energy is consumed for industrial water treatment. In the sustainable development context, efficient water use is closely linked to the efficient use and re-use of other resources, such as energy, chemicals, raw materials and soils. As such, these aspects need to be considered holistically in order to develop sustainable solutions.

Scope

[79] Theme a. is complementing the topic RTD-FOF1-2016

The main objective is the optimisation of the use of water in industry. Research activities should focus on several of the following areas:

- Combining existing technologies (e.g. advanced processing, nano-technology and materials) in order to achieve enhanced sustainability in water treatment processes by reducing water use, energy and raw materials consumption and at the same time minimizing waste and/or recovering valuable substances.
- Selective separation processes in order to be able to treat specific industrial fluxes, also leading to the recovery of valuable substances.
- Adaptation of current processes or equipment to use alternative water sources. e.g. rainwater, salt or brackish water, cooling water, or Waste Water Treatment Plant (WWTP) effluent.
- Alternative cooling/heating methods. Reducing the energy levels that are needed for water and steam related production processes; dry cooling technologies; water and energy recovery processes from water vapour.
- Use of renewable energy, in order to achieve low energy water treatment processes (e.g. photo-degradation of pollutants).
- Development of closed loop recycling and reuse, involving cascading of processes and industrial water symbiosis.
- Development of a sustainable strategy for selecting materials and infrastructure for water transport and use, including water storage and treatment.

The proposals should also include a Life cycle analysis, since it offers the framework to deliver meaningful information on the "water footprint" of manufactured goods, delivered services, business operations and consumer behaviour. The total footprint of the process regarding water, energy and resources should be considered.

Activities are expected to focus on Technology Readiness Levels 5 to 7 and to be centred around TRL 6. This topic addresses cross-KET activities. The proposals are expected to allocate at least 30% of the budget to demonstration activities.

This topic is particularly suitable for SMEs.

The Commission considers that proposals requesting a contribution from the EU between EUR 5 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.

Expected Impact

- Reduction of at least 20% in water use compared to the current practice in the sector.
- Reduction of at least 30% in wastewater production compared to the current practice in the sector.
- Reduction of at least 15% in energy use compared to the current practice in the sector.
- Minimising the Water Footprint, employing less water intensive or waterless technologies and increasing recycling.
- New technology developments in water treatment and wide adoption of these technologies to enhance sustainability in the process industries.
- Decouple the industrial production from the utilisation of fresh water reserves

In order to properly monitor the Resource Efficiency Impact, Key Performance Indicators should be implemented.

Proposals should include a business case and exploitation strategy, as outlined in the Introduction to the LEIT part of this Work Programme.

18. Fast Track to Innovation Pilot

FTIPilot-01-2016: Fast Track to Innovation Pilot

RIA ☒	IA ☑	CSA ☒

Specific Challenge

Innovation is fostered when new ideas can emerge and easily translate into socio-economic value. Working together, partners with complementary backgrounds, knowledge and skills, and in new and established value-chains, can turn these ideas into sustainable innovative products, processes and services that both address societal challenges and/or are highly competitive in global markets. FTI aims to accelerate this commercialisation process by providing extended funding opportunities through an open and agile scheme nurturing bottom-up ideas from innovative constituencies across Europe.

Scope

The FTI pilot supports projects undertaking innovation from the demonstration stage through to market uptake, including stages such as piloting, test-beds, systems validation in real world/working conditions, validation of business models, pre-normative research, and standard-setting. It targets relatively mature new technologies, concepts, processes and business models that need a last development step to reach the market and achieve wider deployment. To this end, if a proposal involves technological innovation, the consortium must declare that the technology or the technologies concerned are at least at Technology Readiness Level (TRL) 6, where appropriate[80]. Projects can be interdisciplinary.

Proposals must relate to any field under the specific objective "Leadership in enabling and industrial technologies" and/or to any of the specific objectives under the priority "Societal challenges"[81].

Proposals should specify the intended outcome of the project and describe its key performance indicators/success criteria.

Proposals must also include a business plan clearly describing the market potential (potential users/customers and benefits for them; targeted European/global markets, etc.), the business opportunities for participants, measures to enhance the probability of eventual commercial take-up and a credible commercialisation strategy that identifies next steps and specifies other actors to be involved. Particular attention should be paid to IP protection and ownership and to the possibility of commercial exploitation ('freedom to operate').

