



EN

Horizon 2020

Work Programme 2018-2020

11. Smart, green and integrated transport

Important notice on the Horizon 2020 Work Programme

This Work Programme covers 2018, 2019 and 2020. The parts that relate to 2019 and 2020 are provided at this stage on an indicative basis. Such Work Programme parts will be decided during 2018 and/or 2019.

(European Commission Decision C(2017)7124 of 27 October 2017)



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Introduction

The priorities identified in this Work Programme will continue to pursue Societal Challenge (SC4)'s overall objective of achieving a European transport system that is resilient, resource-efficient, climate- and environmentally-friendly, safe and seamless for the benefit of all citizens, the economy and society.

Funding priorities will be geared towards the present and future needs of citizens, businesses and EU markets, and strive to maximise value for the transport sector, the wider economy and ultimately, the people. These priorities are aimed at creating new opportunities for sustainable growth and employment.

With regard to the broader international sustainability and climate change agenda, activities funded under Societal Challenge 'Smart, green and integrated transport' are expected to contribute to reaching the global climate targets set by the COP 21 Paris Agreement and have an impact on the implementation of the United Nations (UN) Sustainable Development Goals SDGs. They will also help implement the European Commission's commitment of establishing a strategy for a low carbon competitive economy as envisaged in the Energy Union¹ Communication adopted in February 2015. This commitment has been taken on by the "European Strategy for Low-Emission Mobility" Communication², adopted in July 2016 and the "Accelerating Clean Energy Innovation" Communication³ published in November 2016, which call for a fresh forward-looking approach on transport research and innovation at European level to respond to environmental concerns and new societal imperatives. At the same time, activities will contribute to the Commission's priorities of 'Jobs, Growth and Investment', 'Energy Union and Climate', 'Digital Single Market' and 'Stronger Global Actor', through a process underpinned by open science and open innovation, and which is open to the world and attentive to ethical and gender issues. Furthermore, activities will also take due account of recent developments on reduction of air pollution regulation at the level of the International Maritime Organisations^{4,5}.

The results of the Interim evaluation of Horizon 2020 have been taken into consideration in this Work Programme. Aspects which have been assessed positively, such as the increased emphasis on innovation and demonstration activities as well as better overall coherence are taken forward in this Work Programme.

¹ Energy Union: A framework strategy for a resilient energy union with a forward looking climate change policy ([link](#))

² COM (2016) 501 final

³ COM (2016) 763 final

⁴ Following the decision by the IMO of entry into force on 1/1/2020 of the stricter 0.50% global Sulphur cap in marine fuels used in international shipping for ships sailing outside Emission Control Areas for SO_x (MARPOL Annex VI Convention).

⁵ The decision by the IMO to designate the North Sea and Baltic Sea as Emission Control Areas for NO_x as of 1/1/2021.

The thematic assessment of the interim evaluation of Horizon 2020 identified further specific areas for improvement, such as addressing the oversubscription, the complexity of structure and lack of clarity whereas some stakeholders questioned also the broadness of topics. Efforts have been made to address these issues by providing a simpler structure, a reduced number of topics endowed with adequate budget and improved expected impact statements, in order to make the WP more explicit and comprehensible.

The Specific Programme of SC4 "Smart, green and integrated transport" is structured in four broad lines of activities aiming at:

a) Resource efficient transport that respects the environment. The aim is to minimise transport's systems' impact on climate and the environment (including noise, air and water pollution) by improving its efficiency in the use of natural resources, and by reducing its dependence on fossil fuels and energy imports.

b) Better mobility, less congestion, more safety and security. The aim is to reconcile the growing mobility needs with improved transport fluidity, through innovative solutions for seamless, inclusive, affordable, safe, secure and robust transport systems that make full use of modern information and communication technologies (ICT) capabilities.

c) Global leadership for the European transport industry. The aim is to reinforce the competitiveness and performance of European transport manufacturing industries and related services on global markets including logistic processes and retain areas of European leadership (e.g. such as aeronautics).

d) Socio-economic and behavioural research and forward looking activities for policy making. The aim is to support improved policy making which is necessary to promote innovation and meet the challenges raised by transport, including the internalisation of external costs, and the societal needs related to it. Socio-economic research is also an important instrument for reaching the objectives under this programme.

The Transport part of the Work Programme will, contribute to the following focus areas

1. Building a low-carbon, climate resilient future
2. Digitising and transforming European industry and services

through the specific calls on Green Vehicles and Automated Road Transport. In addition, a part of the Mobility for Growth call contributes to the 'Building a low-carbon, climate resilient future' focus area.

The activities of this Work Programme will be implemented by three Calls for proposals:

1) Call Mobility for Growth: This call contains a "Building a low-carbon, climate resilient future" Focus Area section (section 1. 'Building a low-carbon, climate resilient future: Low-carbon and sustainable transport')

2) Call 'Digitising and transforming European industry and services: Automated Road Transport' and

3) Call 'Building a low-carbon, climate resilient future: Green Vehicles'

In addition to the three Calls for proposals, the Transport Challenge contributes to **Blue Growth, to the Energy part of the Work Programme (through ELENA facility and Smart Cities and Communities)**. Other actions will be implemented by public procurement and/or other instruments (see section **'Other actions'**). These actions are part of the Transport Challenge envelope and complement the content of the Calls.

Thorough and mature research and innovation agendas for the three Calls have been defined taking into account the 'Clean Sky 2', 'SESAR', 'Shift2Rail' and 'Fuel Cells and Hydrogen 2' Joint Undertakings. In addition, European Global Navigation Satellite Systems (Galileo and EGNOS) will provide new opportunities particularly in relation to advanced technologies for automation, connectivity and digitisation. Synergies will be pursued with all these initiatives as well as with other parts of Horizon 2020, namely 'Information and Communication Technologies' (ICT), 'Nanotechnologies, advanced materials, biotechnology and advanced manufacturing and processing' (NMBP), 'Space', 'Secure, clean and efficient energy', 'Climate action, environment, resource efficiency and raw materials' and 'Secure societies'.

In addition, the societal trend towards service-orientation is also visible in the transport sector. Resources are scarce and decreasing while needs and expectations are growing. Hence, there is a need to design, organise and manage transport and mobility in a smarter way. Horizon 2020 is the right tool to explore how these challenges can be addressed in an integrated way. This needs to include people from private households and firms in early phases of the development and design of mobility and transport concepts, vehicles and infrastructures.

Outputs from actions meeting these priorities will have tangible impacts in the form of new implementable technologies, information systems, as well as operational and business models. Some of these impacts will be evolutionary, representing refinements to existing technologies, systems and practices, while others will be more revolutionary, in offering a step-change in performance or innovative solutions. Outputs will also have impacts on the demand-side of European transport, including people's behaviour and company logistics. Overall, they will make the European transport system more efficient, sustainable, safe, resilient and competitive, and they will place it on a trajectory to meet the 2030 and 2050 targets set out in the Transport White Paper as well as those of other policy initiatives.

In line with the strategic objective of the transport White Paper to set up a single European transport system, the Transport part of the Work Programme will put much attention to market up-take of innovations, particularly in areas where they can help to overcome bottlenecks of the current transport system. Wide deployment of new technologies developed in the transport Work Programme of Horizon 2020 is crucial and should be further encouraged through synergies with other relevant programmes, such as Connecting Europe Facility (CEF) and the European Structural and Investment Funds (ESIF).

International cooperation will have a key role to play. Global challenges such as CO₂ and air polluting emissions, oil dependency, transport safety and security, noise pollution, and standardisation of many services, products and procedures will benefit from global solutions. Other aspects that are more local in nature such as traffic congestion, land use planning, behavioural issues could profit from the exchange of best practice identified in effective international collaborations. Activities at the international level are important to enhance the competitiveness of world leading European industries by promoting the take-up and trade of novel technologies, in particular where the applicable regulatory regime is international and can thus result in barriers to the market introduction of innovative solutions coming from EU actors. Demand for high-end European produced vehicles as well as for European know-how is very strong in the emerging markets. With most of future transport growth occurring outside Europe, access to knowledge and to new markets will become increasingly important. In order to address these important challenges, five international cooperation flagships are identified, i.e. areas specifically devoted to international cooperation.

1. In aviation, a multilateral cooperation with multiple partners will be pursued to obtain greener and safer aviation in a smaller world.
2. Mutually beneficial cooperation with the US will focus on road transport automation.
3. Reduction of transport impact on air quality and enforcement of relevant EU and international regulations.
4. Integrated, multimodal, low-emission freight transport systems and logistics
5. Urban mobility and sustainable electrification in large urban areas in developing and emerging economies

Cooperation with China, India, CELAC and/or other third countries will focus on reduced emissions and green vehicles (especially in urban areas). Multilateral exchanges on transport R&I strategies and investment priorities could be pursued with the major international partner countries.

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

Contribution to focus area(s)

Focus Area 'Building a low-carbon, climate resilient future' (LC): EUR 408.00 million

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Focus Area 'Digitising and transforming European industry and services' (DT): EUR 103.00 million

Call - 2018-2020 Mobility for Growth

H2020-MG-2018-2019-2020

Transport is changing at an accelerating pace as a result of several factors in many diverse but interconnected fields: cutting edge technological innovations such as for example the increasing penetration of digital and space-based technologies in automated, connected and cooperative vehicles, transport infrastructure, logistics operations, aeronautics and safety applications; major socio-economic trends such as ageing population, migration and urbanisation; global targets such as those set by the COP 21 Paris Agreement on the fight against climate change and by the UN in support of Sustainable Development Goals; increased international competition for the European transport industry across all modes; new operations and business models based on increased connectivity between infrastructure, transport means, travellers and goods which can contribute to seamless door-to-door mobility.

In order to address these new challenges, targeted efforts are needed to develop and validate new solutions that can be rapidly deployed. They will address in a systemic way transport means, infrastructure and operation models and integrate them into a user friendly European transport system of smart connected mobility for passengers and freight and with significantly reduced impact on climate and environment. A user-centred approach taking into account the evolving needs of transport users is necessary in order to assess the impact of transport solutions on society and economy, while it will also contribute to the competitiveness of European transport industry. Simultaneously a perspective is needed that acknowledges the broader impact of the transport system, not only on its users, but also on non-users in cities and regions.

A number of topics (particularly in section 4 "Accounting for the people") have been informed by European citizens' visions of the future and research and innovation priorities identified as part of the CIMULACT⁶ project (<http://www.cimulact.eu>). As indicated in the Specific Programme, the "activities will be organised in such a way as to allow for an integrated and mode-specific approach as appropriate". Therefore, the contents of the 'Mobility for Growth' call have been structured as follows:

1. 'Building a low-carbon, climate resilient future: Low-carbon and sustainable transport
2. Safe, integrated and resilient transport systems
3. Global leadership and competitiveness
4. Accounting for the people.

In addition to the topics of this Call, transport-related actions are also included in the other two Calls of this part of the Work Programme as well as in other parts of Horizon 2020 Work Programme 2018-2020, particularly in the LEIT/NMBP call 'Nanotechnologies, Advanced

⁶ CIMULACT is funded under Horizon 2020's Science with and for Society programme

Materials, Biotechnology and Production'; LEIT/Space call 'Applications in Satellite Navigation – EGNOS/Galileo'; LEIT/ICT; and SC/Energy calls 'Competitive Low-Carbon Energy' and 'Smart Cities and Communities'.

1. BUILDING A LOW-CARBON, CLIMATE RESILIENT FUTURE: LOW-CARBON AND SUSTAINABLE TRANSPORT

Transport represents almost a quarter of Europe's greenhouse gas emissions and is the main cause of noise and air pollution in cities, many of which are often in breach of air pollution limits. Significant progress towards low-emission mobility is therefore an essential component of the broader shift to the low-carbon economy needed for Europe.

Research and innovation activities under this section will support the long-term transition towards zero-emission and quieter mobility across all transport modes. They will adopt a systemic approach which, in addition to technological innovations of vehicles, systems and infrastructure, places emphasis on socio-economic and regulatory aspects such as increased public awareness, sustainable spatial planning integrating new forms of mobility and improved control and detection mechanisms. International cooperation is an essential element in many of the research topics in this section. Proposed actions can take advantages of the current state of the art modelling activities in the field and of the wealth of Earth Observation data and information provided by the Copernicus programme, especially by the Copernicus Atmosphere Monitoring Service.

Research and innovation activities will support the transition towards zero-emission and quieter mobility across all transport modes. Grounded on a people's perspective, it will lead to improved tools and mechanisms for monitoring and detection of emissions and noise in road vehicles, ships and aircrafts and will provide cities, regional and national authorities and spatial planners with evidence of long term impacts of the current developments in transport technologies and business models on spatial planning to support decision making processes in policy and planning.

Proposals are invited against the following topic(s):

LC-MG-1-1-2018: InCo flagship on reduction of transport impact on air quality

Specific Challenge: The air quality situation in Europe has not sufficiently improved for some pollutants and significant exceedances are still found, for example, for particles, ozone and nitrogen oxides, particularly in areas affected by specific environmental or industrial conditions.. Similar situations occur in many cities around the world, and this is the reason for designing this international cooperation flagship.

High hopes are pinned on zero tailpipe emission technologies that might solve the problem in the longer term, particularly in the road sector. However, fleet renewal is too slow to just wait for all vehicles on the road to be replaced by electrified ones in order to solve the air quality issue. Also, emissions from other sectors, such as ships and aircraft in ports, internal

waterways and airports, can contribute significantly to the problem, and zero emission technologies are not often available.

It is therefore urgent to address in as many ways as possible the reduction of the impact of the existing internal combustion transport fleets and support local authorities and other regulatory bodies with the provision of appropriate/advanced tools. Monitoring of the car fleet, for instance, can detect high emitters, allowing to provide information to authorities for possible cases of defeat devices, tampering, poor durability of depollution systems.

In the case of tampering, the legal situation varies among member states and needs to be clarified in view of facilitating enforcement.

The choices of customers buying new vehicles can be oriented towards cleaner vehicles by making visible which are those that have an overall better performance (i.e. as a consumer information measure, separate from EU certified type-approval testing, while users of existing polluting vehicles could be encouraged to use them in a more environmentally friendly way.

It is also important to verify the performance of On Board Detection (OBD) systems and of periodic inspections and improve them where appropriate.

On board measurement of pollutants could enable new implementation approaches to regulation showing on the one hand how much each driver pollutes (helping in the eco-driving effort) whilst on the other hand allowing a real "polluter pays" approach to certification, taxation and traffic regulation (the needed technology will be explored in LC-MG-1-4-2018, together with research on hardening de-pollution systems against tampering).

Apart from road vehicles, airports and ports can strongly contribute to poor air quality, it is therefore important to quantify their impact and monitor their evolution.

Finally, the health impact of extremely fine particles and of Volatile and Semi-Volatile Organic Compounds (VOCs and SVOCs free or absorbed in the particles), is still not well understood. Such ultra-fine particles have been proven to pass the alveoli, placental and brain barriers and they can reach other organs through the blood stream and generate serious health impacts which need further research.

Scope: Given the policy relevance of the topic, the selected consortia will regularly share their findings with relevant European Commission services. Proposals will have to address one of the following subtopics and clearly indicate which subtopic they are addressing:

A) Low-emission oriented driving, management and assistance. This area aims at exploring the impact of the user (including his driving behaviour and choices in maintaining the vehicle) on emission production:

- Driving behaviour exploration: PEMS⁷ driving measurement campaigns to assess driver behaviour variability and correlate it with real powertrain emission, and (if needed by lab measurement and modelling) brakes and road/tires emissions;
- Derivation of low polluting-emissions driving practices and dissemination through awareness campaigns. The collected data should be of adequate quality to be also usable as input for future implementation in driving assistance tools and automated driving, as well as traffic management;
- Assessment of the impact of other user behaviours such as poor maintenance or tampering. All aspects and causes should be studied, including an assessment of the real effectiveness of OBD and periodic inspections, of the legal situation of tampering in each member state (for both sales of devices and installation) and of the most effective ways to induce car owners not to tamper and to properly maintain their vehicles (considering both technical and economic reasons for their behaviour);
- Assessment of the potential impact of retrofits⁸, both for light and heavy duty road vehicles and NRMM⁹ (including the development of methodologies to verify a level of durability appropriate for the application) and promotion of their application in cities with pollution problems.

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497) international cooperation is encouraged, in particular with China and other Asian and/or CELAC countries.

B) Starting from recently defined emissions indicators (RDE test results including NO_x max and PN max values, WLTP CO₂ emissions), development of a 12 to 18 month project to timely develop support to informed consumer choice by defining a holistic testing and scoring mechanism. This should be capable of assessing all vehicles (conventional and electrified) and lead to a single "GREEN VEHICLE index". Such index should encompass all of the relevant criteria, e.g. tailpipe CO₂, and polluting emissions such as NO_x/NO₂, hydrocarbons and particles, noise, performance and operating cost. The developed methodology should be fine-tuned in a pilot phase on a sufficiently large number of vehicles to ensure that the results are comparable and provide a fair and reliable assessment. Such an index could result in a public awareness scheme (running after project end) capable of orienting eco-conscious consumer choice, and to create a virtuous circle (as achieved by EURONCAP for safety) creating competition on who brings to market the cleanest vehicles. The mechanism should complement (not overlap with) the results of regulatory real-driving emissions (RDE) tests with an aim to maximise the coverage of real-world driving situations and provide relevant information. Particular attention should be paid to the ways in which the variability of real-world emissions performance is communicated, and what usage patterns deliver the best

⁷ Portable Emissions Measurement Systems

⁸ For instance those resulting from the Horizon Prize for the cleanest engine retrofit.

⁹ Non-Road Mobile Machinery, i.e. earth moving machines, locomotives etc).

performance (being therefore complementary to the study and awareness raising activities in Subtopic A).

C) Sensing and monitoring emission in urban road transportation system. This area intends to urgently provide a means to monitor fleet-wide on-road emissions, to detect and repress any emission-affecting modifications of individual vehicles (tampering) or bad maintenance/poor after-treatment system durability/OBD ineffectiveness, to support local air quality plans, and to help national and local enforcement authorities in identifying and prosecuting infringing vehicles.

- Remote sensing of road vehicle emissions (contactless measurements from the roadside, portals or from chasing vehicles); further technological development of available techniques is needed to improve performance, reduce costs, facilitate use by unskilled personnel and achieve a broader deployment potential;
- Establishment of a proper data infrastructure built around vehicle registration databases, traffic management measures and air quality monitoring systems;
- Demonstration of the system in several cities;

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

D) Cost effective enforcement of shipping related emissions legislation, both at the EU and global level, is essential for the expected environmental improvements to be achieved. To support the enforcement, assess their effectiveness and to identify potential future gaps it is necessary to develop, evaluate and demonstrate cost effective systems to measure the airborne emissions of pollutants from a vessel under real operational conditions (e.g using on board systems) and to target ships for inspection and the enforcement of emission limits.

For coastal, urban and port areas, develop measuring technologies and 'beyond state of the art' modelling tools to assess the contribution of air emissions from ships and their comparative impact on air quality and health building also on projects such as 'Interreg Clean North Sea Shipping (CNSS) and the LIFE project 'Clean Inland Shipping' (CLINSH).

In addition to characterising and quantifying particulate matter (in particular, the most harmful, including ultrafine), such systems should also be able to simultaneously measure other relevant pollutants including SO_x and NO_x.

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged, in particular with the involvement of the largest ports and regulating authorities and other relevant bodies within the Asian region as well as in the frame of the activities of the International Maritime Organisation to which EU Member States and global maritime nations are parties.

E) Measurement of airborne pollutants emissions from aircraft under parking (with functioning APU), taxiing, take-off and climb-out conditions and under different climate

conditions (In addition to characterising and quantifying particulate matter down to at least 10nm, systems should also be able to simultaneously measure other relevant pollutants including SO_x and NO_x). An assessment of pollutants' transport and impact on air quality in and around airports, in a form potentially suitable for regulation should be performed.

In line with the Union's strategy for international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged, in particular with Asia, CELAC and the US.

F) In-vitro and in-vivo assessment of health effects of ultrafine nanoparticles (VOCs and SVOCs) emitted from engines of the different transport modes particularly when using fuels with high aromatic content. Focus should be on understanding the biological processes leading to acute genotoxic and systemic effects in the lungs and, in particular, beyond.

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

Expected Impact: All the above actions contribute to the UN's Sustainable Development Goals (SDG), in particular SDG 3 ("Ensure healthy lives and promote wellbeing for all at all ages") and 11 ("Make cities and human settlements inclusive, safe, resilient and sustainable") through:

- Reduction of emissions from the existing combustion-engined car fleet (A, C);
- Reduction of unnecessary driver-induced emissions through a better awareness by the public of their role in controlling polluting emissions (A) ;
- Increase of low emitting vehicle sales by providing more information to guide buyers towards the cleanest available vehicles (B);
- Reduction of transport-related emissions through the improvements of detection and enforcement against vehicles with tampering, defeat devices or durability issue, as well as of ships not complying with emissions regulations, i.e. not using clean low-sulphur fuels, suitable engine parameters for NO_x reduction or properly activating de-pollution devices where appropriate (C, D) ;
- Better understanding of the impact of the different transport modes through monitoring detection and modelling of emissions in the existing road vehicle fleet as well as ships and aircraft (C, D, E) ;
- Improved and more comprehensive data for risk assessment from air pollutants from different transport modes and identification of cost effective reduction measures (F);
- Provide technical evidence to assess gaps in current regulation of vehicles and air quality (All).

Type of Action: Research and Innovation action

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

LC-MG-1-2-2018: Sustainable multi-modal inter-urban transport, regional mobility and spatial planning.

Specific Challenge: A metropolitan area, "agglomeration" or "commuter belt" (with important cross-docking activities), is a region consisting of a densely populated urban core and its less-populated surrounding territories, that is sharing industry, infrastructure and housing. An efficient multimodal transport network at different spatial levels is fundamental to allow a smooth functioning both in such areas and with their connected surrounding regions thus encouraging mobility and enhancing/preserving social inclusion. However, the transport infrastructure needed could cause important negative externalities and even induce unbridled suburbanization.

The introduction of new forms of people mobility and freight distribution, such as innovative soft mobility schemes, drive-sharing, ride-sharing, crowd shipping, crowd delivery, connected and automated vehicles, innovative flying vehicles, Mobility as a Service, could revolutionise transport demand with major consequences for the spatial organisation of cities and their local neighbourhoods. Mitigating the negative impacts of transport and substantially contribute to the achievement of the COP 22 goals must be pursued.