The expected impact should be clearly described in both qualitative and quantitative terms. Factors such as time sensitivity and the international competitive situation should be considered in the light of the technology/innovation fields and industry sectors concerned.

Possible impacts on sustainability or climate change, in particular, or on other cross-cutting objectives of Horizon 2020[82], should also be highlighted.

Consortia must involve participation from industry. Universities, research and technology organisations and further innovation actors may also participate. Actors that can play a key role in the commercialisation process are encouraged to take part, such as cluster organisations, end-users, industrial associations, incubators, investors, or the public sector. First-time industry applicants[83] and SMEs are particularly welcome.

Expected Impact

- Fast development, commercial take-up and/or wide deployment of sustainable innovative solutions (products, processes, services, business models etc.) in enabling and industrial technologies and/or for tackling societal challenges.
- Time to initial market take-up no later than 3 years after the beginning of the FTI project. In very well-justified cases linked to the specific characteristics of a particular innovation field or industry sector, the time to initial market take-up could be longer.
- Enhanced competitiveness and growth of business partners in the consortium, measured in terms of turnover and job creation.
- Increased industry participation, including SMEs, and more industry first-time applicants to Horizon 2020.
- Leveraging more private investment into research and/or innovation.
- Where appropriate, addressing transnational value-chains and/or EU-wide or global markets.

[80] For a definition of TRL, see Part G of the General Annexes.

[81] For proposals which fall under the "Secure Societies" societal challenge, an additional specific procedure may apply (see Participant Portal – H2020 Grant Manuals – Horizontal issues – Security Issues).

[82] Please see Article 14 of the Horizon 2020 Regulation:
http://ec.europa.eu/research/participants/data/ref/h2020/legal_basis/fp/h2020-eu-establact_en.pdf

[83] In the context of the FTI pilot, a "first-time industry applicant" means a legal entity that is a private, for-profit organisation that has obtained a PIC (Participant Identification Code) for the first time under Horizon 2020. See step 4
ofhttp://ec.europa.eu/research/participants/portal/desktop/en/funding/

Euratom

NFRP 1: Continually improving safety and reliability of Generation II and III reactors

RIA ☑ IA ☒ CSA ☒

Specific Challenge

A number of current Generation II reactors should continue operating for a few decades and Generation III should still be in operation one century from now. The objective of this action is to complement, where needed, earlier investment in research regarding the safety and reliability of Generation II and III reactors, with particular attention to the new requirements of the amended Nuclear Safety Directive (Council Directive 2014/87/Euratom of 8 July 2014 amending the Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations).

Scope

Safety and reliability improvements are to be sought in a number of areas, with due consideration to the NUGENIA roadmap. The action should address the remaining technology gaps and encompass experiments as well as numerical simulations. It should focus on the integrity of structural components in ageing reactors, the knowledge basis for lifetime management of the reactor islands and the management of severe accidents. This can involve *inter alia*: probabilistic safety assessment, uncertainty analyses, the identification and understanding of deterioration mechanisms, the assessment of the need for and feasibility of retrofitted safety systems, the development of tools to establish safety cases for Long Term Operation, study of the prevention of hydrogen production, the improved modelling of reactor behaviour, the methodology of seismic risk assessment, the evaluation of accident-tolerant fuel, the improved assessment of fire risks and the safety demonstration of digital I&C equipment and their practical implementation. All aspects of meltdown, as a key issue of Generation-II and -III reactors, are also considered to be in scope. Results obtained as part of this action should be made public. In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged.

The Commission considers that proposals requesting a contribution from Euratom of between EUR 2 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. Proposals for topics NFRP 1 to 5 will be ranked in a single ranking list.

Expected Impact

This action will help industrial stakeholders to develop efficient solutions in response to the new requirements of the amended Nuclear Safety Directive. It will result in reinforcement of the safety features of the Generation-II and -III EU nuclear reactor fleet. This should improve the market profile of EU-based reactor designs and strengthen the competitiveness of the EU nuclear sector through promoting an excellent level of safety in response to market requirements and trends.