To address these challenges and in line with the guidelines to implement SUMP, a multi-dimensional approach is needed assessing new forms of mobility in all transport modes, their infrastructures, travel flux evolution, spatial-economic development, environmental and quality-of-life issues, governance issues across spatial and institutional levels and user behavioural aspects. Development of vertical spatial planning can be included. Models should be proposed to support decision-makers in assessing evolution and potential rebound effects of their plans.

GNSS can contribute to boosting new forms of mobility and allow for a more efficient use of transport infrastructure. A large potential stemming from the combination and integration of GNSS with communication technology and telematics platforms remains so far untapped.

Scope: Proposals should address one or several of the following:

- Address environmental, socio-cultural and spatial impacts of planning in large metropolitan regions, whilst also enhancing connectivity; governance and institutional issues should be included.
- Identification of new forms of mobility (including trips not covered by metropolitan radial transport infrastructure) with the potential to have the greatest impact on spatial redesign of urban and low-density areas - improving the balance between city and rural development -, on urban space sharing (including pedestrians), on new public and private service allocation patterns, on investments in infrastructure, and new solutions

for collective transport and transport planning. Identify ways to promote their implementation of the new forms of mobility both in passenger and freight transport.

- Use of geolocalization data, including Galileo and EGNOS for cooperative mobility in combination with other communication and telematic data to foster a more efficient use of infrastructure and reduction of air pollution.
- Suggest appropriate measures to ensure the lowest carbon and air pollutant level of transport with particular consideration for the interdependencies between different spatial patterns of production/consumption (i.e. localization of production sites and relevant schemes of distribution to final consumers) and the energy and carbon intensity of the related transport systems. Collection and analysis of comprehensive data to provide a sound basis for future planning.
- Comprehensive planning for the entire functional area (defined as an area of intensive commuter movements and/or freight distribution), adapting, further developing and extending the Sustainable Urban Mobility Plan (SUMP)¹⁰ concept, considering specific needs of metropolitan regions, new operating models in collective public and private transport, overcoming social segregation and inequalities, including gender inequalities, in access to education, jobs, health and leisure. Innovative planning concepts (e.g. multi-state planning, performance-based planning, scenario techniques and community planning) should also be considered with the aim to ensuring accessibility, social justice and equity in the mobility of all citizens groups. Coordinated infrastructure development: balancing long-term environmental goals with other development aims (e.g. effective land use and preservation of natural zones), developing environmental high-performance infrastructure (e.g. light rail), upgrading/ repurposing existing infrastructure, improving connectivity to the TEN-T and overall resilience of the region.
- Coordinated development of sustainable policies with proven environmental impact, e.g. air-quality and noise-sensitive traffic management, including "nowcasting" as well as long-term strategy, region-wide freight and logistics concepts, shared mobility and innovative collective mobility promotion and incentives/disincentives for access to urban centres.

Involvement of local authorities, transport operators in research is essential to ensure the appropriate implementation, in line with SUMP guidelines, as well as modelling and recording reactions of users to changes in infrastructure and mobility options (rebound effects) to support future decision-making and ensuring citizens' engagement. Users' involvement is encouraged, as it is important to reach effective changes in behaviour.

¹⁰ The Sustainable Urban Mobility Plan concept [see Annex I to COM(2013)913] considers the functional urban area and proposes that action on urban mobility is embedded into a wider urban and territorial strategy. Therefore, these Plans should be developed in cooperation across different policy areas and sectors (transport, land-use and spatial planning, environment, economic development, social policy, health, road safety, etc.); across different levels of government and administration; as well as with authorities in neighbouring areas – both urban and rural. Sustainable Urban Mobility Plans are about fostering a balanced development and a better integration of the different urban mobility modes

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.

In line with the Union's strategy for international cooperation in research and innovation, international cooperation is encouraged. In particular, proposals should foresee twinning with entities participating in projects funded by US DOT to exchange knowledge and experience and exploit synergies.¹¹

Expected Impact: Research will provide cities, regional and national authorities and spatial planners with evidence of long term impacts of innovative transport technologies and business models. It will aid decision makers to better anticipate and plan necessary investments, adaptation and spatial re-design strategies in view of taking full advantage of the new forms of mobility for improving competitiveness, sustainability, social cohesion, equity, and citizen well-being. Research will also contribute to devising transport planning strategies that contribute to a balanced development between urban and rural areas.

The innovation processes and final impacts should be systematically evaluated in terms of their contribution to environmental health, to enhanced accessibility to the centre of the metropolitan region as well as to the TEN-T corridors, to regional economic performance, social cohesion and overall regional development potential.

To meet the challenge of reducing the environmental impact of commuting and inter-urban transport proposals must demonstrate their contribution towards the following objectives:

- Reduced congestion, energy, emissions of air pollutants, carbon footprint, noise and land-use within the identified metropolitan regions.
- Increased coordination between multimodal infrastructure mobility and spatial-economic development, including reduction of inequalities.
- Increased inter-modality and higher resilience of the transport system between the metropolitan region and the neighbouring cities and rural areas.

Type of Action: Research and Innovation action

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

LC-MG-1-3-2018: Harnessing and understanding the impacts of changes in urban mobility on policy making by city-led innovation for sustainable urban mobility

Specific Challenge:

¹¹ (COM(2012)497)

Urban mobility is in transition. This is a result of, for example, changing user needs; emerging transport technologies; new transport services using new business models; and new institutional and financing structures. Greater data availability provides new opportunities for evidence-based policy and policymakers aim at an ever-increasing integration of urban mobility policy with other sectorial policies. The impacts of this change will go far beyond the transport sector and influence other sectors that are transport-reliant.

The policy impacts, individually and in combination, of new solutions, which are at different levels of maturity, are not clear yet. There are many open questions about how policymakers should react and how Sustainable Urban Mobility Plans (SUMPs), and other sectorial policies that affect urban mobility, should respond and adapt to these potential disruptive changes. Therefore, research is necessary to improve the understanding of the impacts of new urban mobility solutions on policy making.

This topic covers passenger transport and freight transport. It covers urban and peri-urban areas. Special attention should be paid to the needs of vulnerable groups and users with different cultural backgrounds taking into account gender issues; and to the specific context of areas that are undergoing rapid economic change.

Scope: This topic will be implemented through two sub-topics with different types of actions: Proposals should address one of the two.

A) Research and innovation actions: This sub-topic asks to examine the impacts of new mobility solutions, addressing the changing mobility patterns and set up of mobility services, including possible negative effects, and covers all relevant transport modes (including active modes) and vehicle types. City-led proposals should address one or more of the following aspects:

- investments in and management of the transport network, with attention for facilities for recharging; transport system resilience; and transport demand management tools (such as pricing; low emission zones; parking management; one way traffic);
- the specific challenges in areas undergoing rapid economic change, for example in institutional setup; policy coherence; policymakers mind-set; outdated or incomplete legislation/methodologies; and data/statistics;
- new operating and business models in collective public and private transport;
- pathways to tackling congestion and reducing levels of car use through decoupling economic growth and high mobility from traffic growth;
- implications for and interaction with urban planning and design including inputs for developing SUMPs.

Proposals should incorporate new data-driven planning approaches.

The actions will also deliver at least three validated test cases (small pilot projects with quantified objectives in which public stakeholders and economic actors participate) that take

into account different political and socio-economic contexts. The active participation of a small number of representatives from authorities of small and medium-sized cities in proposals should be ensured.

B) Coordination and support actions: This sub-topic addresses the facilitation of knowledge exploitation and support to the cooperation between projects and stakeholders involved in the projects under the first sub-topic, and from across CIVITAS 2020. This Coordination and Support Action should also consolidate the common ‘CIVITAS Process and Impact Evaluation Framework’ and ensure the continuity of a ‘CIVITAS Secretariat’ as well as financing of CIVINets.

Proposals should present innovative approaches for all of the following needs:

- local capacity building and training in deploying innovative mobility solutions;
- networking cities and engaging with stakeholders working at the local level, overcoming language and contextual barriers;
- reinforcing the involvement of the CIVITAS cities from different CIVITAS-Phases in the CIVITAS network;
- partnering with industry and civil society in navigating through transition and change;
- implementing a communication and dissemination strategy with high impact actions.

In order to maximise impacts, and in the context of CIVITAS 2020, all projects funded under this topic and other relevant topics (for example dealing with SUMP) shall work together and exchange information and practical experiences

In line with the Union’s strategy for international cooperation in research and innovation¹² international cooperation is encouraged, especially with the USA, China and India

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 to 4 million each for Research and Innovation actions, and of up to EUR 3 million for the Coordination and Support Action, could address this specific challenge appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Proposals addressing sub-topic A) above, will produce new, practice-based knowledge on how to navigate urban mobility policy through transition taking into account legacy systems and the need to integrate new solutions that are at different levels of maturity. They will provide added-value inputs and contribute to evidence-based policy making at local, regional, national and EU levels. Proposals should demonstrate how their work will support effectively mobility policies in the cities' efforts to follow a viable transformation path towards sustainable mobility.

¹² COM(2012)497

The results of the actions will feed into future EU initiatives, for example on Sustainable Urban Mobility Planning (SUMP); cooperative-ITS; travel and traffic information; low-emission logistics; and future infrastructure networks, including links to the TEN-T and can help improve Air Quality Plans.

Proposals addressing sub-topic B) will help to promote the take up of innovation that leads to more effective and efficient transition of urban mobility systems by strengthening the mechanisms for urban mobility policy making and planning. A 'CIVITAS Secretariat' will be continued. Capacity building; engaging; partnering; and communication and dissemination actions will aim at a maximum impacts and reach of target audiences.

This results in a developing knowledge-base, technical capacity, harmonised evaluation activities, and support for up-scaling and knowledge transfer which is available to cities and other interested parties. Clear commitments and contribution from the action's participants to Europe-wide take up are expected. The Coordination and Support Action must ensure both continuation of CIVITAS support activities and also support for future CIVITAS-type actions.

Type of Action: Coordination and support action, Research and Innovation action

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

LC-MG-1-4-2018: Hardening vehicle environmental protection systems against tampering

Specific Challenge: Automotive emissions control technologies have the potential to greatly reduce the impact of combustion-based transport. However most of them, even when programmed for full effectiveness by the vehicle manufacturer, are affected by the risk of vehicle owners modifying or suppressing them for many reasons.

Three way catalysts (TWC) systems in gasoline and natural gas vehicles, Diesel particle filters (DPF), Exhaust Gas Recirculation (EGR) systems have been tampered with since many years because they can limit engine power, create maintenance problems, increase the consumption of fuel or simply because of the high cost of their replacement when they reach the end of their useful life or in case of malfunction. More recently, tampering has also become widespread on Selective Catalytic Reduction (SCR) systems, particularly for heavy duty vehicles¹³, as the urea-based liquid needed for their functioning is an additional cost for the operator. Finally there are systems providing a remapping of the engine control to increase power and this often leads to strong increases in emissions. For each of these issues there are do-it-yourself as well as 'professional' solutions offered by private enterprises, often on the internet.

¹³

<http://www.acea.be/press-releases/article/truck-manufacturers-call-for-action-to-prevent-aftermarket-manipulation-of>

In addition, there are also concerns¹⁴ that On-Board Diagnostic (OBD) systems, that are intended to signal to the user when the after-treatment system is not working properly, are not always properly functioning and this facilitates tampering while allowing environmentally-damaging component aging or failure to go undetected.

Tampering also exist for other important devices, such as tachographs or alcolocks. At the same time, automotive-type de-pollution technologies are applied in other sectors, such as rail, inland navigation, generators, earth-moving machinery, etc and any anti-tampering solution would also be relevant for these applications. In addition synergies can be sought with cybersecurity efforts in other domains.

The challenge is to ensure that all the above mentioned systems cannot be bypassed or modified and therefore maintain their full operational capability through the life of the vehicle, and to provide input to any legislative initiatives that might be needed to improve the implementation of protection systems and the repression of tampering devices in the field.

Scope: Proposals will have to address all the following technical areas:

- Independent testing of light and heavy duty vehicles from the field to assess the capability of their OBD systems to detect tampering methods and maintenance issues in real driving.
- Installation of representative tampering systems on vehicles, identification of their working principles and analysis of their performance.
- Analysis of vehicle hardware and software by IT security experts and hackers (for instance through a Hackaton or prize) to assess the weaknesses of the employed OBD and protection technologies and assessment of the risk of hacking for each type of application (cars, trucks, non-road) and type of emissions-control system, with priority for truck de-NOX systems and particulate filters on all vehicles.
- Development and application of enhanced tampering proofing methodologies, coding and electronic component protection systems, both specific or derived from security application from the IT sector to ensure a high resistance to tampering of the whole engine management and after treatment system, while maintaining the capability for certification authorities to assess the software according to upcoming legislative requirements and facilitating quick and safe updates of the system to re-establish its integrity if new tampering systems appear on the market.
- Improvement of OBD systems and methodologies including use of cheap sensors, allowing the development of a more tamper resistant OBD and possibly On Board Monitoring (OBM) approaches, capable of also providing the basis for the application of "polluter-pays" taxation principles.

¹⁴ <http://www.sciencedirect.com/science/article/pii/S0269749116327476>

- Deriving guidelines for improvements in anti-tampering and OBD legislation in coordination with the relevant bodies when and where appropriate.

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 solutions contribute to the UN's Sustainable Development Goals (SDG), in particular SDG 3 ("Ensure healthy lives and promote wellbeing for all at all ages") and 11 ("Make cities and human settlements inclusive, safe, resilient and sustainable") since they will reduce vehicle emissions by implementing more effective OBD/OBM systems that guarantee that end users are informed timely of any emissions affecting malfunction or tampering and strong inducements (performance limitation) are applied in case of severe emissions increases. This extremely high resistance to hardware and software tampering will ensure a strong reduction or the total elimination of this phenomenon.

These impacts shall be demonstrated by tampering attempts developed by independent teams and by the implantation of artificial defects on the different depollution systems followed by verification of their detection in laboratory test conditions as well as in real driving.

Support for improved future legislative and standardisation actions.

Type of Action: Research and Innovation action

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

LC-MG-1-5-2019: Advancements in aerodynamics and innovative propulsion systems for quieter and greener aircrafts

Specific Challenge: Significant progress has been done recently in terms of environmental emission (including noise) by the development of Ultra High Pressure Ratio and Ultra High By-Pass Ratio engines. Technology assessments based on the turbofan engine configuration are indicating that there is still remarkable potential inherent in the turbofan engine configuration to be realised to further reduce gaseous and noise emissions. However, as far as noise is considered it is necessary to address the interaction between engines and aerodynamics surface and the engines interaction in aircraft architecture for a better assessment of the gain in term of noise reduction. This is necessary for the above mentioned advanced engines soon available but even more for future aircraft architecture displaying distributed propulsion or closer engine/wing integration.

Scope: In order to substantially decrease the noise and environmental impact of aviation, in parallel to advances in propulsion technologies, the quest for a full understanding of the noise source mechanism (for example associated with the laminar-to-turbulent flow transition, fully turbulent flow regime, high lift devices, landing gears, etc) remains open especially for future

aircraft configurations adopting breakthrough technologies. Hence, proposals should address at least two of the following areas:

- Compatibility between thrust effectors (fan/propeller electrically or mechanically driven) and higher degree of integration into disruptive airframe configurations (e.g. Boundary Layer Ingestion, wing distributed propulsion).
- A better understanding of the noise source mechanisms for high bypass ratio turbofan engines for evolutionary and disruptive aircraft architectures such as distributed propulsion or closer engine/wing integration.
- A better understanding of the noise source mechanism associated with the laminar-to-turbulent flow transition and fully turbulent flow regime.
- A better understanding of the leading/trailing edge noise generated at landing by high-lift devices and undercarriage, including new acoustic treatments on nacelle and aircraft structures.
- Innovative propulsion technologies to address the critical topics related to the further increase of overall pressure ratio and gas temperatures needed to drive efficiency such as: reducing fuel consumption by improving thermal and propulsion efficiency, reducing Particle Number (PN), CO₂ and NO_x emissions by advanced combustion technologies, reducing engine weight and dimensions gaining substantial benefits on aircraft level.

The proposals are expected also to develop multi-physics modelling, numerical simulation and optimisation exploiting High Performing Computing capabilities, innovative flow control technologies, and experimental methodologies.

Proposals should ideally address TRLs ranging from 1 to 4. 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: Results will contribute to ultra-efficient, more silent, regional, short-haul or long-haul commercial, transport aircraft that could result in demonstration activities in 2025. According to the Flightpath 2050 goals pursued by the ACARE SRIA, CO₂ emissions per passenger kilometre have to be reduced by 75%, NO_x by 90% and perceived noise by 65% by 2050, all relative to the year 2000. Recent achievements assessed by the CSA FORUM-AE and extrapolated at TRL6 in 2020 result in the following figures: CO₂ emissions per passenger kilometre about 38% (aircraft, + engine + ATM), NO_x at engine level reduced by about 60% and perceived noise reduced by about 50%. The proposals must demonstrate that their targets are going beyond these last and are approaching the ACARE 2050 goals. Proposals must substantially explain how and why their anticipated targets are realistic.

Type of Action: Research and Innovation action

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

LC-MG-1-6-2019: Aviation operations impact on climate change (InCo flagship)

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

Aviation alters the composition of the atmosphere globally, thus can potentially contribute to anthropogenic climate change and ozone depletion. The last major international assessment of these impacts was made by the Intergovernmental Panel on Climate Change (IPCC) in 1999. In addition to CO₂, the climate impact of aviation is strongly influenced by non-CO₂ emissions, such as nitrogen oxides, influencing ozone and methane, and water vapour, which can lead to the formation of persistent contrails in ice-supersaturated regions.

Beyond the perennial challenge in developing new technologies that can minimize the impact in the medium and longer term, the main objective of this action is expected to address mitigation strategies that will minimise those negative effects by aviation on climate in the short-medium term and are relevant for greener flight trajectories and operations.

Scope:

The proposals may aim at one or more of the following areas:

- A. Advance further the international state-of-the-art, through better scientific understanding of aviation emissions with high degree of uncertainty and high estimated impact to climate change, in order to enable greener flight operations.
- B. Propose and evaluate mitigation strategies towards operational improvements.
- C. Propose and evaluate mitigation strategies towards greener flight trajectories (ensuring complementarities with SESAR JU activities).
- D. Propose and evaluate mitigation strategies based on the use of alternative jet fuel pathways that have been approved under or intended to apply for the ASTM D7566 approval standard. A detailed Life Cycle Analysis (LCA) approach needs to be included taking into account the following key elements: proper co-product allocation methodology, system boundaries, attributional vs consequential LCA and uncertainties from the time horizon, the potential of Green House Gases (GHGs) reduction and economic implications. Regarding the feedstocks, the impact of indirect land-use change (ILUC) on GHGs emissions must also be taken into account and addressed.

Proposals are expected to address the need to design and implement international measurement campaigns, in order to contribute to better climate metric assessments and more reliable physical and climate models.

This action does not address new aircraft technologies on structures, systems, engines nor their integration, towards minimising the impact in the medium and longer term. The projects are expected to formulate specific recommendations for stakeholders on flight planning and on the use of alternative fuels.

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged. In particular bilateral international cooperation with China is encouraged for areas C and D with the aim at promoting substantial coordinated and balanced research and innovation cooperation between the EU and China. Proposals under those research areas C and D are encouraged to have an appropriate balance in terms of effort and/or number of partners between the EU and China. China-based participants have the possibility to apply for funding under the Chinese co-funding mechanism and other Chinese sources.

Although the association of TRL to better understanding aviation emissions is not uniquely defined, the implementation of the proposed topic may cover TRL spectrum from 2 to 4.

The Commission considers that proposals requesting a contribution from the EU between EUR 2 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 topic aims to deliver scientifically founded and globally harmonised policy, regulations and operational improvements to support climate-friendly flight operations. Expected impacts are:

- Better understanding the impact of aircraft emissions on climate towards better policy.
- International measurement campaigns and international validation of physical and climate models.
- Operational improvements in support to achieve the collective medium term global aspirational goal of keeping the global net CO₂ emissions from international aviation from 2020 at the same level (so-called "carbon neutral growth from 2020").
- Enhanced role of the Union in International Organisations and multilateral fora as well as strengthened implementation, governance, monitoring and evaluation.
- Collaboration and sharing expertise on operational improvements and global market-based measures with EU and National aviation and environment research programmes.
- Contribution to UN's Sustainable Development Goal 13: Take urgent action to combat climate change and its impacts.

Type of Action: Research and Innovation action

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

LC-MG-1-7-2019: Future propulsion and integration: towards a hybrid/electric aircraft (InCo flagship)

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

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

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

Scope: Proposals are expected to address feasibility design studies for aircraft energy system with integrated hybrid/electric propulsion and power generation architectures as well as sub-systems enablers in the context of appropriately projected advances in the next twenty-year framework. Each proposal may aim at several of the following areas:

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

Projects are expected to perform an assessment on the applicability, availability and upgrade of research infrastructures for testing and validation with focus on electrical and propulsion benches and computational tools. (incl. wind tunnels, electrical and propulsion benches and

computational tools). Projects are also expected to develop updated roadmap with reference to key enabling technologies towards fully electric or hybrid-electric aircraft and explore new relevant regulatory frameworks.

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

In line with the strategy for EU international cooperation in research and innovation¹⁵, multilateral international cooperation is encouraged, in particular with countries such as Japan and Canada.

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

Expected Impact: Overall, the topic is expected to contribute to Flightpath 2050 goals, namely towards “environmental protection and the security of energy supply” as well as “maintaining global leadership”. Specific impact is expected in the following areas:

- New paradigm shift towards emission-free aviation.
- Strengthen the medium and long-term European aeronautics competitiveness.
- Engagement of European aviation research community to a highly ambitious topic.
- Establishment of roadmaps and prioritization key enabling technologies.
- Foundations for next-generation European demonstrators.
- Contribution to UN's Sustainable Development Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all.