Annex 1. List and link to Work Programmes H2020, 2016-17

Work Programmes 2016-17

http://ec.europa.eu/research/participants/portal/desktop/en/funding/reference_docs.html

1. Introduction 2016-17
2. Future and Emerging Technologies (FETs) 2016-17
3. Marie Sklodowska-Curie actions (MSCA) 2016-17
4. Research infrastructures (including e-Infrastructures) 2016-17
5. Introduction to Leadership in enabling and industrial technologies (LEITs) 2016-17
5i. Information and communication technologies (ICT) 2016-17
5ii. Nanotechnologies, advanced materials, advanced manufacturing and processing, biotechnology 2016-17
5iii. Space 2016-17
6. Access to risk finance 2016-17
7. Innovation in SMEs 2016-17
8. Health, demographic change and wellbeing 2016-17
9. Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy 2016-17
10. Secure, clean and efficient energy 2016-17
11. Smart, green and integrated transport 2016-17
12. Climate action, environment, resource efficiency and raw materials 2016-17
13. Europe in a changing world - inclusive, innovative and reflective societies 2016-17
14. Secure societies - protecting freedom and security of Europe and its citizens 2016-17
15. Spreading excellence and widening participation 2016-17
16. Science with and for society 2016-17
17. Cross-cutting activities (Focus Areas) 2016-17
18. Fast Track to Innovation Pilot 2016-17
19. Dissemination, Exploitation and Evaluation 2016-17

Annex 2. Summary of selected topics (instrument, budget, deadlines)

		TYPE OF ACTION	BUDGET 2016 (M EUR)	BUDGET SHARED WITH CALLS:	BUDGET 2017 (M EUR)	BUDGET SHARED WITH CALLS:	DEADLINE single step	DEADLINE 1st step	DEADLINE 2nd step
4. Research infrastructures (including e-Infrastructures) 2016-17									
INFRADEV-01-2017	Design Studies	RIA			20,00		29/03/2017		
INFRADEV-02-2016	Preparatory Phase of ESFRI projects	CSA	40,00				22/06/2016		
INFRADEV-03-2016-2017	Individual support to ESFRI and other world-class research infrastructures	CSA	30,00		40,00		30/03/2016		
INFRAIA-01-2016-2017	Integrating Activities for Advanced Communities	RIA	88,00		72,00		30/03/2016		
INFRAIA-02-2017	Integrating Activities for Starting Communities	RIA			40,00			30/03/2016	29/03/2017
INFRAINNOV-01-2017	Fostering co-innovation for future detection and imaging technologies	RIA			20,00		29/03/2017		
INFRAINNOV-02-2016	Support to Technological Infrastructures	CSA	10,00				30/03/2016		
5i. Information and communication technologies (ICT) 2016-17									
ICT-02-2016	Thin, Organic and Large Area Electronics	RIA	12,00				12/04/2016		
ICT-02-2016	Thin, Organic and Large Area Electronics	IA	8,00				12/04/2016		
ICT-03-2016	SSI - Smart System Integration	RIA	17,00				12/04/2016		
ICT-03-2016	SSI - Smart System Integration	CSA	1,50				12/04/2016		
ICT-07-2017	5G PPP Research and Validation of critical technologies and systems	RIA			100,00		08/11/2016		
ICT-07-2017	5G PPP Research and Validation of critical technologies and systems	CSA			3,00		08/11/2016		
ICT-08-2017	5G PPP Convergent Technologies	IA			40,00		08/11/2016		
ICT-08-2017	5G PPP Convergent Technologies	RIA			5,00		08/11/2016		
ICT-09-2017	Networking research beyond 5G	RIA			18,00		08/11/2016		
ICT-29-2016	Photonics KET 2016	RIA	40,00				12/04/2016		
ICT-29-2016	Photonics KET 2016	IA	23,00				12/04/2016		
ICT-29-2016	Photonics KET 2016	CSA	3,00				12/04/2016		
ICT-30-2017	Photonics KET 2017	RIA			41,00		25/04/2017		
ICT-30-2017	Photonics KET 2017	IA			43,00		25/04/2017		
ICT-30-2017	Photonics KET 2017	CSA			3,00		25/04/2017		
ICT-31-2017	Micro- and nanoelectronics technologies	RIA			19,00		25/04/2017		
ICT-31-2017	Micro- and nanoelectronics technologies	IA			3,00		25/04/2017		