Type of Action: Research and Innovation action

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

LC-MG-1-8-2019: Retrofit Solutions and Next Generation Propulsion for Waterborne Transport

Specific Challenge: Emissions from waterborne transport remain a challenge particularly concerning the water and air quality around coasts, ports and urban areas. For shipping and inland waterway transport retrofit technology including for example engine modifications, engine replacement, exhaust gas cleaning systems, PM filters, hybrid batteries, fuel changes, efficient emissions capture and storage system can potentially improve the environmental performance (CO₂, NO_x, SO_x, PM) of existing fleets within the next five to ten years.

¹⁵ (COM(2012)497)

However, new next generation vessels are expected to be both cleaner and more CO₂ efficient. Vessels will be increasingly electrified and hybridised use clean fuels, on board energy storage and employ new technologies such as optimised design, batteries and high power fuel cells integrated within dual cycles and with combined heat and power. Novel large area propulsion systems also offer the possibility of large efficiency gains. To maximise efficiency gains from these technologies a radical rethink of ship design is needed.

Scope: To address these challenges, proposals should address one of the following two subtopics and clearly indicate which subtopic is addressed:

Subtopic A) To be implemented through Research and Innovation Action.

- Develop and validate a concept for a passenger ship powered primarily by high power fuel cells and if more efficient, in combination with a combustion engine or turbine as a combined cycle. On board power should exceed 5 MW and the concept should address issues concerning; combined heat and power, battery hybridisation, reliability, environmental performance on the whole life cycle, safety, regulatory, cost, ship design and layout, power system weight, volume and service requirements. The concept should be founded using LNG or LBG or CBG or synthetic fuels with the additional consideration of the consequences of 100% hydrogen operation. In addition, the critical barriers to development and deployment should be identified together with a road map for their solution. Work is expected to focus on the integration of fuel cell technology within the ship and not the detailed internal design of the fuel cell. Work should build upon other relevant activities such as the development of the IGF code within IMO.

Subtopic B) To be implemented through Innovation Action.

Proposals should address one or more of the following aspects:

- Develop and validate to at least TRL 5 innovative next generation high efficiency propulsion systems for ships using electrification and or clean fuels and or renewable energy sources. Consider all aspects of the ship propulsion system including related materials, electrical systems, energy storage and impact on ship design leading towards a zero emission maritime transport.
- Develop and validate to TRL 5 highly innovative large area high efficiency or renewable energy assistance propulsion systems such as whale tails, novel wind power or bio mimic devices and their integration into the ship design. Demonstrate and assess on the whole life cycle, reliability, materials and efficiency at large model scale within a variety of conditions. Consider hydrodynamic and overall efficiency, endurance, reliability, materials, biofouling, noise, manufacture and cost.
- Develop and demonstrate to TRL 6 innovative, cost effective retrofit solutions for marine shipping which will provide substantial improvements in terms of environmental impact and life cycle cost. Solutions must significantly reduce emission in line with water and air quality objectives and even exceeding current legislative requirements,

particularly around ports and urban areas. In combination with distillate fuels, solutions must significantly reduce NOX, SOX and particulate matters (PM), particularly for the most harmful particle sizes, particularly within coastal and port areas. Operational requirements, cost benefits, including effluent disposal costs and procedures shall be considered. Disseminate outcomes and facilitate take up by key stake holders.

- Develop and demonstrate to TRL 6 innovative, cost effective retrofit solutions for inland waterways which will provide substantial improvements in environmental performance. Solutions must significantly reduce emissions at least in compliance and preferably exceeding water and air quality requirements, particularly around terminals and urban areas. In combination with current compliance options (distillates or other low sulphur fuels, required engine operating parameters,...) solutions must meet regulatory requirements and significantly reduce NOX, SOX and ultrafine particulates, particularly for the most harmful particle sizes (including ultrafine particles), particularly within urban, port and terminal areas. Operational requirements, approvals, financing, cost benefits, including effluent disposal costs and procedures shall be considered. Disseminate outcomes and facilitate take up by key stake holders.

The Commission considers that proposals requesting a budget from the EU of between EUR 3 to 5 million each for Subtopic A and between EUR 4 to 6 million each for Subtopic B, would allow this specific challenge to be addressed appropriately. Nonetheless this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Next generation propulsion solutions will enable a large (>10%) increase in energy efficiency and CO2 reduction. Enable integration of large high power marine fuel cells into ship design and demonstrate their feasibility, cost effectiveness and identify technical barriers to adoption. Enable innovative high efficiency low emission ship propulsion system that may integrate several power sources. Demonstrate the feasibility, efficiency gains, reliability and cost effectiveness of large area propulsers. Retrofit solutions will reduce SOx, NOx and PM pollution from waterborne transport, particularly around ports, terminals, urban and coastal regions and in compliance with urban air quality standards but also at open sea since air pollution can travel large distances. Significantly, increase the take up of retrofit emission reduction solutions in existing vessels. Enhance European competitiveness and support European jobs and growth. Facilitate deployment of innovative green waterborne transport technology.

Type of Action: Innovation action, Research and Innovation action

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

LC-MG-1-9-2019: Upgrading transport infrastructure in order to monitor noise and emissions

Specific Challenge: Noise and emissions from transport affect seriously people's health and environmental ecosystems requiring the implementation of mitigation measures to achieve a

higher reduction in all transport modes. The fast development of technologies that facilitate connectivity of innovative sensors, -both on-board and on the side of the infrastructure- could allow real-time monitoring and control of transport noise and emissions. Current applications of different mobile systems and measurement methodologies make comparison of data rather difficult. The development of harmonized measurement methodologies will increase the reliability of collected data and the credibility of the consequent awareness/mitigation procedures. Systems embedded in the transport infrastructure can help in identifying vehicles not respecting prescribed limits and would either allow the operator to be informed swiftly of the environmental deficiencies of the vehicle, or would enable authorities to identify and prevent polluting vehicles from entering, hindering their access to specified low-emission zones, thus mitigating the effects of the non-respect of tolerance limits.

The integration in the infrastructure of absorbing materials and the utilization of negative-emissions solutions can also contribute to the reduction of the negative effects of emissions and noise.

Scope: Proposals should address all the following aspects:

- Development of equipment for integration into infrastructure that would be able to detect and identify (plate recognition) in real-time vehicles exceeding the limits of noise (Db(A)) and emissions (CO₂, NO_x, PM);
- Development of related I2V systems aimed at informing the transgressor of the emissions/noise limits being exceeded and preventing access to delimited low-emission zones;
- Development of automated tolling systems that take into account the level of emissions from individual vehicles;
- Development of new materials and negative-emissions solutions for infrastructure application, apt to mitigate noise and emissions.

Road and rail networks are primarily addressed, but research should not exclude solutions to reduce nuisance coming also from air and water transport.

Potential negative effects from fixed sensors on human health should be carefully considered and avoided.

The Commission considers that proposals requesting a contribution from the EU between EUR 4 and 7 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

In line with the Union's strategy for international cooperation in research and innovation, international cooperation is encouraged. In particular, proposals should foresee twinning with

entities participating in projects funded by US DOT to exchange knowledge and experience and exploit synergies.¹⁶

Expected Impact: Development of measures aimed at reducing the negative effects of noise and emissions. Increased monitoring and detection of transport unacceptable levels of noise and emissions; identification of transgressing vehicles and possible invitation to appropriate revision; limiting access to sensitive zones (e.g. urban centres). Development of technologies to be applied for better calculation of externalities and consequent charging methods. The application of solutions should bring to a reduction of at least 30% in emissions and 20% in noise in targeted zones based on the measured level at the beginning of the project.

Type of Action: Research and Innovation action

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

LC-MG-1-10-2019: Logistics solutions that deal with requirements of the 'on demand economy' and for shared-connected and low-emission logistics operations

Specific Challenge: Urban, metropolitan and peri-urban areas are experiencing a huge increase in demand for new logistics solutions that deal with the requirements of the 'on demand economy' and incorporate opportunities for shared, connected and low-emission logistics operations. Research is needed on how to prioritize and combine a number of competing interests from the private side and public (policy) side.

Scope: Proposals should address all of the following aspects:

- Developing value cases for integrated systems of logistics/ freight operations in urban, metropolitan and peri-urban areas, such as TEN-T urban nodes and consolidation centres in urban areas.
- Addressing (and planning for) the integration of low-emission, and possibly connected (automated) delivery vehicles (e.g. cargobikes, drones) in urban logistics.

In line with the Union's strategy for international cooperation in research and innovation international cooperation is encouraged.¹⁷

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 to 4 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 will result in a clear understanding of cost effective (non-vehicle technology based) strategies, measures and tools to achieve essentially zero emission city logistics in major European urban centres by 2030.

¹⁶ (COM(2012)497)

¹⁷ (COM(2012)497)

Actions will deliver new tested, demonstrated practices and solutions for better cooperation between suppliers, shippers and urban/regions policy makers (planners). These actions should clearly provide inputs for the preparation and implementation of sustainable urban logistics plans (SULPs) and/or SUMP and other planning (private and public side) tools, such as big data and real-time traffic management.

Type of Action: Research and Innovation action

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

2. SAFE, INTEGRATED AND RESILIENT TRANSPORT SYSTEMS

The overall performance of the transport system depends on the performance of infrastructure, means of transport, traffic management systems and on user behaviour. This includes vehicles, aircraft and vessels and their respective infrastructures. Further knowledge is needed on safety in relation to accident response and to the new mobility environment (increased automation, drones applications, etc) as well as on door-to-door integration of different modes for short and long distance travel in both the passenger and the freight transport. The incorporation of economic, social and environmental dimensions is important in order to improve the current transport system, increase its robustness and support safety, security and quality of life. It is also essential to consider aspects of infrastructure construction and maintenance based on innovative solutions.

Research under this section is expected to contribute significantly to transport safety across transport modes and more particularly to the goals set by the Transport White Paper on close to zero road fatalities by 2050, as well as to Sustainable Development Goals 3.6 and 11. It is also expected to contribute to the decongestion of road/city infrastructure by modernising and increasing the reliability and competitiveness of Intra-European Waterborne transport, as well as to the integration of the European network for logistics into the global one by supporting the sustainable development of new logistics routes and their links with national/regional markets.

MG-2-1-2018: Human Factors in Transport Safety

Specific Challenge: Human factors are the largest cause of accidents across all transport modes. Increased technical development and automation fundamentally change the way in which humans interact with the road or rail vehicles, vessels or aircraft and can improve safety by decreasing the human element. Evolving systems, operations and technology change how humans perceive their immediate environment and traffic as well as how they interact with the machine. However, machines are inherently less flexible than humans, who are, by their nature, variable in terms of behaviour, experience, cultural demographic, distraction, fatigue etc. Availability of sufficient relevant data on human factors needs to be secured. There is also a need for better methodologies to assess human factors which should be incorporated within risk based approaches to design and operation. In particular, human behaviour in "normal situations", in addition to accidents and incidents, should be assessed

using real world data when available. Consideration also needs to be taken of demographic factors, including dynamics such as variations in safety perception and behaviour resulting from greater cultural and ethnic diversity in the EU.

The challenge is to improve transport safety through a more timely, focussed and integrated adoption of human factors in the design of road or rail vehicles, vessels or aircraft, infrastructure and the mobility system - taking advantage of automation - as well as increasing knowledge of enhanced human machine interactions to further advance the use of automation without introducing new, previously unknown, safety risks. More knowledge is needed on how automation changes human behaviour and the capability to react appropriately to fast emerging situations in a complex environment.

It is also necessary to understand and address bottlenecks in organisational acceptance of technological and social change. This includes emerging legal and regulatory issues associated with shifts in responsibility of the operator (driver, pilot, captain etc) as well as governance of complex integrated systems.

Cross-fertilisation of concepts and technologies across transport modes is encouraged.

Scope: In order to meet this challenge, proposals should address one of the following sub-topics, and clearly indicate which subtopic is addressed:

- Subtopic A): Understand the limitations, interaction and range of factors that influence and degrade human performance when controlling a vehicle/aircraft/vessel and apply solutions that overcome these limitations. Establish the conditions for a "tolerance zone" of acceptable operator performance and corresponding appropriate actions when the limits of safe behaviour are approached. The range of factors to be taken into account includes – but is not limited to - physical profile and ability, age, gender, linguistic and IT abilities, level of technical and non-technical skills, culture, and limitations faced by persons of reduced mobility (“PRM”). Carry out comparative behavioural and perceptive studies in different EU regions, and – within them – between different cultural and ethnic groups amongst transport users and operators, in order to understand diversity in perception of danger, comprehension of rules, mobility behaviour. Apply the knowledge in concepts and solutions. Methods and measures that support better adaptation skills in human behaviour, or provide intelligent support, may be considered. Define behavioural markers, including indicators of successful and degraded human performance. Develop recovery measures and mitigation solutions together with methods and techniques for measurement of changes in performance. Virtual concepts should be considered. Verify models and methods experimentally in relevant use cases. Activities should be aimed at identifying measures to increase understanding, respect and acceptance of transport safety rules. Furthermore the actions proposed should support the transfer of best practice within the EU and in neighbouring countries and ensure a better transport culture. Collaboration with neighbouring countries is recommended.
- Subtopic B): Improve the assessment of human risk factors in risk based design and operation within waterborne / air transport, including crew resource management, crew

awareness and response in extreme cases (e.g collision, evacuation, aircrafts upset recovery, runway excursions, etc). Identify new (and presently unknown) risk factors which might arise in the transformation towards increasing automation. Compile and analyse a large quantity of global real world accident, incident, near miss and other safety event data. Use this data to develop improved methodologies to address human factors within risk based comprehensive design models and operational safety assessment for waterborne and air transport. The data (if necessary anonymised) should be retained as an open source beyond the project, and be maintained and updated. Standardised guidelines should be developed for assessing and categorising human factors within investigations of accidents, incidents and near misses and other safety events. The resulting data should be easily incorporated into open data bases which can be a continued resource for risk based design and operations. Guidelines should be developed and, if necessary, recommendations to amend existing rules and regulation should be made.

Proposals should include methodologies or tools to demonstrate that they contribute significantly to safe transport systems through the knowledge created and also show how the measures identified adapt best practices to local conditions. Work should draw upon knowledge from other sectors-when addressing risk and interaction with complex systems. Development of enhanced Human Machine Interface solutions and simulators should take into account the advantages of automation. The cross-modal transfer of human factors issues within various levels of automation should also be considered. Proposals addressing air transport may include the commitment from the European Aviation Safety Agency to assist or to participate in the action.

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

The Commission considers that proposals requesting a contribution from the EU of between EUR 4 and 8 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: A significant step towards a safe transport system considering all transport modes, enabled by a decrease in collisions and incidents attributable to human factors by taking advantage of increasing automation in transport operation and control. Enhanced transport safety for a diverse demographic by increasing consideration of human factors within designs and transport operation means. Improved selection and training of operators. Enhanced international cooperation concerning human factors. Improved international rules and regulations. Facilitation of learning and safety improvement from assessment of human factors within accidents, incidents, near misses and other safety events, enabled through the provision of a long term human factors data resource. For road transport, actions will contribute to UN's Sustainable Development Goals 11 (Make cities and human settlements inclusive, safe, resilient and sustainable) and 3.6 (By 2020, halve the number of global deaths and injuries from road traffic accidents). For aviation, actions will contribute to United

Nations' International Civil Aviation Organisation (ICAO), EASA and FlightPath2050 goals to decrease fatality rates. For waterborne actions will contribute to IMO, EMSA, European maritime transport policy and UN Sustainable Development Goals 14 concerning the sustainable use of the seas and oceans.

Type of Action: Research and Innovation action

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

MG-2-2-2018: Marine Accident Response

Specific Challenge: Appropriate actions taken following a marine accident can greatly reduce loss of life or damage to the environment. This is particularly the case for very large passenger ships where flooding and maintenance of stability and systems that can safely evacuate large numbers of passengers (from a wide demographic within difficult conditions harsh environments and where there may be limited search and rescue capability) are critical. Despite improvements, fires on board passenger, ro-ro and containerships continue to be a regular occurrence, which sometimes require external intervention for passenger and crew evacuation and on certain occasions could remain uncontrolled for days before being extinguished. Such interventions cannot be assured and are not always effective with consequent risk to personnel and the environment. The specific challenge is to develop solutions that address these risks and which can be reflected within forthcoming revisions of relevant IMO Rules. International cooperation to draw upon global experience and facilitate common positions that are founded upon joint research is considered particularly valuable.

Scope: To address these challenges, proposals should address one of the following subtopics and clearly indicate which one they are addressing:

Subtopic A): To be implemented through Research and Innovation Action. Linked to a forthcoming revision of IMO rules and with a focus on passenger ships, research will address probabilistic damage and consequence safety assessment and actions to control damage and maximise stability following grounding and contact damage. The widest possible accident and design data from all relevant types of ship and damage should be sourced, processed, interpreted for passenger ships and used within probabilistic models. Retaining open access to data is encouraged. Consideration should be given to validation of such models through simulations and model tests. The optimisation of watertight doors in terms of their operation, their role as a watertight boundary and the risk they pose to personnel should also be considered.

Subtopic B): To be implemented through Research and Innovation Action. Research will address a radical re-think of evacuation systems for passenger ships having a high passenger capacity. Next generation of life saving systems should be developed that are "deskilled" to facilitate safe and swift operation on a damaged vessel within stressful environments and which are suitable for large numbers persons from a wide demographic range within poor or

extreme weather conditions. Together technical solutions developed to TRL5 and their demonstration, social and behavioural aspects need to be considered.

Subtopic C): To be implemented through Innovation Action. With an emphasis on passenger and crew safety for all types of ro-ro ships, research should address risk, design, ignition, detection, extinguishment, containment and regulatory issues so as to greatly enhance the prevention and management of fires at sea without recourse to external intervention. Solutions should be developed that are subject to experimental validation and demonstration and should include both operational and design risk control options. Special consideration needs to be given to fires originating within all types of ro-ro decks.

Subtopic D): To be implemented through Innovation Action. With an emphasis on container vessels and crew safety, research should address risk, design, detection, firefighting and regulatory issues so as to greatly enhance the prevention and safe management of fires at sea without recourse to external intervention. Special attention should be given to fires occurring within the cargo area where relevant risk control options should be presented, analysed and the effects of their application validated through computer simulation and model test.

In line with the Union's strategy for international cooperation in research and innovation international cooperation is encouraged.¹⁸

The Commission considers that proposals requesting a contribution from the EU of between EUR 7 and 12 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: To TRL5, innovative technical solutions which significantly improve the safety of shipping will be developed and demonstrated. Activities will provide a technical basis and proposals for the revision of relevant international IMO safety rules. With respect to damage stability, establish a large body of evidence that can provide a sound basis for probabilistic models, free water effects and realistic procedures and systems to maintain stability sufficiently to enable safe evacuation within all reasonably foreseeable circumstances. Concerning evacuation, activities will develop and demonstrate a system that is intuitive, as far as possible automated and fail safe so that it is operable without significant training. The system must enable the timely safe evacuation of large numbers of persons from a wide demographic range in adverse conditions. Considering several recent on board fires, the developed solutions will enable similar on board fires to be detected swiftly and tackled safely without recourse to external intervention. International cooperation with important shipping nations will facilitate common science based understandings and a global approach to marine safety. Contribute to UN's Sustainable Development Goal 14 Conserve and sustainably use the oceans, seas and marine resources and the target to prevent and significantly reduce marine pollution of all kinds.

Type of Action: Innovation action, Research and Innovation action

¹⁸ [\(COM\(2012\)497\)](#)

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

MG-2-3-2018: Airworthiness of mass-market drones

Specific Challenge: Recent research work¹⁹ carried out on 10 year-long set of reported civil incidents involving drones around the world has found that technical problems (most notably, broken communication links) rather than errors by operators are the major cause of those incidents (circa 64% of the total). This evidence points to the need for adequate airworthiness rules for drone safety and better reporting of accidents.

Whilst multiple local or regional initiatives by aviation safety regulators have emerged worldwide to address this issue, they have been often impacted by the needs for providing timely responses to regional market demands, eventually resulting in significant regional differences in the technical requirements of recreational, professional-grade and specialized industrial drones. The growth in the number and diversity of mass-market drone operations – cf. delivering packages, taking photos, geo-surveying, firefighting or search and rescue – make it essential that safety regulations, including relevant technical aspects, ultimately keep-up with this buoyant and rapidly-growing industry.

In parallel, penetration in the Europe market is often hampered by a lack of mutual recognition of drones-based products and services between States – obliging manufacturers and operators to seek certifications with multiple national authorities.

The EU, through EASA, is currently developing a harmonised performance-driven regulatory framework building upon "best practice". This framework should ultimately ensure safe and environmentally sound operations and reduce the barriers to market entry for businesses that would like to integrate drones in their value chain. The implementation and effectiveness of such a framework will depend eventually on a relevant body of appropriate technical standards – supporting demonstration of compliance of product features or technologies with applicable requirements. Such over-arching framework could equally serve as an input for global standards and procedures.

Scope: Gather comprehensive global information on on-going²⁰ and planned work on technical rules, standards and procedures for civilian markets and/or use in civilian airspaces,;

Critically assess and benchmark the gathered information, providing a knowledge-base of "best practice" and data aimed at supporting the EASA's regulatory due-process; particular emphasis shall be given to the provision of data for purposes of validation of specific product or technical requirements;

Contribute to the development and subsequent validation of a well-reasoned set of technical standards that are appropriate for all relevant categories of drones.

¹⁹ Graham Wild, John Murray, Glenn Baxter; "Exploring Civil Drone Accidents and Incidents to Help Prevent Potential Air Disasters"; Aerospace, 2016; 3 (3): 22 DOI: 10.3390/aerospace3030022

²⁰ Including activities at ASTM, JARUS, EUROCAE (WG73, WG93, and WG105)

Consortia should include organisations from all parts of the drone value-chain – drone/part suppliers, operators, academia, and safety regulators – to ensure the triplet of user-producer-oversight competences required for full performance and swift delivery of the work.

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 and 3 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: Support to the on-going EU regulatory process for technical rules, standards and procedures for civilian drones to enable safe, environmentally sound and reliable operations in Europe with a view to accelerate the timing and enhance the quality of such due-process. Generate additional leverage for Europe in the international negotiations for global rules and standards.

Increase the acceptance of EU standards in the global drone product and service marketplace, generating economies of scale towards reducing costs whilst de-risking customer choice.

Offer better opportunities for European drone designers, manufacturers and operators in accessing global markets.

Type of Action: Coordination and support action

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

MG-2-4-2018: Coordinating national efforts in modernizing transport infrastructure and provide innovative mobility services

Specific Challenge: Europe is faced with a growing need to make transport infrastructure more resilient, and to keep pace with the changing mobility needs and aspirations of people and businesses and to reduce the impact of infrastructure on the environment. It is urgent to find innovative solutions to upgrade transport infrastructure ensuring an adequate performance level that reflects also vehicle and ICT developments. National Transport Authorities are facing a change in their role from infrastructure managers to service providers and a number of relevant activities are being carried out at national and international level. A close collaboration between these activities is necessary to ensure coherence at European level, and avoid duplication of efforts and resources.

Scope: Proposals should address all of the following, including National Authorities from at least 10 EU Member/Associated Countries:

1. Develop a coordination mechanism that will allow National Transport Authorities to align their efforts in modernizing the transport infrastructure network;

2. Identify new roles and competences for the infrastructure managers/operators to respond to the new and future functionalities of the transport infrastructure;
3. Consolidate partnerships and alliances between the transport infrastructure stakeholders and the research community;
4. Continue the coordination activities for information exchange and cross-cutting fertilization between projects funded under Horizon 2020, CEF and national schemes for the optimal exploitation of the results.

Proposals should consider the advancements already achieved with other initiatives (e.g. Infravation EraNet+²¹, C-Road²², RIS²³, PRIME²⁴

The Commission considers that proposals requesting a contribution from the EU of between EUR 0.8 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.

A multimodal approach as well as an international dimension are encouraged.

Applicants are invited to read the eligibility and admissibility conditions for this topic.

Expected Impact: Align Transport Authorities' activities and decision-making options on the development of the core and comprehensive TEN-T, ensuring compatibility and interoperability of the system, and support joint cross-border actions fostering closer collaboration between national authorities. Enable infrastructure managers to provide higher quality and innovative services to users and customers of the transport network; ensure the appropriate flow from research to innovation to implementation; enhance the appropriate communication flow and cross-fertilization between actions.

Type of Action: Coordination and support action

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

²¹ <http://www.infravation.net/>

²² <https://www.c-roads.eu/platform.html>

²³ <http://www.ris.eu/>

²⁴ https://ec.europa.eu/transport/modes/rail/market/infrastructure-managers-prime_en

MG-2-5-2018: Innovative technologies for improving aviation safety and certification in icing conditions (InCo flagship)

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

Aviation is inherently and increasingly international. Aviation impacts globally the atmosphere, and vice-versa. Aviation emissions to the atmosphere are increasing. In-flight weather hazards are also increasing worldwide. Meanwhile, the demand for aviation keeps growing globally. Commercial Air-Transport (CAT) fatal and non-fatal accidents are continuously decreasing with EASA Member States accident rate much lower than the world-wide one²⁵. However, in-flight weather hazards, in particular icing conditions, are a contributing factor in accidents and incidents world-wide. In line with ACARE Strategic Research & Innovation Agenda, further advancements in understanding, modelling, detection, avoidance and mitigation of in-flight performance degradation are necessary towards enabling harmonised certification with less flight trials.

Scope: Although several research activities addressed the issue of ice accretion on aircraft, resulting in improved understanding of icing phenomena, and also in promising strategies to detect and to remove ice accretion, those advancements were mostly focused on airframe. Future advancements should also include engines as well as rotorcrafts. In addition, reduction of power consumption of in-flight anti/de-icing devices and of the negative environmental impact of anti/de-icing processes is necessary, both in-flight and on the ground.

The proposals may aim at addressing several or all of the following areas:

- Further advancements in the detection, understanding, sensing, modelling, simulation and testing of icing, de-icing and anti-icing of all types in aviation (e.g. mixed-phase, ice crystals, super cooled large droplets, etc).
- Explore/propose/validate new certification methods, means of compliance, standards and protection systems (e.g. either active or passive, including coatings) for all types of icing and air vehicles, engines and on-board systems.
- Address the overall system integration, including operational and maintenance aspects.

The range of TRLs to address is broad, from fundamental research up to TRL 5 (at the end of the project). In line with the strategy for EU international cooperation in research and innovation²⁶, multilateral international cooperation is encouraged, in particular with countries such as United States, Canada, Russia, Japan, Brazil and Australia. International cooperation can include work towards global monitoring of in-service events and icing hazards and towards joint tests, standards and certification, taking into account the activities of bodies such as the European Aviation Safety Agency (EASA), Federal Aviation Administration

²⁵ EASA, Annual Safety Review, 2016

²⁶ (COM(2012)497

(FAA), EUROCAE and United Nations' International Civil Aviation Organisation (ICAO). Proposals may include the commitment from the European Aviation Safety Agency to assist or to participate in the action.

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:

- Contribute to increase passenger safety by fewer accidents and less in-flight events worldwide.
- Contribute to decrease costs for all parties (e.g. industry, authorities, research & test centres) by improved and internationally accepted certification, standards and means of compliance, covering all types of icing hazards.
- Contribute to decrease delays in operations thanks to more efficient avoidance of icing hazards and to fewer damages in need of inspection and repair.

Type of Action: Research and Innovation action

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

MG-2-6-2019: Moving freight by Water: Sustainable Infrastructure and Innovative Vessels

Specific Challenge: Although it is a means of transport that can reduce transport CO₂ and air polluting emissions and significantly contribute to reducing congestion on European roads waterborne transport around European coasts and on its inland waterways remains under-utilised and is not fully integrated in the multimodal European Transport system. Both technical and administrative requirements hinder the take up of Intra-European waterborne transport. Improvements are needed concerning: efficient and seamless integration between transport modes and last mile connection, inland waterway bottlenecks, capacity of small ports, loading times, efficiency of transferring cargo between modes, cost effectiveness of partial cargo loads, environmental impacts and the feasibility of mixed passenger/freight services. There is a need to stimulate the modernization of intra-European waterborne transport as well as waterborne transport with neighbouring countries, particularly in the case of the outermost regions by fostering automation and digitisation so as to enable their more efficient and reliable participation in the whole supply chain, to reduce environmental impacts such as noise and to respond to changing freight flows and supporting full implementation of synchromodality within inland waterways.

Scope: Proposals should focus on either area a) inland waterways or area b) maritime transport. To address this challenge, proposals should address the first bullet (for Maritime

transport), or the fourth bullet (for Inland Waterway Transport), and at least four others of the following aspects. Proposals should clearly indicate which area they are addressing:

- With a focus on the TEN-T network, develop to at least TRL5 one or more innovative inland waterway or short sea transport solutions incorporating innovative vessels which can operate more effectively within intermodal logistic chains with limited and affordable improvements to existing infrastructure. For example, solutions may combine freight with passenger services or ship to ship transfers so as to improve the cost effective feeding of freight from large to small inland ports. The role of smaller coastal ports, inland waterways and their urban waterfront, including those located in the outermost regions, should not be neglected as a means to exploit their high potential to contribute to innovative mobility solutions and last mile freight delivery.
- Solutions should address the entire business model including connectivity IT infrastructure and integration with other transport modes.
- Automated and connected inland waterway and/or port infrastructure should be addressed to enable more efficient operations. As appropriate, smart systems and automation should consider the automation of bridges, locks and dams, cargo handling and units, docking systems and shore side power. Digitisation, for example, EGNOS/Galileo services should facilitate efficient cross-border traffic and cargo information and ensure multi-modal interconnectivity and integration. The High Precision and Authenticated Positioning services of Galileo should be taken into account in optimizing the port operations.
- Proposals addressing inland waterways, should address solutions for infrastructure maintenance and operation that increase the network resilience as well as long-term reliable navigability forecast, and should ensure compatibility with existing and emerging harmonised cross border and intermodal traffic management systems.
- Environmental performance must be significantly improved compared to the current state of the art with regard to local air quality, noise, energy efficiency and risk of pollution. An environmental impact assessment and safety assessment of the developed solution in comparison to alternative forms of transport should be undertaken.
- Concepts should be proven, a cost-benefit analysis undertaken and experimental validation and demonstration should be undertaken where feasible.
- Dissemination, engagement and cooperation with logistics, shippers and intermodal transport operators are encouraged.
- Business cases should be developed for key routes including comparison with existing transport solutions.
- Recommendations should be made for optimising the conditions for intermodal solutions incorporating waterborne freight transport, including over shorter distances.

- Outcomes should be developed to a level which would be potentially suitable for deployment possibly with the support of CEF TEN-T, EIB loan, ESIF or other programme.

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

Expected Impact: Decongest road and/or city infrastructure. Reduce the CO₂ and air pollutant emissions of intra-European freight transport. Enhance the performance of the CEF TEN-T network. Substantially increase the amount of freight fed from intercontinental European ports using waterborne transport. Modernise, increase the reliability and competitiveness of Intra European Waterborne transport. Proposal should demonstrate that the deployment of solutions can increase the quantity of freight moved by Inland Waterways or Short Sea Shipping by at least 10% by 2030 compared to 2010 baseline data.

Type of Action: Research and Innovation action

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

MG-2-7-2019: Safety in an evolving road mobility environment

Specific Challenge: The road mobility environment – the area which covers both road transport users and those affected by them – is evolving. Vehicle types are beginning to change as a result of increasing levels of automation. New vehicle types and new types of road user will operate with conventional vehicles and road users as part of an evolving mixed traffic environment. Vulnerable road users are still a continued concern, and in the increasingly connected transport system "vulnerability" may in the future also be more related to the non-connected users and people unable to fully use the potential of the Information and Communications Technologies (ICT) services offered to mobility. Automated vehicles may enable occupants to be placed out of the traditional seating position (e.g. face to face or in lounge/office environments) while undertaking new activities, thus making them more vulnerable in normal traffic.

(Active and passive) safety systems will need to adapt to the future types of the potential collisions, occupant positioning taking into account possible differences between men and women and vulnerable road users of the future, and address the need to reduce minor and major injuries, as well as fatalities.

Scope: The scope is to assure the development of robust solutions in the context of the changing environment, leading to dramatic improvements in transport users' and road workers' safety. In order to be properly addressed, traffic safety needs to be articulated in terms that are relevant for the connected and automated transport system.

To respond to the challenges proposals should address the following:

- Define road safety characteristics and properties as conditions and constraints in a traffic system (including road workers) which is undergoing increasing automation and is highly dependent on software, positioning/navigation systems and connectivity. The concept of vulnerability should be given appropriate consideration and be viewed in the evolutionary context of the mobility system also addressing "automotive digital divides", e.g. between urban and rural areas. Future traffic changes and new traffic scenarios will need to be considered taking into account aspects such as severe weather conditions, poor road conditions. Updated ways to assess accident risks should be developed and also take into account injuries causing longer-term disability. A reduction of at least 10% (compared with 2016 figures) for road traffic casualties (fatalities, injuries and incidents -where known) should be demonstrated for the solutions developed within the chosen theme(s) below.

In addition at least one of the following themes should be addressed:

- Development of tools and models which simulate how traffic scenarios are expected to change over time with the introduction of new vehicle types and new safety technologies for all road users. Human Body Models may need to be further developed to represent future collision scenarios (including pre-crash and near-crash behaviour) taking into account all road users. (such as gender, percentile, age, obesity, etc). Open source approaches are encouraged.
- Design of (active/passive) protection systems for future collision scenarios as well as for occupants' variable body postures and different human body types in future interior concepts. These systems may require the further development of occupant monitoring functions and can make use of the sophisticated sensor systems which will be fitted to automated vehicles.
- Development of (physical and/or digital) infrastructure and on-vehicle safety solutions as well as education and training schemes for all road users which match the pace of the increased implementation of automated driving functions.

The cultural diversity of road users should be considered, as well as age, gender and IT-experience.

In line with the Union's strategy for international cooperation in research and innovation²⁷ international cooperation is encouraged.

The Commission considers that proposals requesting a contribution from the EU between EUR 4 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: A reduction of at least a 10% (with respect to 2016 figures) in injuries and fatalities in road accidents, contributing to the ambitions of the Transport White Paper's goal

²⁷ COM(2012)497

to reach close to zero road fatalities by 2050. Contribution to the UN's Sustainable Development Goals (SDG), in particular goal 3.6 ("By 2020, halve the number of global deaths and injuries from road traffic accidents") and SDG 11 ("Make cities and human settlements inclusive, safe, resilient and sustainable").

Innovative optimum protection systems enabling the occupants of automated vehicles to assume new seating positions and leverage the perceived benefits of automation. Solutions will contribute to industry competitiveness and EU leadership in road safety.

Harmonised and relevant methods for the assessment of safety solutions in both real-world conditions and in future mobility scenarios, e.g. based on virtual simulations with validated models and/or based on experimental results.

Safer use of vehicles, effective education and training schemes and increased awareness of all road users in the evolving road mobility environment.

Type of Action: Research and Innovation action

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

MG-2-8-2019: Innovative applications of drones for ensuring safety in transport

Specific Challenge: The drone market is the fastest growing in aerospace, generating high-skilled jobs and enabling innovative services, both in the public sector at large (safety, security, environment monitoring, ...) and in the private sector (farming, infrastructure, delivery, inspection, broadcasting, leisure, ...), not only by large companies but also by many SMEs including start-ups. More services with drones and other emerging technologies can underpin safety and security in different transport modes: waterborne, railways, road transport and air transport.

The EU can strengthen its internal market and bolster its global market share by boosting in a consistent manner the development and safe and secure use of drones for civil and commercial purposes in the EU, notably allowing them to fly in the Single European Sky²⁸, including over European waters (e.g sea route and harbours) or to sail in European waterways and coastal areas. The development of vertical spatial + transport planning tools/methodologies and the development of technologies that help authorities in charge (e.g. city police officers) to ensure the enforcement of rules and to prevent abuse of drones for unwanted purposes can help to safely integrate drones in concepts for the last mile delivery in cities or rural areas..

²⁸ The EU regulatory framework is being set following the "EU Aviation Strategy" [COM/2015/0598] and the new regulation on common rules in the field of civil aviation and on the European Aviation Safety Agency (EASA), proposed by the Commission in December 2015 [COM(2015)0613]. The framework entails the harmonisation of regulations and standards across the European Union along with comprehensive, cohesive and conclusive demonstration of the enabling technologies.

Drones can be considered in a broad sense i.e. Unmanned Aerial Systems, including autonomous and remotely piloted systems. On the one hand drones can be problematic for transport safety and security. This is addressed in SESAR2020 and by the IMO at MSC 98, with a view to ensure enforcement of regulations on drones as well as safe and secure integration into Air and Maritime Traffic Management. On the other hand, drones can be enablers of safety and security of current transport means, for instance by monitoring large vehicles/vessels/air vehicles, transport infrastructure and transport operations and users in nominal and also contingency conditions, such as search and rescue. Furthermore, delivery by drones can enhance mobility services in line with the U-space concept set by the EU in the Riga Declaration. In any cases, public acceptance, privacy issues and other legal aspects of the widespread use of drones are recognised as essential, especially in urban environments.

Scope: The proposals are expected to address both of the following research areas:

- Develop and test technologies, operational and business models for the application of drones or drone swarms and other emerging technologies to increase the safety, security, public acceptance and overall efficiency of air, waterborne and surface transport, both passenger and cargo, including search and rescue applications.

- Explore and develop innovative technologies and sustainable business models for pilot services, such as large vehicles/vessels/aircraft inspections, transport management (including emergencies), transport infrastructure condition monitoring and maintenance, logistics, on-demand cargo and/or personal mobility using drones and other emerging technologies safely.

Efficient, reliable and secure (taking into account cybersecurity) collection, distribution (including wireless transmission) and automatic processing of data (on ground and on board) should be included (e.g including through sensor integration) while respecting privacy rights/personal data protection requirements. Also requirements from law enforcement agencies and insurance should be considered.

Scaled demonstration of the services should underpin and accelerate the regulatory adaptation, certification, public acceptance, standards validation and follow-on deployment in Europe, including innovative commercial and public pre-procurement. Applications of drones should leverage synergies among EU satellite-based systems for navigation (EGNOS/Galileo), observation (Copernicus) and communication.

Proposals should also ensure consistency with the overall regulatory framework, in particular with EASA's work for systems certification and standardisation and complementarity with SESAR2020 Programme (including SESAR 2020 RPAS Exploratory Research Call from 28 June 2016) EMSA and Shift2Rail IP2 activities and with other EU co-funded drone related projects and initiatives, notably under Horizon 2020 Security challenge or EDA's SARUMS activities. Proposals may include the commitment from the European Aviation Safety Agency to assist or to participate in the action.

Proposals should ideally address TRLs ranging from 3 to 5.

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:

- Contribute to increase safety and security of the overall civil transport system.
- Contribute to enhance safe and seamless mobility of cargo and passengers.
- Contribute to economic growth by unleashing new markets, new industries and new high-added value jobs in Europe while ensuring appropriate legal frameworks and advancing safety systems certification and setting standards with potential to become a global reference.
- Building knowledge and acceptance within society for the steps described within U-Space.

Type of Action: Research and Innovation action

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

MG-2-9-2019: InCo Flagship on Integrated multimodal, low-emission freight transport systems and logistics

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

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

global benefit and ensuring better integration of these regions into the world economic landscape.

Scope: Proposals should address one or more of the following aspects:

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

- Collect best case models and develop decision support systems aimed at helping public authorities and private companies to determine the most likely scenarios and to promote a higher level of collaboration between the different stakeholders, including new emerging ones.
- Consideration of aspects of governance, privacy and cybersecurity of and with regard to cargo.

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

In line with the Union's strategy for international cooperation in research and innovation²⁹, international cooperation is encouraged. In particular proposals should consider cooperation with projects or partners from the US, Japan, Canada, China, Latin America.

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

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

Type of Action: Research and Innovation action

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

3. GLOBAL LEADERSHIP AND COMPETITIVENESS

Global leadership and competitiveness are core objectives of the Transport work programme. They address directly the Commission's priority on "Jobs, growth and investment" and they are linked to export, trade and global markets. Europe is world leader in the design and manufacturing of transport vehicles despite the fierce competition, even from non-established new players. This work programme aims to maintain and extend the European industrial

²⁹ (COM(2012)497)

leadership worldwide, promoting the penetration of the latest developments in new materials, innovative processes, advanced automation and digital technologies into all transport sectors. It also aims to contribute to new transport business models that are changing the way innovation, research and technology is applied.

In addition to technological developments, competitiveness increasingly relies also on organizational framework conditions, including cooperation frameworks. Synergies on collaborative design and processes as well as manufacturing methods and supply chains in all transport modes should enable innovation breakthroughs that will keep the European industry, including SME, competitive in the decades to come.

Actions under these topics will contribute to the development of advanced technological capabilities in transport exploiting both evolutionary and disruptive technologies which will result in strengthened global leadership, environmental protection and enhanced travel comfort and safety. In particular, the research topics will reinforce and streamline European global leadership and competitiveness in advanced (both evolutionary and disruptive) technologies for the design and manufacturing of vehicles with the highest level of safety, comfort, connectivity, automation and life-cycle performance. Advanced multidisciplinary and collaborative capabilities for the design and manufacturing of vehicles along their life cycle as well as to the development of visualisation methods and big-data analytics tools. They will also investigate further passenger-centric business cases, spanning multiple transport stakeholders.

MG-3-1-2018: Multidisciplinary and collaborative aircraft design tools and processes

Specific Challenge: Maintaining and extending European industrial leadership, through embedding design-for-excellence in the product lifecycle addresses the second challenge of the ACARE Strategic Research and Innovation Agenda. The high development cost and risks of new aircraft (including engine) led to new supply chain models, driven by international risk-sharing partnerships. Transforming potential design concepts into aircraft products (including engines) is a complex, multidisciplinary and collaborative process, which has to take into account in economic, environmental and societal aspects in a holistic manner. Although high fidelity computational tools, new processes and computer resources have radically changed over the last two decades thanks to the opportunities offered by High Performance Computing and Internet of Things, yet part of the supply chain follows the transition from traditional tools and rules to the new multidisciplinary computational reality with caution and slow pace.

Scope: This topic aims to further develop and validate by both numerical and experimental means the new multidisciplinary and collaborative aircraft design (including engine integration) and optimisation paradigm as well as accelerate its introduction for the benefit of the whole European aircraft supply chain – from integrators and high-tier suppliers to SMEs. The proposals should aim at addressing one or more of the following areas:

- Advance further and validate multi-disciplinary and multi-material design and optimisation decision tools for overall aircraft (including engine) architectures based on

very large multi-criteria evaluations and on overall performances versus costs of the new products, including their intrinsic levels of safety and security.

- Advance further digital interconnection tools as well as rapid integration of Internet of Things (IoT) in aircraft design and manufacturing.
- Advance further and validate Computational Solid and Fluid Dynamics (CSFD), Multidisciplinary Design Optimisation (MDO) and Uncertainty Quantification (UQ) methodologies towards efficient integration of tools with different levels of fidelity, resolution, and complexity.
- Significantly advance user-centric visualisation methods and tools as well as big-data analytics.
- Explore further multi-component collaborative testing and certification/air worthiness, with emphasis on virtual and hybrid testing (VHT) methods and tools.

Although the association of TRL to multidisciplinary and collaborative aircraft design capabilities is not uniquely defined, the implementation of the proposed areas of this topic cover in broad sense a TRL spectrum from 2 to 5 (at the end of the project).

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

Expected Impact: Overall, the topic is expected to have significant impact on Flightpath 2050, namely towards “maintaining global leadership” as well as “protecting the environment” challenges. Specific impact is expected in the following areas:

- Advanced multidisciplinary and collaborative capabilities for whole aircraft (including engine) along its life cycle.
- Significantly reduced aircraft design cycle and higher complexity decision trade-offs.
- Development of synergies on visualisation methods and big-data analytics.
- Increase the European innovation potential in Aeronautics and Air Transport (AAT) by a more balanced and integrated collaboration of industry, including SMEs and research providers.

Type of Action: Research and Innovation action

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

MG-3-2-2018: The Autonomous Ship

Specific Challenge: Digitisation and autonomy will bring disruptive changes to waterborne transport, providing competitive advantages to European business, better integrating logistics, changing business models, improving safety, facilitating maintenance, allowing telemetry and shore-based support as well as modifying the role of crew thus raising societal issues that need to be addressed. Whilst the first autonomous prototypes are being deployed, important regulatory and technical challenges remain. Due to the regulatory environment applicable to intercontinental shipping, the first adopters will operate only within national water of a single country or several countries subject to specific agreement. Consequently the first connected and autonomous services are expected to concern inland waterways, short sea shipping, ferries, coastal operations and urban water transport. The challenge is to now develop and demonstrate integrated automation technologies within a real environment.