		TYPE OF ACTION	BUDGET 2016 (M EUR)	BUDGET SHARED WITH CALLS:	BUDGET 2017 (M EUR)	BUDGET SHARED WITH CALLS:	DEADLINE single step	DEADLINE 1st step	DEADLINE 2nd step
5ii. Nanotechnologies, advanced materials, advanced manufacturing and processing, biotechnology 2016-17									
EEB-05-2017	Development of near zero energy building renovation	IA			54,00	EEB-5, EEB-6, EEB-7, EEB-8	19/01/2017		
EEB-07-2017	Integration of energy harvesting at building and district level	IA			54,00	EEB-5, EEB-6, EEB-7, EEB-8	19/01/2017		
NMBP-03-2016	Innovative and sustainable mateRIAls solutions for the substitution of critical raw mateRIAls in the electric power system	RIA	78,08	NMBP-1, 2, 3, 23, 26				08/12/2015	24/05/2016
NMBP-04-2017	Architectured /Advanced mateRIAl concepts for intelligent bulk mateRIAl structures	RIA			114,19	NMBP-4, 5, 6, 7, 22, 25, 28, 29, 35		27/10/2016	04/05/2017
NMBP-05-2017	Advanced mateRIAls and innovative design for improved functionality and aesthetics in high added value consumer goods	IA			114,19	NMBP-4, 5, 6, 7, 22, 25, 28, 29, 35		27/10/2016	04/05/2017
NMBP-07-2017	Systems of mateRIAls characterisation for model, product and process optimisation	RIA			114,19	NMBP-4, 5, 6, 7, 22, 25, 28, 29, 35		27/10/2016	04/05/2017
NMBP-13-2017	Cross-cutting KETs for diagnosticssss at the point-of-care	RIA			15,00		19/01/2017		
NMBP-15-2017	Nanotechnologies for imaging cellular transplants and regenerative processes in vivo	RIA			40,00	NMBP-12, 14, 15		27/10/2016	04/05/2017
NMBP-16-2017	Mobilising the European nano-biomedical ecosystem	CSA			5,20	NMBP-8, 16, 31, 34	19/01/2017		
NMBP-17-2016	Advanced materials solutions and architectures for high efficiency solar energy harvesting	IA	32,00	NMBP-17, 18				08/12/2015	24/05/2016
NMBP-21-2016	ERA-NET on manufacturing technologies supporting industry and particularly SMEs in the global competition	ERA-NET-COFUND	30,00	BIOTEC-01, NMBP-11, NMBP-21			21/01/2016		
NMBP-26-2016	Analytical techniques and tools in support of nanomateRIAl risk assessment	RIA	78,08	NMBP-1, 2, 3, 23, 26				08/12/2015	24/05/2016
NMBP-29-2017	Advanced and realistic models and assays for nanomateRIAl hazard assessment	RIA			114,19	NMBP-4, 5, 6, 7, 22, 25, 28, 29, 35		27/10/2016	04/05/2017
NMBP-36-2016	Policy support for Industry 2020 in the circular economy	CSA	10,70	BIOTEC-04, NMBP-24, 27, 30, 31, 32, 33, 36			21/01/2016		