Scope: To address these challenges, proposals should address the first bullet and several of the following aspects:

- With a focus on first adopters (inland waterways, short sea shipping, ferries coastal operations and urban water transport) develop and demonstrate to TRL7 a fully autonomous vessel within a realistic environment which encompasses all necessary features including collision avoidance, interaction with waterway and/or port infrastructure, interaction with waterborne traffic, connectivity, control, navigation and docking, condition monitoring, smart maintenance and fail safe operation. The differentiators of EGNOS/GALILEO for Autonomous Vessels should be considered.
- Assess operability, reliability and failure scenarios for on board systems without human interaction on board, for example; propulsion and machinery systems, auxiliaries, safety systems, navigation, connectivity/communication and if appropriate, their connectivity/controllability from a remote operation centre.
- Develop validation, certification and safety assessment methodologies, tools to support autonomous ships and system development.
- Safety assessment and demonstrate hazard avoidance using typical scenarios.
- Regulatory and legal requirements, including liability regimes, needed to operate autonomous waterborne transport within the environments foreseen for the likely first adopters should be addressed. Also, for intercontinental shipping identify the potential necessary amendments to international conventions. In discussion with important stake holders, identify the technological and regulatory barriers and establish a road map to overcome.
- Cybersecurity solutions to enable secure safe and reliable data connectivity that are resistant to both malicious intervention and system failure.

- Advance and demonstrate underdeveloped technologies such as for example situational awareness and actions to alert in case of a potential unavoidable collision such as with a fast moving leisure craft.
- Address operations and establish a business case for the most promising vessel type and for other services likely to be adopted at an early stage.
- Increase public awareness of autonomous waterborne transport and engage in dialogue with relevant stake holders so address social and human factors including those concerning safety, change of skills, socio technic aspects and the impact on employment.

The Commission considers that proposals requesting a contribution from the EU between EUR 10 and 20 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Achieve a breakthrough in automated waterborne transport through demonstration of a fully autonomous vessel targeted towards either inland waterways, short sea, ferry, coastal operation or urban water transport vessel within a relevant environment. Understand the social economic and regulatory factors of autonomous waterborne transport. Enable establishment of the first commercial automated water transport services within 5 years. Enhance European competitiveness and support European jobs and growth.

Type of Action: Innovation action

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

MG-3-3-2018: "Driver" behaviour and acceptance of connected, cooperative and automated transport

Specific Challenge: Today's vehicles - in all modes of transport - are becoming increasingly connected and cooperative, as well as automated. This raises a number of issues about the role of the "driver" (or operator, rider, pilot, captain) in such vehicles (cars, trucks, powered-two-wheelers, trains, ships, planes, etc.). In particular, human-machine interaction is becoming increasingly complex in an environment with higher levels of both qualitative and quantitative information, automated data exchange (into and out of the vehicle) and increasing levels of automation (systems, operations, etc.).

However, developments in recent years have primarily focused on "hard" technological advances and the maturity of technology-driven transport/mobility concepts, outpacing and insufficiently addressing the "soft" human component in this evolution. Therefore the challenge relates to a number of inter-related themes, ranging from public acceptance of connectivity and automation (e.g. data privacy, role of the human), to the development of user-friendly and appropriate Human-Machine Interfaces (HMI), "driver"/vehicle interaction and ethical decision making, to "driver" training and certification for new technologies/levels of automation.

A clear challenge for the roll-out of connectivity and automation in transport remains the lack of a detailed, evidence-based assessment of real "driver" behaviour in connected and highly automated or autonomous vehicles (and possible mitigation solutions), accounting also for gender, age and ability, with and without the assistance of cross-modal Cooperative Intelligent Transport Systems (C-ITS), under various use cases (incl. technical failure) and in a range of operating environments (e.g. urban, rural, etc).

Scope: In order to meet this challenge, proposals should address at least 5 of the following aspects:

- Assess public acceptance across Europe for higher levels of connectivity and automation, relating to a number of public concerns, including data privacy, safety and security, consequences of the availability of 24/7 mobility, vehicle control, liability, ethics, new features such as driver alerts (various types of alarm), as well as the proliferation of new technology and related behaviours, particularly in view of different types of users ("drivers" / passengers, etc) – all elements enabling sensible use of connectivity and automation.
- Public acceptance of different user groups, including current non-drivers (i.e. the elderly, people with disabilities, children, etc.), which in higher levels of automation could travel alone in an automated vehicle.
- Perform simulations, correlate and analyse driver behaviour/reaction under different scenarios/use cases, including driver distraction/assistance, driver-vehicle interaction technology failures and/or conditions instigating accidents (either by the vehicle itself or by other/external factors), as well as in different operating environments (e.g. urban, rural, multimodal hub) with other users, utilising big data analytics, assessing impacts of traffic flows, schedule reliability and congestions and also developing appropriate mitigation solutions to enhance "driver" behaviour under such scenarios (including using visual and acoustic information).
- Demonstrate the relevance, differentiation and the required evolution/adaptation of "driver" behaviour in connected and automated vehicles for passenger and/or freight transport (considering in particular the value of life vs. the value of cargo and also time and comfort).
- Estimate the effects of "driver"-vehicle interaction on transport safety and whether these would be marginal compared to full automation (with no "driver" interaction), hence implying a need to accelerate efforts towards fully connected automation. The necessary timing and issues on the transition from conventional to automated vehicles should be examined (e.g. interaction between "drivers" of conventional and automated vehicles).
- Analyse the levels of Human-Machine Interfaces (HMI) across different types of vehicles, as well as the margins for further optimisation in order to enable information generation and dynamic processing in multiple real-time or changing conditions.

- Assess and elaborate common issues, approaches and lessons learned across all transport modes (e.g. HMI, "driver" behaviour, ethical decision making, etc.).
- Address explicitly the ethical and legal issues associated with "driver" and/or vehicle decision making processes under different circumstances, as well as explore solutions to overcome the ethical and legal challenges relating to connectivity and automation.
- Investigate new "driver" training needs and certification requirements for new technologies/levels of automation, including effects on employment and skills.
- Assess the regulatory state of art, with particular reference to any regulatory gap hindering the adoption of automated vehicles (cars, trains, ships, planes).
- Assess attitudes towards shared modes of transport and the inclusion of connected, cooperative and automated vehicles as part of fleets.

Research should be validated in a selected number of use cases through testing/trials/demonstrations, involving service providers and end users.

The Commission considers that proposals requesting a contribution from the EU of EUR 3 to 4 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:

- Support the integration of higher levels of connectivity and automation in transport;
- Contribute to improved levels of safety and security in all modes of transport, in line with the Transport White Paper 2011 (e.g. Vision Zero);
- Contribute to the possible reduction of cost for industry and public authorities through an improved understanding of requirements and needs of different types of "drivers"/users in the context of connectivity and automation in all modes of transport;
- Contribute to a better user acceptance of innovative, cooperative, connected and highly automated transport systems;
- Enhance driver awareness and behaviour in a range of complex / urban operating environments.

Type of Action: Research and Innovation action

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

4. ACCOUNTING FOR THE PEOPLE

Social sciences and humanities are integrated in the Transport work programme at several layers. They are embedded both as an essential component of several topics and research

questions as well as distinct topics of socio-economic relevance in other parts of the work programme, including in the "Other Actions" part, where a number of relevant public procurement actions are foreseen.

In addition, the present section addresses issues which are intended to complement and underpin the activities covered in the other sections of this work programme. It includes topics examining issues such as: an inclusive digitally interconnected transport system, regulatory frameworks to enable effective deployment of emerging technologies and business/operating models, demographic changes and women's participation, digitisation of the transport system, Open Science, Big data and updated frameworks to evaluate, monitor and assess the impact of new mobility solutions.

The overall objectives are to create an innovative and inclusive digital travel environment that improves accessibility and social inclusion, travel experience and citizen well-being. This environment should be created around accessible, protected and socially acceptable mobility solutions together with appropriate regulatory frameworks and policies for all.

In doing so, the research topics will contribute to a smooth adoption of new and emerging transport mobility solutions, ensuring equity and societal acceptance. They will aid decision-makers design, monitor and evaluate appropriate regulatory frameworks and policies that accommodate these new solutions for the benefit of society and economy taking into account the necessary levels of social and personal protection. They will contribute towards improving the competitiveness of European industry and SMEs and the attainment of the UN's Sustainable Development Goals.

MG-4-1-2018: New regulatory frameworks to enable effective deployment of emerging technologies and business/operating models for all transport modes

Specific Challenge: New forms of shared-use mobility, automated vehicle technologies in all transport modes and innovative concepts such as Mobility as a Service (MaaS) often have to function in the regulatory frameworks that may not be adapted to these solutions and to rapid technological change.

Fragmented, extensive or inadequate regulation can negatively affect businesses and citizens-consumers and could potentially impact on the international competitiveness of the European economy. In addition, protracted regulatory responses might result in belated solutions that are no more adequate to the technology and business/operating models that have in the meantime further evolved.

The challenge is to devise new regulatory approaches, frameworks and governance models through evidence based research. These should be flexible enough to cope with the fast pace of technological change and foster effective deployment of emerging user-centric technologies and business models, while at the same time preserving adequate level of protection with regard to security (including cybersecurity), safety, data protection, social protection, ethics, etc. Regulatory barriers between transport modes should also be identified and analysed with a view to suggest actions which will foster a multimodal transport system.

Scope: Proposals should address several or all of the following:

- Identification of new technologies, services, business and operating models and mobility solutions (including social innovations) having the potential to disrupt and overhaul the current regulatory approaches in both passenger and freight transport;
- Comparative evidence based analysis of different regulatory responses and governance models (both in terms of existing and forthcoming solutions) to disruptive transport technologies and business/operating models across the EU and beyond, identification of best practices and lessons learned;
- Analysis of the main economic, political and social (e.g demographic, cultural and historical) variables influencing the regulatory responses;
- Identification of the necessary characteristics of regulatory approaches/frameworks and governance models that can accommodate disruptive innovation without compromising on the adequate level of protection with regard to security (including cybersecurity), safety, data protection, social protection, and which can contribute to a sustainable model of public infrastructure use.
- Analysis of issues of cooperation among public and private parties, in both mandatory and non-mandatory situations as well as data exchange, governance and communication.

In line with the Union's strategy for international cooperation in research and innovation³⁰, international cooperation is encouraged.

Proposals should ensure involvement of policy-makers and business representatives and include actions to promote take up of research results by key stakeholders.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 and 2 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 in this topic should specifically contribute to the EU's better regulation agenda, which aims to design and evaluate EU policies and laws transparently, with evidence, and backed up by the views of citizens and stakeholders. Research under this topic should aid regulators and policy makers in updating and building appropriate regulatory responses to the current and future developments in the transport systems by allowing effective introduction of innovative technologies and business models, while at the same time safeguarding adequate level of security, safety, data privacy, and social protection. The impact should carefully balance the perspective of all stakeholders, economic actors, users, local and national governments.

Type of Action: Coordination and support action

³⁰ COM(2012)497

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

MG-4-2-2018: Building Open Science platforms in transport research

Specific Challenge: The rapid development of digital technologies and new collaborative tools are the basis of an on-going transformation and opening up of science and research, referred to as Open science.

The idea captures a systemic change to the way science and research have been carried out for the last fifty years: shifting from the standard practices of publishing research results in scientific publications towards sharing and using all available knowledge at an earlier stage in the research process.

Open Science covers a wide range of aspects, from skills, researchers' career, evaluation of research, open access to research results, and relevant data infrastructures, all aiming at making science more efficient, better reproducible and more responsive to societal and economic expectations. Two important elements for operationalising Open Science at the European level are mandating Open Access to publications and their underlying data as well as developing and using a European Open Science Cloud for storing, accessing and managing all research data.

As these developments are relatively new there is a need to create a common understanding on their practical impact in the area of transport research, identify current practices and devise concrete approaches for operationalising Open Science in transport research, and to adopt them in the form of codes of conduct.

Scope: Proposals should address all of the following:

- Identify the spectrum of stakeholders and analyse their practices and expectations in implementing various aspects of Open Science in transport research, including in particular Open Access to publications and data in transport research in Europe and internationally;
- Map the landscape of existing research data infrastructures and scientific clouds in transport research as well as governance and new operational/business models being developed to provide better data access in view of their integration within the European Open Science cloud;
- Create a forum for national and European stakeholders – public and private - to exchange ideas and share best practices for operationalising Open Science principles in transport research;
- Identify the main Challenges and opportunities for implementing the various aspects of Open Science in the area of Transport Research, in particular taking into account the specificities of knowledge production and exploitation in the area of transport research including IPR, technology transfer and the dual dimension of data (i.e data that can be attributed both as a private resource used by companies and as a public good);

- Identify and engage international partners for mutual learning and sharing of best practices;
- Design a Code of Conduct for implementing Open Science principles in transport research in Europe;

In line with the Union's strategy for international cooperation in research and innovation³¹, international cooperation is encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 and 2 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 lead to setting up a community of transport research organisations willing to work on the basis of a commonly agreed Open Science Code of Conduct. Furthermore, actions should contribute to creating a solid knowledge base on the implementation of Open Science approaches in transport research, and in particular on current constraints and bottlenecks in this field. This should lead, amongst other, to improved efficiency, quality and integrity and, when relevant, interdisciplinarity of transport research, speed up the path from research to innovation and promote citizen's engagement in the scientific process.

Type of Action: Coordination and support action

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

MG-4-3-2018: Demographic change and participation of women in transport

Specific Challenge: Societal changes are demanding a much higher attention to specific groups of users with specific needs and expectations for mobility. Only a disaggregated analysis can lead to the satisfaction of all citizens, thus ensuring a large as possible integration of all parts of the population in the society. Women account for half of society, but the specific needs linked to their physical and social characteristics have not been sufficiently assessed. The resulting inequalities in mobility opportunities therefore need to be thoroughly explored. By identifying the influence of intersectional aspects such as age, social level, ethnic origins, education, family composition the transport system can be adjusted to meet the specific demands of this group and lead to increased social inclusion and equity.

Scope: Proposals should address all of the following:

- Assessment of the specific transport requirements of women (service supply, infrastructure/vehicle design, safety and security issues...) as well as employment opportunities in the future transport system, according to the technical and organisational development of the sector.

³¹ COM(2012)497

- Analysis of intersectional aspects such as gender, age, social level, education, ethnic origin, family composition, etc, and of their influence on specific mobility needs and the possibility to increase the participation of women in transport-related jobs.
- Perform Gender Impact Assessments of new technologies and business/operational models in order to assess their acceptance and non-discriminatory performance.
- Assessing the opinions and attitudes on (including the aptitude in using) new technologies, access to public transport in the context of social and spatial inequalities, the specific features needed for public transport (including diminishing the risk of violence), as well as
- Future needs for skills and opportunities for professional careers.

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

Expected Impact: Proposals should provide a new level of understanding and new sets of data to be used in planning future transport systems. They will also demonstrate that the knowledge created by the action and the measures identified to adjust transport traditional functionalities to the specific needs identified will contribute to an inclusive mobility system, leading to a higher level of social equity.

Type of Action: Research and Innovation action

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

MG-4-4-2018-2019: Support for dissemination events in the field of Transport Research³²

Specific Challenge: An integral aspect of the Transport part of Horizon 2020 is to organise event(s) of a major strategic nature. The Transport Research Arena (TRA) Conferences and Aerodays are the examples of events organised in different Member States, with a high European dimension. The proposed actions should help promoting and disseminating Transport Research activities in Europe.

Scope: In 2018, proposals should address only one of the following sub-topics:

1) Innovation awards for students and researchers in the context of the Transport Research Arena conference - TRA 2020

³² This activity is 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 the Innovation and Networks Executive Agency (INEA) and will be implemented by the Commission services.

The action should focus on organising two competitions for transport research and innovation awards to be assigned at the TRA conference in 2020:

- A competition for students and young researchers with the goal of stimulating the interest among young researchers/students in the field of transport.
- A competition for senior researchers in the field of innovative transport concepts based on results from EU-funded projects only.

Both competitions should cover all transport modes and cross-cutting issues (technological, socio-economic and behavioural aspects) in line with the EU policy objectives for smart, green and integrated transport. The organisation of these awards should ensure high-quality competition and very good media coverage before, during and after the TRA conference. The action should give particular attention to gender issues.

The Commission considers that proposals requesting a contribution from the EU of between EUR 0.4 and 0.7 million each would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

2) Support for event(s) in the field of aviation under the Presidency of the European Union

The objective of the action is the preparation and the support of an event(s) to gather the aviation stakeholders for discussing political, industrial and research issues on a European and global level. The event(s) should address the technological and industrial developments of the aviation sector providing a high-level, future oriented perspective coming from politics, the industry and the research community, in response to European citizen's needs and expectations. The event(s) should also offer a forum for government officials, decision makers, managers, researchers, engineers and journalists to discuss and reflect on a research and innovation roadmap for aeronautics in line with Europe's Vision for Aviation 'Flightpath 2050'.

In collaboration with the different European Commission services and the Advisory Council for Aviation Research and Innovation in Europe (ACARE), the action will define the overall planning of the event(s), structure the technical and political sessions of the event(s), contribute to select the appropriate location for the venue and offer operational IT tools for the registration of participants, the handling of speakers' contributions, etc.

Specific attention should be put on a broad and balanced participation i.e. students, young researchers, women, a large number of countries' representatives, etc.

Proposals must demonstrate the commitment of the national authorities' support. Applicants are invited to read the eligibility and admissibility conditions for this sub-topic.

In order to ensure high political and strategic relevance, the Member States holding a Presidency of the European Union in the same year are invited to liaise in order to avoid

overlaps, and to ensure that each event has clearly identified objectives, messages and target groups.

The Commission considers that proposals requesting an EU contribution up to a maximum of EUR 0.7 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

In 2019, proposals should address the following sub-topic:

Support for the organisation of the Transport Research Arena 2022 conference

The action will prepare and provide support to the Transport Research Arena Conference (TRA) to be organised in 2022. TRA is the European Transport Research conference which brings together representatives of transport stakeholders from all over Europe and beyond around research and innovation results and policy.

The objective of the conference is to provide a platform for discussion of political, industrial, research and policy issues on a European and global scene, which pursues a smart combination of top-down and bottom-up approaches. In line with previous TRA conferences, the event should address the technological and industrial developments of the transport sector (road, rail, waterborne and aviation sectors and also cross-modal aspects) providing a high-level, future oriented perspective coming from politics, the industry and the research community, in response to Europe's social needs and expectations.

In collaboration with the relevant actors, such as the European Commission services, the different European Technology Platforms (ERTRAC for road, ERRAC for rail, WATERBORNE TP for waterborne, ALICE for logistics and ACARE for aeronautics) and also the previous TRA conference organisers in order to maintain continuity, the action will define the overall planning of the conference, structure the technical and political sessions of the event, contribute to select the appropriate location for the venue and offer operational IT tools for the registration of participants, the handling of speakers' contributions, contribute to the organisation of logistics, etc. Support to the organisation of demonstration activities should also be foreseen.

Proposals must demonstrate the commitment of the national authorities' support. Applicants are invited to read the eligibility and admissibility conditions for this sub-topic. A financial plan to organise the event is also necessary.

The Commission considers that proposals requesting a contribution from the EU of between EUR 0.5 and 0.7 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: The actions will contribute to a wide dissemination of the results of European transport research and to raise the visibility and weight of the EU policy in the field.

These actions are expected to increase the attractiveness of transport related studies and reinforce the pursuit of excellence in European transport research and innovation, by giving recognition and visibility to the best achievements.

It will allow creating links and exchanges between research and innovation stakeholders and policy makers, thus improving the development and deployment of innovative solutions for transport in Europe.

Type of Action: Coordination and support action

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

MG-4-5-2019: An inclusive digitally interconnected transport system meeting citizens' needs

Specific Challenge: Merging physical transport assets like infrastructure or vehicles with the digital layer, through the Internet of Things (IoT) and big data applications opens vast possibilities in terms of the development of new transport services, business/operating models and social innovations. This has been exemplified in the rapid development of services such as multimodal travel planners, transportation network companies, Mobility as a Service, public transport on demand, new airline ancillary products, various forms of tracking and tracing and many others.

Digitally based services and applications provide citizens with an increasing level of tailored real-time information and greater choice thus allowing for a travel process that is faster, more comfortable and which gives travellers greater control. These services and applications can also serve as basis for social innovations in mobility. In the longer time frame, digitisation of transport promises to lead towards fully personalised services and commercial offers. Despite this, important and often overlooked aspects are user impact and user's ability and readiness to take advantage of the new opportunities. Benefiting from digital technology requires specific skills, willingness and ability to assume a new role as an active participant of the digital travel ecosystem. The main challenge is therefore to ensure that all members of society can benefit from digitisation. In order to achieve this, it is necessary to better understand the needs and attitudes of various users, in particular vulnerable-to-exclusion citizens such as, for example, elderly, low-income, disabled or migrants, in relation to the requirements brought about by the digitised transport system as well as the skills and strategies necessary for all citizens in order to fully benefit from it.

Scope: Proposals should address several or all of the following:

- Identify the main characteristics of demands that digitally based mobility solutions place on the users;
- Identify the needs and attitudes of all societal strata of transport users - in particular vulnerable to exclusion citizens - in the digitised travel ecosystem, taking into account

interpersonal and intrapersonal (over time for the same person) variations (age, culture, etc);

- Identify the obstacles to the appropriation of digital mobility by different user groups and possible nudges to facilitate it, including the potential for social innovations;
- Investigate user requirements when transport is interrupted, e.g.: due to extreme weather, man-made or technical hazards.
- Investigate gender related differences in the adoption of digitally based transportation products and services;
- Identify skills and strategies needed in order to fully benefit from digitalisation in transport and thus to avoid digital exclusion or digital divide in terms of social and spatial aspects;
- Analyse differences and particularities in relation to the adoption of new mobility solutions and social innovations across a representative sample of member states, both in terms of user uptake and service provision;
- Provide recommendations for policy making and practical applications for designing an inclusive digital transport system and its related products and services with due regard to data protection and cybersecurity issues;

Research should be validated in a selected number of case studies through pilot demonstration, trials and testing involving service providers and end-users. Furthermore, actions should be undertaken in view of ensuring take up of research results by key stakeholders.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 and 3 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: Research will help policy-makers design appropriate regulatory frameworks and social and educational strategies in order to create the best possible conditions for an inclusive, user friendly digital transport system, taking into account the needs and characteristics of all parts of society, with particular attention to vulnerable to exclusion citizens. Moreover, research will also help regional authorities and businesses in designing digital transport solutions that are better tailored to citizens' individual needs.

Type of Action: Research and Innovation action

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

MG-4-6-2019: Supporting Joint Actions on sustainable urban accessibility and connectivity³³

Type of Action: ERA-NET Cofund

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

BLUE GROWTH

MG-BG-01-2018: Unmanned and autonomous survey activities at sea:

Specific Challenge: Surveying the sea floor remains an expensive activity, typically requiring manned research vessels towing specialised sonar devices with the remote oceans. Consequently the sea bed remains largely unknown. Recent developments in autonomous technology enables the potential possibility of an underwater vehicle which can operate with a high level of independence and survey large areas without the cost of an accompanying support vessel. Such technology would revolutionise and massively reduce the cost of large area marine seabed surveys and as a result greatly increase our knowledge of the world's oceans (e.g. sea bed survey, fish stock assessment, surveillance, etc).

Scope: To address this challenge, proposals should address the following aspects:

- Develop and demonstrate to TRL5 an autonomous sea bed survey vehicle (if appropriate including its docking and reloading device) which can operate within the deep oceans for extended periods without the need for a close support vessel.
- Energy and propulsion systems capable of supporting several months of autonomous survey operation over large areas.
- Minimising deep sea deployment and recovery costs by for example enabling deployment by air and return to base features.
- Robust and secure data transmission, redundancy and "find me" features to enable self-recovery or in extreme case, rescue in case of breakdown.
- Compatible survey equipment.

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

³³ It is planned to include for 2019 a topic addressing specific challenges of sustainable urban accessibility and connectivity. The topic will be further defined with the update of the work programme 2019. It is planned to implement the action as ERA-NET Cofund action. Proposals should pool the necessary financial resources from the participating national (or regional) research programs with a view to implementing a joint call for proposals resulting in grants to third parties with EU co-funding in this area. Proposers will be requested to include other joint activities including additional joint calls without EU co-funding.

Expected Impact: Enable a massive reduction in the cost of extended deep sea survey activities in comparison to traditional survey techniques Increase the availability of sea bed survey data. Promote the capabilities of European Marine industries and support European growth and jobs. Enhance the capabilities of European high technology SME's. Contribute to UN's Sustainable Development Goal 14. Conserve and sustainably use the oceans and the target to scientific knowledge. Develop research capacity and transfer marine technology.

Type of Action: Research and Innovation action

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

MG-BG-02-2019: Ship emission control scenarios, marine environmental impact and mitigation

Specific Challenge: Increasingly strict emission standards apply to shipping around the coastlines of many developed countries. Presently these are mainly focussed on SO_x, but in future, reflecting health concerns, increasingly strict limits are likely to address NO_x and particulate matter. A variety of compliant solutions can meet present, and may be able to meet emerging and future standards. However, some of these solutions may lead to secondary impacts and new waste streams. The principal challenge is to better understand the comprehensive environmental impacts from the wide scale adoption of a range of potential emission reduction solutions together with any secondary effects on the the marine environment. As well as building upon current state of the art modelling (e.g by IIASA and EMSA³⁴), appropriate Earth Observation data and information provided by the Copernicus programme and its Marine Environmental Monitoring Service maybe taken into consideration.

Scope: To address these challenges, proposals should address all of the following aspects:

- Assess the range of emission reduction technologies and designs which may be deployed, consider their cost benefits.
- Experimentally characterise waste streams from emission control technologies, identifying the substances and quantities involved.
- Considering several possible scenarios for the wide scale adoption of different emission control technologies depending on fuel costs, availabilities service needs etc model the disbursement of to the marine environment around the European coastline. Modelling should consider the main shipping routes, use real ship traffic, hydrological and weather data and the variety of constituents discharged. Consideration should be given to vulnerable regions such as estuaries and enclosed waters.

³⁴ International Institute for Applied Systems Analysis, European Marine Safety Agency.

- For the scenarios modelled assess the environmental impact on the marine environment in the medium and long term including consideration of any potential bio accumulation.
- Considering SO_x, NO_x and particulate matter, assess and propose sustainable cost effective emission reduction strategies and technologies. Assessments should also include consideration of waste stream costs and their cost effective treatment.
- Open access to source and dispersion model data is encouraged.

In line with the Union's strategy for international cooperation in research and innovation, international cooperation is encouraged. The participation of civil society is also encouraged.

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

Expected Impact: For a variety of likely emission reduction scenarios, activities will provide comprehensive information concerning the predicted dispersion of discharges from shipping and any long term environmental impact. Identify the most effected locations. Provide a sound science basis for future policy decisions at local, national, European and international levels. Provide a valuable open data and modelling resource. Facilitate cooperation between industry and environmental scientists. Contribute to UN's Sustainable Development Goals 14 Conserve and sustainably use the oceans, seas and marine resources and the target to prevent and significantly reduce marine pollution of all kinds.

Type of Action: Research and Innovation action

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

Conditions for the Call - 2018-2020 Mobility for Growth

Opening date(s), deadline(s), indicative budget(s):³⁵

³⁵ The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.

The Director-General responsible may delay the deadline(s) by up to two months.

All deadlines are at 17.00.00 Brussels local time.

The deadline(s) in 2019 are indicative and subject to a separate financing decision for 2019.

The budget amounts for the 2018 budget are subject to the availability of the appropriations provided for in the draft budget for 2018 after the adoption of the budget 2018 by the budgetary authority or, if the budget is not adopted, as provided for in the system of provisional twelfths.

The budget amounts for the 2019 budget are indicative and will be subject to a separate financing decision to cover the amounts to be allocated for 2019.

*Horizon 2020 - Work Programme 2018-2020
Smart, green and integrated transport*

Topics (Type of Action)	Budgets (EUR million)		Deadlines	
	2018	2019		
Opening: 31 Oct 2017				
MG-4-4-2018-2019 (CSA)	1.40		04 Apr 2018	
LC-MG-1-3-2018 (CSA)	3.00		04 Apr 2018	
MG-2-3-2018 (CSA)	3.00			
MG-2-4-2018 (CSA)	1.00			
MG-2-5-2018 (RIA)	16.00			
MG-4-1-2018 (CSA)	2.00			
MG-4-2-2018 (CSA)	3.00			
MG-4-3-2018 (RIA)	5.00			
MG-BG-01-2018 (RIA)	8.00			
LC-MG-1-1-2018 (RIA)	30.00			30 Jan 2018 (First Stage) 19 Sep 2018 (Second Stage)
LC-MG-1-2-2018 (RIA)	12.00			
LC-MG-1-3-2018 (RIA)	11.00			
LC-MG-1-4-2018 (RIA)	5.00			
MG-2-1-2018 (RIA)	18.00			
MG-2-2-2018 (IA) MG-2-2-2018 (RIA)	35.00			
MG-3-1-2018 (RIA)	12.00			
MG-3-2-2018 (IA)	20.00			
MG-3-3-2018 (RIA)	12.00			
Opening: 05 Sep 2018				
LC-MG-1-10-2019 (RIA)		10.00	16 Jan 2019 (First Stage) 12 Sep 2019 (Second Stage)	
LC-MG-1-5-2019 (RIA)		15.00		
LC-MG-1-8-2019 (IA)		8.00		
LC-MG-1-8-2019 (RIA)		15.00		

*Horizon 2020 - Work Programme 2018-2020
Smart, green and integrated transport*

LC-MG-1-9-2019 (RIA)		7.00	
MG-2-6-2019 (RIA)		30.00	
MG-2-7-2019 (RIA)		8.00	
MG-2-8-2019 (RIA)		15.00	
MG-2-9-2019 (RIA)		14.00	
Opening: 04 Dec 2018			
LC-MG-1-6-2019 (RIA)		10.00	24 Apr 2019
LC-MG-1-7-2019 (RIA)		15.00	
MG-4-5-2019 (RIA)		7.00	
MG-4-6-2019 (ERA-NET-Cofund)		6.00	
MG-BG-02-2019 (RIA)		8.00	
MG-4-4-2018-2019 (CSA)		0.70	24 Apr 2019
Opening: To be defined			
Focus area topic(s) for 2020			To be defined
Opening: To be defined			
Focus area topic(s) for 2020			To be defined
Opening: To be defined			
Focus area topic(s) for 2020			To be defined
Overall indicative budget	197.40	168.70	

Indicative timetable for evaluation and grant agreement signature:

For single stage procedure:

- Information on the outcome of the evaluation: Maximum 5 months from the final date for submission; and
- Indicative date for the signing of grant agreements: Maximum 8 months from the final date for submission.

For two stage procedure:

Horizon 2020 - Work Programme 2018-2020
Smart, green and integrated transport

- Information on the outcome of the evaluation: Maximum 3 months from the final date for submission for the first stage and maximum 5 months from the final date for submission for the second stage; and
- Indicative date for the signing of grant agreements: Maximum 8 months from the final date for submission of the second stage.

Eligibility and admissibility conditions: The conditions are described in General Annexes B and C of the work programme. The following exceptions apply:

MG-2-4-2018	In order to ensure appropriate coverage, proposals must include National Authorities from at least 10 EU Member/Associated Countries. Proposals without this requirement will be considered ineligible.
MG-4-4-2018-2019	<p>For 2018, in Subtopic 2) The commitment of the national authorities' support (from a political and resources point of view) is a necessary condition for the success of the action. Therefore proposals must be accompanied by a written endorsement from the relevant Ministry of the Country where the conference will take place. Proposals without such a written endorsement will be considered ineligible.</p> <p>For 2019, in order to ensure the involvement of the hosting country as well as continuity with previous TRA conferences, proposals must be accompanied by a written endorsement from the relevant Ministry of the Country where the conference will take place. Proposals without such a written endorsement will be considered ineligible.</p>

Evaluation criteria, scoring and threshold: The criteria, scoring and threshold are described in General Annex H of the work programme. The following exceptions apply:

LC-MG-1-1-2018, MG-2-1-2018, MG-2-2-2018	Grants will be awarded to proposals according to the ranking list. However, in order to ensure a balanced portfolio of supported actions, at least the highest-ranked proposal per sub-topic will be funded provided that it attains all thresholds.
MG-2-6-2019	Grants will be awarded to proposals according to the ranking list. However, in order to ensure a balanced portfolio of supported actions, at least the highest-ranked proposal in the area of a) Inland Waterways and b) Maritime Transport will be funded provided that it attains all thresholds.

Evaluation Procedure: The procedure for setting a priority order for proposals with the same score is given in General Annex H of the work programme.

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

Consortium agreement:

All topics of this call	Members of consortium are required to conclude a consortium agreement, in principle prior to the signature of the grant agreement.
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Call - 2018-2020 Digitising and Transforming European Industry and Services: Automated Road Transport

H2020-DT-ART-2018-2019-2020

Significant progress has been made in key technologies for innovative connected and automated driving (CAD) functions and applications (e.g. advanced vehicle control, vehicle localization systems, data processing, artificial intelligence, user interfaces, etc.). Many demonstration projects are already ongoing where automated driving functions are tested in different use cases. The previous call on "Automated Road Transport" in the Transport Workprogramme 2016/17 focused on vehicles with functions for automated driving level 3, which are expected to enter the market in the next few years.

The overall objective of this call is to promote a wide market introduction of highly automated driving systems towards SAE level 4³⁶. The call will focus on large-scale demonstrations to test the performance and safety of innovative highly automated driving systems for passenger cars, efficient freight transport operations and shared mobility services in urban areas. Furthermore the changing role of the driver and how to account for it by human centred design of automated vehicles will be addressed.

The Call 2018-2020 Automated Road Transport is part of the Focus Area "Digitising and transforming European industry and services". Demonstrations will look at testing the use of digital, connectivity as well as satellite navigation technologies for optimised connected and automated driving functions (including the EGNOS and Galileo). Digital technologies, such as Big Data, the Internet of Things and Artificial Intelligence techniques provide a great potential for developing innovative automated driving functions and mobility solutions for the future. Communication and cooperation of automated vehicles with other vehicles, infrastructure and other road users can increase the safety, comfort, productivity and the enabling of innovative business models of automated vehicles and improve the efficiency of the overall transport system.

By supporting innovative connected and automated driving technologies and mobility solutions, the call will help to create new global market opportunities for European industry and strengthen the position of Europe as a world leader in innovative mobility. Actions under this call are expected to contribute to more road safety as well as to better traffic flow, less congestion, fuel efficiency and reduce carbon emissions. New shared and fully automated mobility services can help decrease the total number of cars on the road, alleviating the overall traffic. Actions will contribute to UN's Sustainable Development Goals 11 (Make cities and human settlements inclusive, safe, resilient and sustainable) and 3.6 (By 2020, halve the number of global deaths and injuries from road traffic accidents).

³⁶ Definition of SAE Level 4 – High Automation: "the driving mode-specific performance by an automated driving system of all aspects of the dynamic driving task, even if a human driver does not respond appropriately to a request to intervene".

In addition to the topics of this call, actions related to "Automated Road Transport" are included in the "Mobility for Growth" call of this part of the Work Programme as well as in other parts of the Horizon 2020 Work Programme 2018-2020. The call "Mobility for Growth" includes topics on "Human Factors in Transport Safety" (MG-2.1-2018), "Safety in an evolving road and mobility environment" (MG-2.4-2019), "New regulatory frameworks to enable effective deployment of emerging technologies and business models" (MG-4.2-2018) and "Driver behaviour and acceptance of connected, cooperative and automated transport" (MG-3.4-2019), which refer to connected and automated systems and technologies of all transport modes. Cooperation and cross-fertilisation of concepts and technologies across transport modes developed in the different proposals is strongly encouraged. The LEIT/ICT work programme includes a topic on "5G for connected and automated driving". This topic addresses the applicability of 5G connectivity to "Connected and Automated Driving" use cases.

Proposals are invited against the following topic(s):

DT-ART-01-2018: Testing, validation and certification procedures for highly automated driving functions under various traffic scenarios based on pilot test data

Specific Challenge: The automotive industry commits significant efforts and resources to test and validate advanced driver assistance functions. For systems with high levels of automation, the need for testing and validation will drastically increase as a comprehensive range of driving situations and scenarios have to be considered. Current available procedures do not provide an efficient and cost-effective solution. There is a great need for a comprehensive approach to develop common procedures for testing, validation and certification for highly automated driving functions in various traffic scenarios.

Scope: Research should focus on the development of testing and validation procedures of highly automated driving functions for different use cases in various traffic scenarios, including cross-border travelling. Proposed solutions shall seek broad consensus and agreement among involved stakeholders across the value chain. Therefore, a large participation of stakeholders from industry and Member States is crucial. Data and knowledge gathered from on-going and future pilot tests across Europe should provide a sound scientific basis to define comprehensive validation procedures for highly automated driving. Data obtained by proposed actions should be made available for all manufacturers and stakeholders. Procedures for merging the real-time simulation of driving environments with real tests on complete vehicle or on one or several subsystems in parallel should be researched to reduce testing time and costs, foster the collaboration between different stakeholders and analyse complex interactions in complete sets of tests. Proposals should elaborate common criteria for model-based validation and simulation on vehicle level as well as on vehicle components, and V2X communication systems level. The consideration of new testing procedures and tools for reliable and accurate positioning as well as for cyber-security vulnerability assessment would be an asset.

Proposed actions should build on the knowledge and results of on-going projects and other initiatives addressing testing and validation procedures of highly automated driving functions as well as fully leveraging the potential of advanced services offered by EGNOS and Galileo. It will be necessary to catalogue and analyse existing procedures and parameters and to identify gaps and weaknesses and potential synergies. Proposals should look at the possibility of employing new approaches to testing and validation, for example procedures already used successfully in other sectors which could be transferred and adopted to highly automated driving functions. The development of testing and validation procedures should also take into account the needs of type approval.

In line with the Union's strategy for international cooperation in research and innovation, international cooperation is encouraged. In particular, proposals should consider cooperation with projects or partners from the US, Japan, South Korea, Singapore, and/or Australia. Proposals should foresee twinning with entities participating in projects funded by US DOT³⁷ to exchange knowledge and experience and exploit synergies.

The Commission considers that proposals requesting a contribution from the EU between EUR 4 to 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: Comprehensive testing, validation and certification procedures for highly automated driving functions and reliable and accurate positioning to pave the way for accelerated implementation of highly automated vehicles across Europe. New testing procedures and tools for cyber-security vulnerability assessment to secure connected and automated vehicles from manipulation and threats to guarantee safe operations.

Common criteria for model-based validation and simulation on vehicle, vehicle components, and V2X communication systems level to support harmonisation and standardisation for homologation processes.

Type of Action: Research and Innovation action

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

DT-ART-02-2018: Support for networking activities and impact assessment for road automation

Specific Challenge: Besides technological progress in developing new automated driving functions, there are still many challenges and uncertainties related to the deployment of connected and automated vehicles. Many of these challenges can be better addressed when European partners work together and cooperate with international partners. Therefore, a coordinated and harmonised approach to support the deployment of automated driving systems at European and international level is needed. More cooperation is also necessary to

³⁷ United States Department of Transportation.

assess the impacts of connected and automated driving systems. Several methodologies to assess impacts of connected and automated transport systems have already been developed and applied. However, a commonly agreed methodology to assess the impacts of connected and automated driving systems that would allow for informed decision making does not exist.

Scope: This topic will be implemented through two sub-topics (two types of actions). Proposals should address only one of the two.

Subtopic 1) Research and innovation action: Assessment of impacts, benefits and costs of connected, cooperative and automated driving systems

Proposals should address all the following aspects:

- Assess the short, medium and long term impacts, benefits and costs of different scenarios/use cases for connected, cooperative and automated driving systems (for passengers cars, automated urban transport and goods transport) considering the full range of impacts including, but not limited to, driver behaviour, mobility behaviour, recharging and refuelling behaviour, accessibility, safety, traffic efficiency, emissions, energy consumption, use of resources, impact on employment, required skills, infrastructure wear and land use.
- Establish a solid multidisciplinary methodology to assess the long-term impacts of connected and automated driving systems.
- Provide a public toolkit for assessing impacts, benefits and costs of connected and automated systems (including required infrastructures) and decision support system to help authorities to evaluate strategic decisions on urban regulations and planning.

Specific attention should be paid to the transition phase towards higher levels of automation when individual vehicles may operate at different automation levels given the circumstances, and where human and machine operated vehicles are both present in varying penetration degrees.

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

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

Subtopic 2) Coordination and support action: Networking activities to support connected, cooperative and automated driving

Proposals should address all the following aspects:

- Explore ways to strengthen cooperation and experience exchange amongst European and international stakeholders of connected, cooperative and automated driving in areas such as: research and innovation (e.g. human-machine interface, social acceptance of automated driving technologies, digital technologies for automation, impact assessment), global framework and international standards for connectivity and automation technologies, sharing of knowledge and data of large-scale European and national demonstration projects, foster a common evaluation framework across the demonstrations, education and training needs.
- Support programme owners and managers to better coordinate national and multi-national funding programmes in the area of connected, cooperative and automated driving, building on past coordination efforts.
- Support ongoing and extend international cooperation activities in the area of cooperative, connected and automated driving (including road automation, standardisation harmonisation and connectivity issues). An extension of the cooperation to countries and regions beyond US and Japan should be explored.
- Provide a forum for European and international stakeholders of road automation to exchange experiences and knowledge on the development and deployment of cooperative, connected and automated mobility systems and to discuss future challenges. Organise conferences and workshops on connected, cooperative and automated driving in Europe. Interactions fostering discussions on best practices and lessons learned of automated transport solutions across all transport modes are encouraged.

In line with the Union's strategy for international cooperation in research and innovation, international cooperation is encouraged. In particular, proposals should consider cooperation with projects or partners from the US, Japan, South Korea, Singapore, and/or Australia. Proposals should foresee twinning with entities participating in projects funded by US DOT³⁸ to exchange knowledge and experience and exploit synergies.

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

Expected Impact:

- Enable decision makers to promote the most promising scenarios of connected, cooperative and automated driving systems based on a comprehensive impact assessment and knowledge base.
- Demonstrate the expected socio-economic and environmental benefits of future connected, cooperative and automated driving systems and raise awareness and acceptance.

³⁸ United States Department of Transportation.

- Minimise uncertainties related to the development and acceptability of different scenarios of connected, cooperative and automated driving.
- Understand which factors and measures can better unlock and foster the adoption of connected, cooperative and automated vehicles.
- Better visibility, comparability and transferability of research and demonstration activities in Europe and worldwide.
- Closer cooperation between stakeholders within Europe and worldwide on common challenges in the area of connected and automated driving. Better coordination of national and multi-national funding programmes will create synergies and reduce overlaps when setting R&I priorities.
- Support to EU Member States and stakeholders that are undertaking, or planning, larger scale public road tests with connected, cooperative and automated vehicles to exchange learnings and data, exploit synergies and propose common ways on how to leverage pilots towards deployment.
- Higher penetration of automated driving functions in the market, resulting in both increased safety on the roads and lower emissions, and stronger market position of European industry in systems for vehicle automation, including through Galileo and EGNOS.

Type of Action: Research and Innovation action, Coordination and support action

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

DT-ART-03-2019: Human centred design for the new driver role in highly automated vehicles

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

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

The proposed actions should include all of the following aspects:

- Research to characterise driver roles in SAE automation level 4 situations and for the transition between use cases with different automation levels. Upgrade of comprehensive models for driver behaviour/reaction, awareness, readiness and monitoring. Driver generational effects, considering in particular variations in IT usage experience and age, but also other cultural factors should be taken into account.
- Impact assessment methods, especially for safety aspects, based on these models. The new relationship between driver and vehicle (mutual cooperation or even handover rather than continuous control) should be reflected, also considering the variety of activities a driver may engage in while the vehicle is in charge. Use cases where an operator controls the vehicle remotely may be included.
- Develop easily understood solutions making it clear to the driver what is the operational capability (authority) of the automated mode or modes currently enabled, as well as ensuring safe and reliable function (re-)allocation and corresponding driver/operator readiness. Driver control handover, driver/operator state and impairment are among the aspects that should be considered and the intended driver reaction should be secured.
- Demonstration of concept functionality in real world situations with various use cases and driving environments where automated systems receive and give back control from/to the driver.