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5iii. Space 2016-17									
COMPET-1-2016	Technologies for European non-dependence and competitiveness	RIA	14,85				03/03/2016		
COMPET-2-2016	Maturing satellite communication technologies	RIA	7,00				03/03/2016		
COMPET-4-2016	SRC - Space Robotics Technologies	RIA	18,00				03/03/2016		
COMPET-5-2016	Scientific Instrumentation	RIA	3,00				03/03/2016		
GALILEO-3-2017	EGNSS professional applications	IA			8,00			01/03/2017	
COMPET-1-2017	Technologies for European non-dependence and competitiveness	RIA			15,00			01/03/2017	
COMPET-2-2017	Competitiveness in Earth observation mission technologies	RIA			7,00			01/03/2017	
COMPET-3-2017	High speed data chain	RIA			10,00			01/03/2017	
COMPET-7-2017	Technology transfer and business generators	CSA			1,00			01/03/2017	
7. Innovation in SMEs 2016-17									
SMEInst-01-2016-2017	Open Disruptive Innovation Scheme	SME Instrument	60,00		66,00		STEP 2 03/02/16 14/04/16 15/06/16 13/10/16 STEP 1 24/02/16 03/05/16 07/09/16 09/11/16	STEP 2 18/01/17 06/04/17 01/06/17 18/10/16 STEP 1 15/02/17 03/05/17 06/09/17 08/11/17	
SMEInst-02-2016-2017	Accelerating the uptake of nanotechnologies advanced materials or advanced manufacturing and processing technologies by SMEs	SME Instrument	31,83		35,32				
SMEInst-04-2016-2017	Engaging SMEs in space research and development	SME Instrument	11,37		12,60				
SMEInst-05-2016-2017	Supporting innovative SMEs in the healthcare biotechnology sector	SME Instrument	35,00		45,00				
SMEInst-06-2016-2017	Accelerating market introduction of ICT solutions for Health, Well-Being and Ageing Well	SME Instrument	18,00		12,50				
SMEInst-09-2016-2017	Stimulating the innovation potential of SMEs for a low carbon and efficient energy system	SME Instrument	46,00		50,00				
SMEInst-10-2016-2017	Small business innovation research for Transport and Smart Cities Mobility	SME Instrument	57,57		61,23				
SMEInst-11-2016-2017	Boosting the potential of small businesses in the areas of climate action, environment, resource efficiency and raw materials	SME Instrument	25,00		27,50				
SMEInst-13-2016-2017	Engaging SMEs in security research and development	SME Instrument	15,37		14,67				
INNOSUP-01-2016-2017	Cluster facilitated projects for new industrial value chains	IA	15,00					06/04/2016	08/09/2016
INNOSUP-03-2017	Technology services to accelerate the uptake of advanced manufacturing technologies for clean production by manufacturing SMEs	CSA			4,90		28/03/2017		

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8. Health, demographic change and wellbeing 2016-17									
SC1-PM-05–2016	The European Human Biomonitoring Initiative	COFUND-EJP	50,00				13/04/2016		
SC1-PM-06–2016	Vaccine development for malaria and/or neglected infectious diseases	RIA	40,00				13/04/2016		
SC1-PM-08–2017	New therapies for rare diseases	RIA			60,00			04/10/2016	11/04/2017
SC1-PM-09–2016	New therapies for chronic diseases	RIA	60,00				13/04/2016		
SC1-PM-10–2017	Comparing the effectiveness of existing healthcare interventions in the adult population	RIA			40,00			04/10/2016	11/04/2017
SC1-PM-16–2017	In-silico trials for developing and assessing biomedical products	RIA			19,00		14/03/2017		
SC1-PM-17–2017	Personalised computer models and in-silico systems for well-being	RIA			19,00		14/03/2017		
SC1-HCO-01-2016	Valorisation of FP7 Health and H2020 SC1 research results	CSA	2,00				13/04/2016		
SC1-HCO-02-2016	Standardisation of pre-analytical and analytical procedures for in vitro diagnostics in personalised medicine	CSA	2,00				13/04/2016		
9. Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy 2016-17									
SFS-05-2017	Robotics Advances for Precision Farming	RIA			7,00		14/02/2017		
SFS-13-2017	Validation of diagnostic tools for animal and plant health	IA			6,00		14/02/2017		
SFS-22-2017	Smart fisheries technologies for an efficient, compliant and environmentally friendly fishing sector	IA			6,00		14/02/2017		
BG-04-2017	Multi-use of the oceans marine space, offshore and near-shore: Enabling technologies	IA			8,00		14/02/2017		
BG-05-2016	ERA-NET Cofund on marine technologies	ERA-NET-COFUND	10,00				17/02/2016		
BG-07-2017	Blue green innovation for clean coasts and seas	IA			12,00		14/02/2017		
BG-09-2016	An integrated Arctic observation system	RIA	30,00	BG-09 and BG-10			17/02/2016		
BG-10-2016	Impact of Arctic changes on the weather and climate of the Northern Hemisphere	RIA	30,00	BG-09 and BG-10			17/02/2016		
BG-12-2016	Towards an integrated Mediterranean Sea Observing System	RIA	8,00					17/02/2016	13/09/2016
BG-13-2016	Support to the BLUEMED Initiative: Coordination of marine and maritime research and innovation activities in the Mediterranean	CSA	3,00				17/02/2016		
RUR-04-2016	Water farms – improving farming and its impact on the supply of drinking water	RIA	5,00					17/02/2016	13/09/2016

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10. Secure, clean and efficient energy 2016-17									
EE-10-2016	Supporting accelerated and cost-effective deep renovation of buildings through Public Private Partnership (EeB PPP)	IA	16,00	EE-10-2016 and EE-17-2016-2017			21/01/2016		
EE-11-2016-2017	Overcoming market barriers and promoting deep renovation of buildings	CSA	30,00	EE6, EE9, EE11, EE13, EE14, EE16, EE24, EE25			15/09/2016		
EE-11-2016-2017	Overcoming market barriers and promoting deep renovation of buildings	CSA			47,00	EE2, EE6, EE9, EE11, EE14, EE15, EE16, EE18, EE19, EE23, EE24	07/06/2017		
EE-12-2017	Integration of Demand Response in Energy Management Systems while ensuring interoperability through Public Private Partnership (EeB PPP)	IA			16,00	EE12, EE17-2017	19/01/2017		
11. Smart, green and integrated transport 2016-17									
MG-1.1-2016	Reducing energy consumption and environmental impact of avIAtion	RIA	40,00					20/01/2016	29/09/2016
ART-01-2017	ICT infrastructure to enable the transition towards road transport automation	IA			50,00	ART-1, ART-3, ART-7		26/01/2017	27/09/2017
ART-02-2016	Automation pilots for passenger cars	IA	48,00	ART-2, ART-4				20/01/2016	29/09/2016
ART-05-2016	Road infrastructure to support the transition to automation and the coexistence of conventional and automated vehicles on the same network	RIA	13,00					20/01/2016	29/09/2016
12. Climate action, environment, resource efficiency and raw materials 2016-17									
SC5-04-2017	Towards a robust and comprehensive greenhouse gas verification system	RIA			43,00	SC5-1, SC5-2, SC5-4, SC5-6	07/03/2017		
SC5-13-2016-2017	New solutions for sustainable production of raw mateRIAls	RIA	26,00				08/03/2016		
SC5-13-2016-2017		RIA			10,00		07/03/2017		
SC5-14-2016-2017	Raw materials Innovation actions	IA			56,00			07/03/2017	05/09/2017
SC5-16-2016-2017	Raw materials international co-operation	CSA			9,50	SC5-15 and SC5-16	07/03/2017		
SC5-18-2017	Novel in-situ observation systems	RIA			15,00		07/03/2017		

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13. Europe in a changing world - inclusive, innovative and reflective societies 2016-17									
ENG-GLOBALLY-09-2016	Centres/Networks of European research and innovation	CSA	10,00				14/04/2016		
CULT-COOP-08-2016	Virtual museums and socIAl platform on European digital heritage, memory, identity and cultural interaction	RIA	10,00				04/02/2016		
CULT-COOP-08-2016	Virtual museums and socIAl platform on European digital heritage, memory, identity and cultural interaction	CSA	1,00				04/02/2016		
CULT-COOP-09-2017	European cultural heritage, access and analysis for a richer interpretation of the past	RIA			9,00		02/02/2017		
14. Secure societies - protecting freedom and security of Europe and its citizens 2016-17									
CIP-01-2016-2017	Prevention, detection, response and mitigation of the combination of physical and cyber threats to the critical infrastructure of Europe	IA	20,00				25/08/2016		
CIP-01-2016-2017	Prevention, detection, response and mitigation of the combination of physical and cyber threats to the critical infrastructure of Europe	IA			20,00		24/08/2017		
SEC-01-DRS-2016	Integrated tools for response planning and scenario building	IA	8,00				25/08/2016		
SEC-03-DRS-2016	Validation of biological toxins measurements after an incident: Development of tools and procedures for quality control	IA	8,00				25/08/2016		
SEC-10-FCT-2017	Integration of detection capabilities and data fusion with utility providers' networks	IA			16,00		24/08/2017		
SEC-14-BES–2016	Towards reducing the cost of technologies in land border security applications	RIA	10,00				25/08/2016		
SEC-15-BES–2017	Risk-based screening at border crossing	IA			8,00		24/08/2017		
SEC-16-BES–2017	Through-follAge detection, including in the outermost regions of the EU	RIA			8,00		24/08/2017		
SEC-20-BES-2016	Border Security: autonomous systems and control systems	IA	24,00	SEC-19, SEC-20			25/08/2016		
DS-01-2016	Assurance and Certification for Trustworthy and Secure ICT systems, services and components	RIA	13,50				12/04/2016		
DS-01-2016	Assurance and Certification for Trustworthy and Secure ICT systems, services and components	IA	9,00				12/04/2016		
DS-01-2016	Assurance and Certification for Trustworthy and Secure ICT systems, services and components	CSA	1,00				12/04/2016		