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

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

The Commission considers that proposals requesting a contribution from the EU between EUR 4 to 8 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact:

- Innovative solutions, concepts and algorithms for a safe human-machine interface of highly automated driving functions and for safe and controlled transfer between use cases of different automation levels.
- Reduction of risks for driver behaviour related incidents by ensuring that drivers/operators are adequately alerted, made aware and engaged when the highly

automated vehicle encounters situations or use cases that it cannot handle and thus will turn to lower automation levels.

- The research will help achieve the European Transport White Paper "Vision Zero" objective by preventing road accidents caused by human errors. Once on the market the developed concepts and solutions will also contribute to Sustainable Development Goal 3 (Ensure healthy lives and promote well-being for all at all ages; in particular goal 3.6. "By 2020, halve the number of global deaths and injuries from road traffic accidents").

Type of Action: Research and Innovation action

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

DT-ART-04-2019: Developing and testing shared, connected and cooperative automated vehicle fleets in urban areas for the mobility of all

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

Scope: The proposed actions should include all the following aspects:

- Thorough analysis of new, emerging business/operating models and related technologies for shared, connected and cooperative automated vehicle fleets that are complementing existing high-capacity public transportation systems.
- Design innovative shared, connected, cooperative and automated vehicle concepts (road vehicles at SAE level 4 and higher) and the associated new business/operating models addressing user and customer needs, including cultural aspects, for mobility of people and/or delivery of goods. Specific user needs in different regional and operating environments and for different user groups, e.g. elderly, children and users with disabilities should be considered and attractiveness and acceptability by all users should be ensured. The potential of combining automated urban delivery and people transportation should be addressed.

- Test robustness, reliability and safety of shared highly automated vehicle fleets that are operating in semi-open or open environments focusing on the interaction with other road users, including pedestrians, cyclists and public transport systems. The fleets should consist of electrified vehicles. Synergies with advanced energy efficient, smart and multimodal mobility concepts should be actively developed. Fleet management should include operational optimisation as well as energy management. Fleet tests should consider the entire "functional urban area" and explicitly include feeder services and other collective transport options in peri-urban and low-density urban areas.
- Vehicles should use connectivity technologies to allow communication and cooperation between vehicles, infrastructure and with other road users and to enable automated, smart mobility services, innovative fleet management concepts and higher performance of automated vehicle functions. Proposals should make the best use of EGNOS and Galileo which significantly improve the vehicle positioning availability and reliability. The development of solutions for the next generation of cooperative services³⁹ by efficiently combining C-ITS and automation for smart, smooth, safe and efficient traffic flows (including the development and testing of "open message definitions" for all C-ITS stakeholders) would be an asset.
- Identify and provide for the needs of vulnerable road users (including their potential re-definition to include non-connected users, out-of-position passengers in automated cars, cyclists, pedestrians, etc.) resulting from this new automated/mixed environment (use of standard & highly automated vehicles).
- Develop architecture, functional and technical requirements for ICT technologies, for secure data collection and processing needed for the operation of connected and cooperative automated vehicles. Develop ways to enhance the optimised use of big data in (road) transport for implementing smart and safe mobility solutions, innovative traveller services and (city) traffic management.
- Fulfil all security requirements to protect the shared automated vehicles to any threats and avoid any conscious manipulations of the information enabling automated driving.
- Assess and demonstrate benefits of the pilot implementation on energy efficiency, traffic flow, safety, user appreciation etc, based on holistic modelling solutions.

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

The Commission considers that proposals requesting a contribution from the EU between EUR 15 and 30 million would allow this specific challenge to be addressed appropriately.

³⁹ Beyond Day 1 and Day 1.5 services, as defined in COM(2016)766, the European Strategy for C-ITS

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

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

Type of Action: Innovation action

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

DT-ART-05-2020 - Efficient and safe connected and automated heavy-duty vehicles in real logistics operations

DT-ART-06-2020 - Large-scale, cross-border demonstration of highly automated driving functions for passenger cars

Conditions for the Call - 2018-2020 Digitising and Transforming European Industry and Services: Automated Road Transport

Opening date(s), deadline(s), indicative budget(s):⁴⁰

Topics (Type of Action)	Budgets (EUR million)			Deadlines
	2018	2019	2020	
Opening: 31 Oct 2017				

⁴⁰ The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.

The Director-General responsible may delay the deadline(s) by up to two months.

All deadlines are at 17.00.00 Brussels local time.

The deadline(s) in 2019 and 2020 are indicative and subject to separate financing decisions for 2019 and 2020.

The budget amounts for the 2018 budget are subject to the availability of the appropriations provided for in the draft budget for 2018 after the adoption of the budget 2018 by the budgetary authority or, if the budget is not adopted, as provided for in the system of provisional twelfths.

The budget amounts for the 2019 and 2020 budget are indicative and will be subject to separate financing decisions to cover the amounts to be allocated for 2019 and for 2020.

Horizon 2020 - Work Programme 2018-2020
Smart, green and integrated transport

				04 Apr 2018
DT-ART-01-2018 (RIA)	6.00			
DT-ART-02-2018 (RIA)	6.00			
DT-ART-02-2018 (CSA)	3.00			
Opening: 04 Dec 2018				
DT-ART-03-2019 (RIA)		8.00		24 Apr 2019
DT-ART-04-2019 (IA)		30.00		
Opening: To be defined				
Focus area topic(s) for 2020			50.00	To be defined
Overall indicative budget	15.00	38.00	50.00	

Indicative timetable for evaluation and grant agreement signature:

For single stage procedure:

- Information on the outcome of the evaluation: Maximum 5 months from the final date for submission; and
- Indicative date for the signing of grant agreements: Maximum 8 months from the final date for submission.

Eligibility and admissibility conditions: The conditions are described in General Annexes B and C of the work programme.

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

Evaluation Procedure: The procedure for setting a priority order for proposals with the same score is given in General Annex H of the work programme.

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

Consortium agreement:

All topics of this call	Members of consortium are required to conclude a consortium agreement, in principle prior to the signature of the grant agreement.
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Call - Building a low-carbon, climate resilient future: Green Vehicles

H2020-LC-GV-2018-2019-2020

The demand for electrified vehicles is progressively increasing thanks to significant technological advances achieved in recent years. Awareness of the ever growing impact of noxious and particulate emissions on health and significant progress in battery technology and production will lead to an acceleration of their market penetration. The Calls will focus on the most critical aspects supporting a massive introduction of electrified vehicles: 1) advances in electric batteries (production of elementary cells and pack assembly), 2) new architectures, concepts and components to support the advent of the 3rd generation of electrified vehicles, 3) improve the recharging experience from the view-point of the end-users, 4) supporting the competitiveness of European industries through the development of digitalised production environments and the use of advanced material, 5) addressing the urban dimension of introducing electrified vehicles.

In addition to the topics of this call, a topic on the next generation and realisation of battery electrochemistries for BEV and PHEV is included in “Nanotechnologies, Advanced materials, Biotechnology and Advanced Manufacturing and Processing” under the “Leadership in Enabling and Industrial Technologies” (LEIT) part of HORIZON 2020.

The strategic objective of the Green Vehicles Calls for proposals for the years 2018, 2019 and 2020 will be to prepare the ground for this potential massive increase of electrified vehicles and to support European industries to maintain their leading world position in supplying automotive products. The major impact of the research will be to promote the development of a new generation of electric vehicles with a minimum of 400 km range that meets customer expectations, progress and demonstration in urban and regional electric vehicles (light and smart vehicles for passengers, delivery vehicles and buses) and support the production of batteries, components and electrified vehicles in Europe. Wide user acceptance shall be stimulated by accessibility and ease of use of all types of charging infrastructure – public, semi-public and private.

Proposals are invited against the following topic(s):

LC-GV-01-2018: Integrated, brand-independent architectures, components and systems for next generation electrified vehicles optimised for the infrastructure

Specific Challenge: With the successful introduction of electrified vehicles on the market, the upcoming challenge is to achieve affordability, user friendliness and optimization of the infrastructure. In parallel to the ongoing developments of vehicles powertrains, electronics and sub-systems innovations will enable new functionalities in EVs. On the infrastructure side, variable and higher charging power are coexisting and connected services are currently under development. New developments in the electronic architecture as well as in the system integration of innovative sub-systems in the vehicles are required to leverage the benefits of

new functionalities for the user. The topic should contribute to face the challenge of the development of new components, systems and architectures required for the next generation of electrified vehicles that will allow to meet end-users expectations in terms of cost, convenience of long range travel and comfort, by finding for each application the best compromise between fast charge, battery size and battery life.

Scope: Proposals will have to address one or more of the following technical areas:

- Integrated electric/electronic architectures (incl. high voltage) and control systems for third generation electrified vehicles powertrains.
- Development of smart bus systems, electric motors, power electronics enabling drastic size and weight reduction, when integrated in batteries and motors and modular approaches, connectivity and systems for enabling automated driving functions, have to be considered.
- Modular and flexible on-board charging optimized for infrastructure capabilities taking into account variable power with up to 350 kW
- Breakthrough heating and cooling concepts to minimize the impact on vehicle range in extreme conditions.

For each of technical areas reliability, safety and security have to be considered – including for instance electromagnetic compatibility and sensorisation of components. Coverage of research on all quality aspects is required to keep quality high and costs due to failures low using components and sub-systems for the 3rd generation. Research topics are like modelling of aging, lifetime, bonding, packaging, cooling, manufacturing in general, traceability and a database for failure mechanisms.

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:

- Significant advancements of e-powertrain technology – according to the targets in the latest version of ERTRAC's “European Roadmap - Electrification of Road Transport” – e-motors, power electronics, charging system with high impact on overall powertrain efficiency
- Affordability of the developed components and subsystems should be improved by demonstrating a minimum of 20% cost reduction in mass production (in comparison to the cost of the best current generation components) and user friendliness in terms of reach and charging procedures.

- The integration of new components and functionalities on the vehicle (similar innovation in battery packs is included in GV6) and on the infrastructure side in GV3 should allow the development of new concepts for affordable FEVs which enable long duration trips (e.g. 700-1000km day trips across different Member States) with not more than 60-90 minutes additional travel time (due to charging) and without additional degradation impact on the FEV power train including the battery
- Automotive quality enabled in the whole system with new functionalities.
- The impact on overall efficiency increase of the new functionalities should be demonstrated with a full size hardware implementation in an existing demo vehicle.

Type of Action: Innovation action

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

LC-GV-02-2018: Virtual product development and production of all types of electrified vehicles and components

Specific Challenge: Significant advances in digitization offer new opportunities for the automotive industry in terms of virtual product development and production, reducing the time-to-market of all types of electrified vehicles at lower costs. The increasing hybridisation and electrifications (i.e. multi-energy powertrains including for instance, BEVs, PHEVs and FCEVs on the same platform) leads to significant increased number of vehicle variants and increased system complexity requiring a large upfront concentration of development activities by means of digitalization in order to keep development times at comparable levels as today. Optimisation of the various parameters (for instance, the proportion of power and energy between battery and engine/fuel cell in PHEVs and EREVs) on such platforms requires advanced simulation capabilities at vehicle level (excluding engine/fuel cell development). Furthermore, by exploiting the potential benefits of digitization to the full, radically new multi-disciplinary, cross organisational and connectivity-based approaches to electric vehicle design and production should be possible which in turn will enable the development of new vehicle concepts, architectures, and integrated solutions with significant reductions in time-to-market, energy consumption and emissions over the full life-cycle while enabling performance and safety to be improved. The challenge will be that next generation virtual product engineering and manufacturing tools become fully integrated and adaptable across the entire value chain of electrified vehicles including production, operation and maintenance in accordance with the principles of Industry 4.0.

Scope: Proposals will have to address at least one of the following technical areas:

- Development of fully integrated, multidisciplinary, scientific-based and validated design tools (including processes) that exploit high performance computing resources and enable the efficient design, personalisation, optimization and flexible manufacturing of electrified vehicles and their components;

- Development of high-confidence, real-time capable simulation models for virtual and X-in-the-loop testing;
- Seamless integration and validation of computational tools and product/processes across the entire value chain including the handling of all kinds of uncertainties along the value chain while managing digital upgrades and ensuring traceability of data used;
- Development of strategies and processes enabling the seamless validation of simulation models with physical data from experimental testing facilities;
- Development of simulation environments capable of merging the different technologies involved (digital, communications, physical domain, software...);
- Development of concepts and methods utilizing data-mining and machine-learning in the automotive industry, supporting decision-making processes and circular economy approaches;
- Digitalization and optimisation of electrified vehicles and components production processes utilizing virtual tools, big data and connectivity;
- Value driven design and assessment methods and tools for including novel technologies to enhance system performance that lead to a radical simplification of EVs.

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

Expected Impact:

- Substantial reduction in BEV, FCEV and (P)HEV lead-time and time to market (-20%) with consistent or improved quality through digital integration of design with manufacturing and supply chain.
- Increasing multipower platforms development efficiency at minimized costs despite increased complexity such as modularity.
- Accelerated uptake of innovations leading to increased market penetration of more energy-efficient vehicles and hence faster and more flexible reaction to the dynamics of mobility and transport demands.
- Supporting circular economy through fully integrated tools across the entire value chain and life-cycle.
- Improved integration of suppliers, SMEs and research into the automotive product development leveraging the EU competitiveness.

Type of Action: Research and Innovation action

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

LC-GV-03-2019: User centric charging infrastructure

Specific Challenge: The market share of full electric vehicles is still low in many European member states. Several reasons have been identified for this. Charging infrastructure is considered as one of the central reasons when the urban model does not allow for widespread garage availability, or when frequent long range travel is involved. Currently most EV owners have their own garage and live in peri-urban areas.

Innovative solutions need to be evaluated and developed to allow EV drivers to have a similar or even better mobility experience than with conventional fossil fuel vehicles in terms of availability, convenience, performance and costs of the necessary charging infrastructure. At the same time, the infrastructure should not affect the noise environment around them, in order not to create resistance to their installation in urban contexts.

In the longer term, electric roads can be considered for further streamlining the user experience and optimising vehicle design, starting from urban and peri-urban applications such as bus, taxi and LDV lanes, for later extension to extra-urban applications.

The challenge will be to support the accelerated deployment of recharging infrastructure, on one hand a slow charging one for cities with low garage availability, on the other to support occasional ultrafast charging for long range travel. The responsible stakeholders need to be incentivized to take clear steps for a wide availability of charging points and to improve the conditions for a broad market acceptance in the electrification of transport.

Scope: Proposals will have to address all following technical areas including demonstration of the final solutions and their interoperability in multiple cities and TEN-T transnational road links:

- Analysis of subjective perception of charging options and identification of decision influences and concerns of users. The results should provide the basis for strategies or solutions to encourage or incentivize users of different social groups to overcome acceptance barriers in order to accelerate widespread usage of EVs.
- Attractive and convenient charging infrastructure access with connected vehicle systems avoiding waiting times (through for instance, charging facility reservation and scheduling, integration with route planning of multiple vehicles). User preferences like use of renewable energy and avoidance of frequent handling of heavy cables have to be considered. Automated conductive or wireless solutions are expected with highly reliable and interoperable devices. Test methods need to be further optimized, for instance to assess interoperability. Optionally, further extension of the developed stationary wireless charging technology towards urban and periurban "electric road" applications, with the aim of creating an installed base of wireless-ready vehicles to provide the critical mass needed for the deployment of electrified roads at a later stage.

- Transparent, flexible and interconnected payment systems for maximum availability of the charging infrastructure also for drivers who do not regularly use the same car (company/family sharing, commercial car sharing, rental cars, ...) or travel across Europe.
- User survey about parking habits, considering for instance how much time is spent at a given location; what type of services are needed or expected during charging; how should the future charging station look like.
- Improvement of the currently deployed or planned superfast charging systems according to the previous survey to convince all car owners of the advantages of electric mobility including a sufficient convenience for long trips. All technical possibilities for optimization, both on the vehicle (like temperature preconditioning), or for energy demand rationalisation (e.g. local renewable power support for solar panels, battery storage for peak shaving and other grid services, demand control by interconnected route management systems for incoming vehicles while taking into account the electricity grid availability and voltage and frequency control constraints in real-time) need to be taken into account.
- Scalable charging infrastructure for ramp-up of expected electric mobility needs in terms of power levels and number of charging posts at one site, adequately managing the impact on the grid.
- Cheap low power DC-Charging for highly efficient connection to future home and office energy systems based on DC-Networks with possibility of V2G by smartening the link between vehicle, charging infrastructure and the grid.
- Low power DC-charging for LEV's in combination with theft-proof parking for two-wheelers.
- Analysis of market models, regulatory and harmonization recommendations to foster the deployment of EV charging infrastructure in all member states of the EU. Demand control also for slow charging in public or private parking garages shall be enabled by standardized communication to remove barriers of electricity installations in existing apartment blocks and garages considering smart grid implications.
- Development of planning methods to optimize the location of charging sites, taking in consideration user needs and habits (volume of EVs in the area, type of mobility needs, accessibility to charging points, traffic volume, ...) as well as time and costs associated to the availability and reinforcement of the necessary electricity network with easy scalability according to the different stages of EV penetration. Analysis and cost effective solutions for specific cases like availability of infrastructure in isolated mountain or seaside locations, or for special events, where high peak demand is associated with short periods of use. Consideration for local storage benefits in the different cases studied.

The Commission considers that proposals requesting a contribution from the EU between EUR 8 and 15 million depending on the level of involved demonstration would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact:

- Wide user acceptance beyond early adopters, urban users and garage parkers;
- Foster investors to invest in charging infrastructure;
- Determine legal gaps which slow down infrastructure expansion and propose solutions;
- Develop test methods and set up procedures to improve interoperability issues of vehicle-to-charger and charger-to-infrastructure communication;
- Facilitate grid integration of high-power chargers;
- Improve and standardize charging solutions and payment systems for LEVs for price reduction and higher market acceptance in urban environments.

Type of Action: Innovation action

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

LC-GV-04-2019: Low-emissions propulsion for long-distance trucks and coaches

Specific Challenge: Long-distance transport is a main consumer of energy and contributor to CO₂ and air pollutant emissions in Europe, and requires specific attention due to very high demand on efficiency, dependability, reliability and cost. This topic considers heavy-duty trucks and bus-coaches in long-distance operation, and the challenge will be to reduce their energy consumption, CO₂ ,regulated and non-regulated emissions (to anticipate future legislation and emerging issues such as extremely fine nanoparticles) through multi-technology vehicles operated on a mix of alternative and renewable fuels as well as recuperated heat and regenerated and externally supplied electricity.

Scope: Proposals will have to address all the following technical areas:

- Sub-systems and component concepts including electro-hybrid drives, optimized ICEs and after-treatment systems for alternative and renewable fuels, electric motors, smart auxiliaries, energy storage and power electronics, suitable for real life operation under different mission conditions
- Concepts for connected and digitalized fleet management, predictive maintenance and operation in relation to electrification where appropriate to maximise the emissions reduction potential.

- Implementation of required adaptations in VECTO accordingly to facilitate early take-up of the innovations.

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

Expected Impact:

- The internal combustion engine performance shall be further enhanced to reach a peak thermal efficiency target of 50%
- Reduction of CO₂ emissions based on new ICEs optimized (where sufficiently large benefits can be demonstrated) for different combinations using alternative and renewable fuels with additional energy savings using heat recuperation or plug-in hybrid. Emissions with high global warming potential will have to be taken into account in the total CO₂ equivalent emissions target and methodologies to introduce such emissions in VECTO devised accordingly.
- A total energy saving, excluding the effect of alternative fuels and plug-in electricity, of at least 10% with respect to the best in class conventional vehicle of 2018 (according to the ongoing monitoring exercise) is targeted at calculated vehicle level VECTO results, validated by propulsion system measurements
- 30% reduction of NO_x, CO and hydrocarbons in an extended range of environmental conditions
- Reduction of unregulated components (N₂O, N₂, NH₃, CH₄ for NG powertrains, PN measured with a lower threshold of 10nm
- Reduction of noise in environmental zones in electric modes
- Implementation of needed simulation methodologies in VECTO.

Type of Action: Innovation action

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

LC-GV-05-2019: InCo flagship on “Urban mobility and sustainable electrification in large urban areas in developing and emerging economies”

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

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

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

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

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

Proposals should address all of the following activities:

- - Development of a toolbox for advanced management strategies towards a more efficient private and public electric mobility: E-mobility management strategies, focusing on smart deployment and operation of vehicles, in particular electrified vehicle, to increase mobility and energy efficiency, emission reduction and user acceptance of electrified vehicles
 - o A smart and cooperative management of the vehicle in urban operation, (intermodal route planning, ecorouting eco-driving charging and parking infrastructure availability...).
 - o Deployment and operation of infrastructure use charging infrastructure (conventional and wireless) and network, availability of parking places. Adaptation and integration of existing/ adapted vehicles of different types if necessary.

- Efficient integration of the operations of different electrified road public transport, from e-bike to bus rapid transit (e- BRT) including mini-buses, taxi and mobility services on demand through smart navigation and routing, coordinated traffic management, demand-responsive service and dispatching
- Comparative demonstrations activities and pilots in cities in Europe, Asia, African and/or CELAC countries: Innovative concepts for electrified road public transport (passenger and freight), jointly designed through International Partnerships as a contribution to a wider sustainable mobility concept, from the perspective of a seamless mobility, taking in account the acceptance of users (travellers or freight operator). Comparative demonstrations activities and pilots (in European and Chinese's Cities, African, CELAC countries) of such jointly designed concepts developed by local partners.
- Implementation concepts to scale up the demonstration activities. Evaluation of the relative outputs and accordingly the development of implementation concepts to scale up the demonstration activities and exploration of the sustainable mobility planning in the city transformation process :
 - Sustainable planning of city and transportation infrastructure: link city planning with policy discussion and implementation solutions and city goals and with any Air Quality Plans
 - Dedicated plans for financing solutions, including public and private operations.
 - Regional and international replication conditions to reach out to a larger number of cities and countries

Cooperation and synergies with ongoing activities undertaken with international initiatives such as Decarbonising Transport (International Transport Forum) and the Urban Electric Mobility Initiative (UN-Habitat) and other joint initiatives of European Member States international cooperation initiatives and the European Commission (e.g. Mobilise Your City) should be sought where appropriate.