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17. Cross-cutting activities (Focus Areas) 2016-17									
PILOTS-01-2016	Pilot lines for manufacturing of mateRIAls with customized thermal/electrical conductivity properties	IA	32,00	PILOTS 01-02				08/12/2015	24/05/2016
PILOTS-02-2016	Pilot Line Manufacturing of Nanostructured Antimicrobial Surfaces using Advanced Nanosurface Functionalization Technologies	IA	32,00	PILOTS 01-02				08/12/2015	24/05/2016
PILOTS-03-2017	Pilot Lines for Manufacturing of Nanotextured surfaces with mechanically enhanced properties	IA			48,00	PILOTS 3, 4, 5		27/10/2016	04/05/2017
PILOTS-04-2017	Pilot Lines for 3D printed and/or injection moulded polymeric or ceramic microfluidic MEMS	IA			48,00	PILOTS 3, 4, 5		27/10/2016	04/05/2017
PILOTS-05-2017	Paper-based electronics	RIA			48,00	PILOTS 3, 4, 5		27/10/2016	04/05/2017
FOF-01-2016	Novel hybrid approaches for additive and subtractive manufacturing machines	RIA	77,00	FOF 01-02-03-04-05			21/06/2016		
FOF-02-2016	Machinery and robot systems in dynamic shop floor environments using novel embedded cognitive functions	IA	77,00	FOF 01-02-03-04-05			21/06/2016		
FOF-03-2016	Zero-defect strategies at system level for multi-stage manufacturing in production lines	IA	77,00	FOF 01-02-03-04-05			21/06/2016		
FOF-04-2016	Continuous adaptation of work environments with changing levels of automation in evolving production systems	RIA	77,00	FOF 01-02-03-04-05			21/06/2016		
FOF-05-2016	Support for the further development of Additive Manufacturing technologies in Europe	CSA	77,00	FOF 01-02-03-04-05			21/06/2016		
FOF-06-2017	New product functionalities through advanced surface manufacturing processes for mass production	RIA			85,00	FOF 06-07-08-09-10	19/012017		
FOF-07-2017	Integration of unconventional technologies for multi-mateRIAl processing into manufacturing systems	RIA			85,00	FOF 06-07-08-09-10	19/012017		
FOF-08-2017	In-line measurement and control for micro-/nano-enabled high-volume manufacturing for enhanced relIAbility	IA			85,00	FOF 06-07-08-09-10	19/012017		
FOF-09-2017	Novel design and predictive maintenance technologies for increased operating life of production systems	IA			85,00	FOF 06-07-08-09-10	19/012017		
FOF-10-2017	New technologies and life cycle management for reconfigurable and reusable customised products	IA			85,00	FOF 06-07-08-09-10	19/012017		
FOF-13-2016	Photonics Laser-based production	IA	15,00				21/06/2016		
SPIRE-01-2016	Systematic approaches for resource-efficient water management systems in process industries	IA	74,00	SPIRE 01-02-03-04-05-06			21/01/2016		

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18. Fast Track to Innovation Pilot 2016-17									
FTIPilot-01-2016	Fast Track to Innovation Pilot	IA	100,00				15/03/2016 01/06/2016 25/10/2016		
Euratom									
NFRP 1	Continually improving safety and relIAbility of Generation-II and -III reactors	RIA	47,74	NFRP 1-, NFRP -2, NFRP -3, NFRP 4, NFRP 5			05/10/2016		
NFRP 1	Continually improving safety and rellability of Generation-II and -III reactors	RIA			7,71	NFRP 1-, NFRP -2, NFRP -3, NFRP 4, NFRP 5			
NFRP 13	Fission/fusion cross-cutting research in the area of multi-scale materials modelling	RIA			8,00	NFRP 13, NFRP 14	05/10/2016		

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