In line with the strategy for EU international cooperation in research and innovation⁴¹, international cooperation is encouraged.

Applicants are invited to read the eligibility and admissibility conditions for this topic.

⁴¹ (COM (2012) 497)

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 15 and 18 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Proposals are expected to contribute to:

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

Type of Action: Innovation action

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

LC-GV-06-2020 - Next generation and realisation of battery packs for BEV and HEV

LC-GV-07-2020 - Advanced light materials and their production processes for automotive applications

LC-GV-08-2020 - Reducing the environmental impact of hybrid light duty vehicles

LC-GV-09-2020 - Next generation electrified vehicles for urban use

Conditions for the Call - Building a low-carbon, climate resilient future: Green Vehicles

Opening date(s), deadline(s), indicative budget(s):⁴²

⁴² The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.

The Director-General responsible may delay the deadline(s) by up to two months.

Horizon 2020 - Work Programme 2018-2020
Smart, green and integrated transport

Topics (Type of Action)	Budgets (EUR million)			Deadlines
	2018	2019	2020	
Opening: 31 Oct 2017				
LC-GV-01-2018 (IA)	42.00			04 Apr 2018
LC-GV-02-2018 (RIA)	14.00			
Opening: 04 Dec 2018				
LC-GV-03-2019 (IA)		35.00		24 Apr 2019
LC-GV-04-2019 (IA)		25.00		
LC-GV-05-2019 (IA)		18.00		
Opening: To be defined				
Focus area topic(s) for 2020			112.00	To be defined
Overall indicative budget	56.00	78.00	112.00	

Indicative timetable for evaluation and grant agreement signature:

For single stage procedure:

- Information on the outcome of the evaluation: Maximum 5 months from the final date for submission; and
- Indicative date for the signing of grant agreements: Maximum 8 months from the final date for submission.

Eligibility and admissibility conditions: The conditions are described in General Annexes B and C of the work programme. The following exceptions apply:

LC-GV-05-2019	Due to the specific challenge of this topic, in addition to the minimum number of participants set out in the General Annexes, proposals shall include at least two participants/cities from Asia (e.g. China, India, etc), at least two participants/cities from CELAC countries and two participants/cities from African
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All deadlines are at 17.00.00 Brussels local time.

The deadline(s) in 2019 and 2020 are indicative and subject to separate financing decisions for 2019 and 2020.

The budget amounts for the 2018 budget are subject to the availability of the appropriations provided for in the draft budget for 2018 after the adoption of the budget 2018 by the budgetary authority or, if the budget is not adopted, as provided for in the system of provisional twelfths.

The budget amounts for the 2019 and 2020 budget are indicative and will be subject to separate financing decisions to cover the amounts to be allocated for 2019 and for 2020.

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	countries.
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Evaluation criteria, scoring and threshold: The criteria, scoring and threshold are described in General Annex H of the work programme.

Evaluation Procedure: The procedure for setting a priority order for proposals with the same score is given in General Annex H of the work programme.

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

Consortium agreement:

All topics of this call	Members of consortium are required to conclude a consortium agreement, in principle prior to the signature of the grant agreement.
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SME instrument & Fast-Track-to-Innovation

The respective calls for the EIC-SME instrument call (H2020-EIC-SMEInst-2018-2020) and EIC-Fast-Track-to-Innovation (H2020-EIC-FTI-2018-2020) are found under the Horizon 2020 Work Programme Part – ***Towards the next EU Framework Programme for Research and Innovation: European Innovation Council (EIC) Pilot*** (part 17 of this work programme).

Other actions⁴³

1. Horizon prize for the cleanest engine of the future⁴⁴

The detailed information for this prize was included in the Work Programme 2016-2017, part 11. "Smart, green and integrated transport", adopted with Commission Decision C(2015)6776 of 13 October 2015 as last amended by Commission Decision C(2017)2468 of 24 April 2017 available at the following link http://ec.europa.eu/research/participants/data/ref/h2020/wp/2016_2017/main/h2020-wp1617-transport_en.pdf

The Contest was published by the Commission on 20/04/2016 and information is available at the following link <https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/calls/h2020-futureengineprize-2016.html#c.topics=callIdentifier/t/H2020-FutureEnginePrize-2016/1/1/1/default-group&callStatus/t/Forthcoming/1/1/0/default-group&callStatus/t/Open/1/1/0/default-group&callStatus/t/Closed/1/1/0/default-group&+identifier/desc>

Type of Action: Inducement prize

Indicative budget: EUR 3.50 million from the 2019 budget

2. External expertise⁴⁵

This action will support the use of appointed independent experts for the monitoring of actions (grant agreement, grant decision, procurements, financial instruments) including, where appropriate, ethics checks.

Type of Action: Expert Contracts

Indicative timetable: Along 2018-2019

⁴³ The budget amounts for the 2018 budget are subject to the availability of the appropriations provided for in the draft budget for 2018 after the adoption of the budget 2018 by the budgetary authority or, if the budget is not adopted, as provided for in the system of provisional twelfths.

The budget amounts for the 2019 and 2020 budget are indicative and will be subject to separate financing decisions to cover the amounts to be allocated for 2019 and for 2020.

⁴⁴ This action was part of the Work Programme 2016-2017 and is presented in this Work Programme only for the purpose of having a financing decision for 2019.

This activity is 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 the Innovation and Networks Executive Agency (INEA) and will be implemented by the Commission services.

⁴⁵ Monitoring of FP7 projects, of H2020 projects which are being managed by Commission services, as well as the evaluation of applications submitted to prize contests, for which EUR 1,5 million is allocated, is excluded from the delegation to the Innovation and Networks Executive Agency (INEA) and will be implemented by the Commission services

Indicative budget: EUR 0.60 million from the 2018 budget and EUR 0.60 million from the 2019 budget and EUR 0.60 million from the 2020 budget

3. External expertise to advise on EU research and innovation policy⁴⁶

This action will support the provision of independent expertise in support of the design, implementation and valorisation of EU research policy. Individual experts will work in the following domains:

- Analysis, design, assessment and implementation of strategic transport research and technology options and actions
- Future transport-related research actions and programmes, contribution to their impact assessment.
- International cooperation in the field of transport research and innovation.
- Analysis and valorisation of EU transport research results in view of contributing to the elaboration of policy reports (such as projects for policy, project cluster reports, etc).
- New generation of batteries for improved electromobility – electrification of vehicles

The tasks of individual experts would include:

Analysis of the contribution of the funded research to the EU policy objectives spanning across all transport modes and systems; analysis of the state-of-the-art at international level; investigation of deployment options for the developed knowledge; participation in international symposia (in particular the annual EU-US transport research symposia), including the drafting of White Papers and reports on the symposia's conclusions; advise the Commission on promising technologies covered by European and nationally funded projects and on ways to stimulate synergies; assisting the elaboration of a research and development strategy for the expansion of the European industrial base of elementary battery cells.

In addition to individual experts, this action provides for the following Commission expert groups:

- A Commission expert group on the Strategic Transport Research and Innovation Agenda.

Its responsibilities will include: steering the implementation of the transport strategy, monitoring and exchanging best practices at the EU and international level, assisting and advising the Commission on measures to support the roll-out of low-emission transport solutions; the expert group will focus on the long term objectives of EU transport policy and those of other policies, notably energy, climate and industrial policy.

- A Commission expert group on Open Science – Transport Research Cloud.

⁴⁶ This activity is 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 the Innovation and Networks Executive Agency (INEA) and will be implemented by the Commission services.

The responsibilities of this expert group will be to explore the main issues to be addressed in view of creating a dedicated transport research cloud, which will contribute to the creation of a European Open Science Cloud (EOSC).

The activities carried out by the experts will be essential to the development and monitoring of the above-mentioned policy areas. The advice provided by the experts will focus on transport science and technology options in relation to policy goals and international cooperation priorities, without which the policy would not reach its objective.

The experts' tasks (whether participating in groups or/and individually) will include attending meetings and remote drafting and possible preparatory work. The experts will be highly qualified and specialised, and will be selected on the basis of objective criteria, following an open call for expressions of interest. A special allowance of EUR 450/day for each full working day spent assisting the Commission (Article 21 of Decision C(2016)3301 in the case of expert groups) will be paid to the experts appointed in their personal capacity who act independently and in the public interest. This amount is considered to be proportionate to the specific tasks to be assigned.

Type of Action: Expert Contracts

Indicative timetable: Along 2018 and 2019

Indicative budget: EUR 0.80 million from the 2018 budget and EUR 0.80 million from the 2019 budget and EUR 0.80 million from the 2020 budget

4. Support to the ITF Decarbonising Transport project⁴⁷

Support for the Decarbonising Transport project led by the International Transport Forum, an OECD body, aiming to help governments and decision-makers to identify and implement policy measures for reducing transport carbon dioxide emissions (CO₂) and attain the Paris Agreement targets. The project will include data-driven computer modelling over all transport modes, analysis of policy impact and outcomes, simulation of technology evolution, dissemination through inclusive dialog and mutual learning among stakeholders from different countries. This grant will complement activities of the work programme 2014-2015, in particular the construction of a Europe-wide transport model, technology watch, data and scenarios. It will also contribute to the identification of appropriate policy measures which will support the Member States in the process of decarbonisation of transport, and strengthen international cooperation between the main stakeholders thus facilitating their successful implementation.

⁴⁷ This activity is 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 the Innovation and Networks Executive Agency (INEA) and will be implemented by the Commission services.

This grant will be awarded without call for proposals in line with Article 190(1)(e) of the Rules of applications of Regulation (EU, Euratom) 966/2012, Regulation No 1268/2012 and Article 11(2) of the Rules for participation and dissemination in "Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020)", Regulation (EU) No 1290/2013.

Legal entities:

Organisation for Economic Co-operation and Development OECD, 2, rue André Pascal 75016
– Paris – FRANCE

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

Indicative timetable: Launch in the first quarter of 2018 – Expected start of contract: fourth quarter of 2018

Indicative budget: EUR 1.00 million from the 2018 budget

5. Ex-post analysis of Clean Sky 2, SESAR and Shift2Rail Joint Undertakings⁴⁸

Based on the results of the interim assessment for the three Joint Undertakings (JUs), additional analyses will be carried out by external studies and policy-relevant feedback will be sought in consultation with Member States and stakeholders. Three service contracts (one service contract-study per each JU) are foreseen. The studies should in particular analyse the measures taken by the Joint Undertakings in response to the recommendations and conclusions of the respective interim evaluations. The studies should determine the impact of those measures and other needs within the context of the long-term research, innovation challenges and policy objectives in the respective areas addressed by the Joint Undertakings. In addition, the studies should highlight shortcomings and propose additional measures to be taken where necessary.

Type of Action: Public Procurement - Three direct contracts

Indicative timetable: Launch in the first quarter of 2018 – Expected start of contract: third quarter of 2018

Indicative budget: EUR 0.90 million from the 2018 budget(Around EUR 0.30 million for each contract.)

6. Support for the implementation of TRIMODE, a 'Europe wide transport model, technology watch, data and scenarios'⁴⁹

The purpose of this action is to build on an existing Administrative Agreement in order to provide scientific and technical support to the follow-up of the project development, review and assistance in the approval of the final deliverables of the project TRIMODE (a Europe wide transport model integrating also energy and economy models). In addition, to use the

⁴⁸ This activity is 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 the Innovation and Networks Executive Agency (INEA) and will be implemented by the Commission services.

⁴⁹ This activity is 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 the Innovation and Networks Executive Agency (INEA) and will be implemented by the Commission services.

model as well as complementary analytical tools in order to perform a rigorous, up-to-date, robust quantitative transport policy analysis.

The technical and scientific support to the Commission would include at least three main aspects which require specific attention: implementation (encompassing applied methodological framework and algorithms, efficiency of storage and manipulation of data and acceptable computation times), suitability of the model (correct calibration, robustness of results) and functionality (ability to represent policy scenarios relevant to the involved Commission services).

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

Indicative timetable: Second quarter of 2018

Indicative budget: EUR 0.50 million from the 2018 budget

7. New mobility patterns in European cities⁵⁰

The 2016 Low Emission Mobility Strategy foresees a set of initiatives to encourage further a shift towards low-carbon, circular economy in the transport sector, by increasing its efficiency, by speeding up the deployment of low-emission alternative energy for transport and by moving towards zero-emission vehicles. Cities and local authorities play a significant role for the delivery of this strategy: urban transport is responsible for 23% of transport greenhouse gas emissions and is the main cause of air pollution in cities. Local authorities are already implementing incentives for low-emission alternative energies and vehicles, encouraging modal shift to active travel (cycling and walking), public transport and/or shared mobility schemes, such as bike, car-sharing and car-pooling, to reduce congestion and pollution.

This initiative aims at conducting a pan-European survey that should provide a snapshot of mobility patterns in European cities. The survey should collect information about the new mobility models, the use of collective transport, private conventionally fuelled and alternative fuelled vehicles, as well as of active modes. It should also assess the interest of European citizens in shifting to more sustainable transport modes and identify obstacles to their further deployment. The potential of such survey for the future to serve as a basis for monitoring and assessment of sustainable mobility trends will also be looked at.

Type of Action: Public Procurement - One direct contract.

Indicative timetable: 2019

Indicative budget: EUR 2.00 million from the 2019 budget

⁵⁰ This activity is 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 the Innovation and Networks Executive Agency (INEA) and will be implemented by the Commission services.

8. Support to the development, implementation, monitoring and evaluation of transport research and innovation policy activities⁵¹

The action will focus on three types of activities:

— Technical assistance, and economic and policy analysis to support various aspects of the research and innovation policy relevant in transport and related sectors. The areas mainly concerned are: a) urban mobility (including links with broader urban policies and smart cities actions); b) logistics; c) intelligent transport systems; d) infrastructure (such as TEN-T); e) road safety; f) socio-economic and behavioural studies and other forward looking activities for policy making; and g) international cooperation.

— Communication activities, such as events and publications, that could support dissemination of knowledge and information to interested organisations and individuals, as well as development of new forms of cooperation and information exchange between interested organisations and individuals.

— Supporting new forms of innovation in the transport and mobility sector, as well as new forms of supporting innovation, e.g. start-up support, new business models, new financing instruments, cooperation with organisations outside the transport sector, supporting transport innovation investment communities and intermediaries.

Type of Action: Public Procurement - One or several service contract(s)

Indicative timetable: Along 2018-2019

Indicative budget: EUR 1.00 million from the 2018 budget and EUR 1.00 million from the 2019 budget

9. Support to the organisation of the annual EU-US Transport research symposia⁵²

The action will prepare and provide support to the EU-US Transport Research Symposia to be organised annually in 2018-2020 (second quarter of each year). In 2018 and 2020, the EU-US symposia will be held in Brussels, while in 2019 the symposium will take place in Washington, D.C. For the years 2018 and 2020, the action will consist of the selection of the appropriate location for the venue, the invitation, registration and follow up of approximately 25 participants, the handling of the speakers' contributions and the organisation of the logistics for the event (including reception, lunch, dinner, etc). The estimated budget for the organisation of the 2018 and 2020 symposia is approximately EUR 0.2 million. In 2019 the symposium will be logistically organised by the US counterparts. Therefore, in 2019 the action will be limited to the invitation, registration and follow up of approximately 25

⁵¹ This activity is 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 the Innovation and Networks Executive Agency (INEA) and will be implemented by the Commission services.

⁵² This activity is 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 the Innovation and Networks Executive Agency (INEA) and will be implemented by the Commission services.

participants, the handling of the speakers' contributions and the assistance to the US organiser of the logistics for the event. As a consequence, the estimated budget for the contribution to the organisation of the 2019 symposium is approximately EUR 0.1 million.

Type of Action: Public Procurement - One specific contract - Use of an existing framework contract

Indicative timetable: 1st quarter 2018.

Indicative budget: EUR 0.50 million from the 2018 budget

10. Exploring the possible employment implications of connected and automated driving⁵³

The road transport sector employs 12 million people in the EU. The full deployment of connected and automated transport (CAD) is expected to affect the labour market in both positive and negative ways and its potential impact on employment is gaining growing attention. At present, there is an important gap in the international literature dedicated to this specific subject. According to the few existing studies, new employment opportunities could emerge (e.g engineers, researchers, etc), while enhancement in specialisation and working conditions can be expected for the working staff of the transport sector. On the other hand, the services potentially provided by CAD may threaten the business of professional drivers and other professions related directly or indirectly to conventional road transport. Such changes need to be anticipated and may need to be accompanied through public support actions (action on skills, vocational training, etc).

The action will assess the short, medium and long term impacts on employment of connected, cooperative and automated driving systems (e.g for passengers cars, automated urban transport and goods transport) including for example, development of jobs, changes in work patterns and required skills, business/operating models of producers and service providers, logistics and supply chains, emerging needs and opportunities in relation to gender related employment issues, etc.

Type of Action: Public Procurement - One direct contract

Indicative timetable: First quarter 2018

Indicative budget: EUR 2.00 million from the 2018 budget

⁵³ This activity is 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 the Innovation and Networks Executive Agency (INEA) and will be implemented by the Commission services.

11. Dissemination and exploitation of results⁵⁴

The challenge is to exploit the knowledge from projects in the field of transport, funded under FP7 and Horizon 2020. Projects that are at a short distance from market application may need assistance amongst other in defining their strategy towards exploitation, developing their business plan, identifying the risks and opportunities, and finding investors and other exploitation partners. For this, the Commission will offer a targeted service linked to the TRL level of the project, through procurement contracts.

Type of Action: Public Procurement - One or several specific contract(s) – Use of an existing framework contract. For 2018, indicative number of specific service contracts: 3 to 5.

Indicative timetable: Along 2018 -2019. For 2018, expected start: 2nd quarter 2018.

Indicative budget: EUR 0.15 million from the 2018 budget and EUR 0.15 million from the 2019 budget and EUR 0.20 million from the 2020 budget

⁵⁴ This activity is 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 the Innovation and Networks Executive Agency (INEA) and will be implemented by the Commission services.

Call - Mobility for Growth 2018-2020 (continued)

H2020-MG-2018-2019-2020-continued

Call 2020 – Mobility for Growth (continued)

1. BUILDING A LOW-CARBON, CLIMATE RESILIENT FUTURE: LOW-CARBON AND SUSTAINABLE TRANSPORT

2. SAFE, INTEGRATED AND RESILIENT TRANSPORT SYSTEMS

MG-2-10-2020: Towards full automated infrastructure construction and maintenance

MG-2-11-2020: Jointly implementing innovation in the areas of safety, connectivity and infrastructure (ERA-net Co-fund)

3. GLOBAL LEADERSHIP AND COMPETITIVENESS

MG-3-04-2020: Enhanced avionics, operations and door-to-door user-experience through higher connectivity and automation

MG-3-05-2020: Towards a high-speed global air transportation demonstration

MG-3-06-2020: Next Generation Multifunctional and Intelligent Aerostructures – from manufacturing to maintenance and recycling

MG-3-07-2020: Improved Production Processes in Ship building

4. ACCOUNTING FOR THE PEOPLE

MG-4-07-2020: Digitisation of the transport system: data sharing, analytics

MG-4-08-2020: Advanced methods and tools in support of transport/mobility researchers, planners and policy makers

BLUE GROWTH

MG-BG-03-2020: Under water noise mitigation and environmental impact

Indicative budget: EUR 147.500.000

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Budget⁵⁵

	Budget line(s)	2018 Budget (EUR million)	2019 Budget (EUR million)	2020 Budget (EUR million)
Calls				
H2020-MG-2018-2019-2020		197.40	168.70	
	<i>from 08.020304</i>	150.40	122.70	
	<i>from 06.030301</i>	47.00	46.00	
H2020-DT-ART-2018-2019-2020		15.00	38.00	50.00
	<i>from 08.020304</i>	15.00	38.00	50.00
H2020-LC-GV-2018-2019-2020		56.00	78.00	112.00
	<i>from 08.020304</i>	56.00	78.00	112.00
H2020-MG-2018-2019-2020-continued				147.50
	<i>from 06.030301</i>			51.00
	<i>from 08.020304</i>			96.50
Contribution from this part to call H2020-EIC-FTI-2018-2020 under Part 17 of the work programme		14.76	14.76	14.76
	<i>from 08.020304</i>	10.42	10.42	10.42
	<i>from 06.030301</i>	4.34	4.34	4.34

⁵⁵ The budget figures given in this table are rounded to two decimal places.

The budget amounts for the 2018 budget are subject to the availability of the appropriations provided for in the draft budget for 2018 after the adoption of the budget 2018 by the budgetary authority or, if the budget is not adopted, as provided for in the system of provisional twelfths.

The budget amounts for the 2019 and 2020 budget are indicative and will be subject to separate financing decisions to cover the amounts to be allocated for 2019 and for 2020.

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Contribution from this part to call H2020-LC-SC3-2018-2019-2020 under Part 10 of the work programme		3.00	3.00	
	<i>from 06.030301</i>	<i>3.00</i>	<i>3.00</i>	
Other actions				
Prize			3.50	
	<i>from 08.020304</i>		<i>3.50</i>	
Expert Contracts		1.40	1.40	1.40
	<i>from 06.030301</i>	<i>1.00</i>	<i>1.00</i>	<i>1.00</i>
	<i>from 08.020304</i>	<i>0.40</i>	<i>0.40</i>	<i>0.40</i>
Grant to Identified beneficiary		1.00		
	<i>from 08.020304</i>	<i>1.00</i>		
Public Procurement		4.55	3.15	0.20
	<i>from 06.030301</i>	<i>1.60</i>	<i>3.00</i>	
	<i>from 08.020304</i>	<i>2.95</i>	<i>0.15</i>	<i>0.20</i>
Provision of technical/scientific services by the Joint Research Centre		0.50		
	<i>from 08.020304</i>	<i>0.50</i>		
Contribution from this part to Delegation Agreement under Part 10 of the work programme		5.00	5.00	5.00
	<i>from 06.030301</i>	<i>5.00</i>	<i>5.00</i>	<i>5.00</i>
Estimated total budget		298.61	315.51	330.86