

HORIZON 2020
WORK PROGRAMME 2016 – 2017
11. Smart, green and integrated transport

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DRAFT

INTRODUCTION

The specific objective of the Transport Challenge ‘Smart, green and integrated transport’ is “to achieve a European transport system that is 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 and businesses, and strive to maximise value for the transport sector, the wider economy and ultimately, the people.

The Specific Programme 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 and air pollution) by improving its efficiency in the use of natural resources, and by reducing its dependence on fossil fuels.

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.

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 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 and the societal needs related to it.

These activities are addressed in this Work Programme by three Calls for proposals:

- 1) **Mobility for Growth**
- 2) **Automated Road Transport**
- 3) **European Green Vehicles Initiative**

In addition to the three Calls for proposals, Transport Challenge contributes to the following Calls on cross-cutting focus areas: **Blue Growth, Smart Cities and Communities with Nature-based Solutions**, and **Energy Efficiency**. Also, it contributes to the **SME instrument** and the **Fast Track to Innovation Pilot** Calls. Other actions will be implemented by calls for tenders or by other instruments (see section ‘**Other actions**’). These actions are part of the Transport Challenge envelope and complement the content of the Calls.

A 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 GNSS will provide new opportunities for the

localisation and the guidance of vehicles. It is intended to create synergies 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'.

Particular attention will be paid in this Work Programme to the following major transport research challenges:

- Improving energy/resource efficiency, reducing transport's dependence on fossil fuels, take-up of alternative fuels, and achieving the required level of mitigation of climate change, pollution, noise and adverse health effects in the transport sector.
- Supporting the development and take-up of automation in road transport, in view of optimising its contribution to the ambitious EU policy goals in terms of road safety, reduced congestion, energy efficiency and air quality as well as ensuring the leading role of European industry in the global market to boost growth and create jobs.
- Paving the way for the deployment of innovative mobility solutions, including through the use of ICT and satellite navigation technologies, for example in connected and automated vehicles, personalised/smart services, overcoming fragmentation through the bundling of existing services via single interfaces, and optimising the role of data and connectivity (e.g. internet of things) as driving factors.
- Modernising infrastructure for Europe-wide mobility demands and for reducing social and territorial inequalities in access to mobility, introducing new materials and processes, smart transport systems and new charging and refuelling options, and making infrastructure more safe, adaptable, resilient and responsive to evolving weather conditions and disruptive events.
- Assessing the impacts and cost-effectiveness of new solutions to address the mobility challenges in urban areas, exploring new opportunities to support take-up of innovative solutions, including through procurement.
- Optimising the use of the infrastructure and redistributing passenger and freight traffic between transport modes, as a way to mitigate environmental problems and ease traffic congestion.
- Optimising the efficiency and interoperability of transport systems and operations through new approaches to target setting and performance review.
- Making quantum improvements in safety levels across the transport system, reducing the associated costs for both the users and the public sector.
- Anticipating technological developments that have the potential to be transformational, both internal to transport and in other activities that are likely to impact on transport and the competitiveness of the European transport industry, while promoting the use of common standards and procedures across transport modes.

- Understanding and managing the impact of demographic trends.
- Assessing future requirements for skills and jobs across transport sectors and systems.

All these priorities are related to one or more of the above-mentioned four broad lines of activities defined in the Specific Programme. They have a two-fold aim: addressing key challenges that Europe faces, and making our industry more competitive and cooperative through transferring these solutions and standards worldwide, as other regions are confronted with similar challenges.

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.

Outputs from actions meeting these priorities will have tangible impacts in the form of new implementable technologies, information systems, and business practices. 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.

International cooperation will have a key role to play. Global challenges such as CO₂ and polluting emissions, oil dependency, transport safety and security, 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. Potential areas for mutually beneficial cooperation with the US may include road transport automation, logistics, infrastructure, and climate change mitigation. Cooperation with China, Brazil and possibly other countries could focus on fuel efficiency, clean vehicles and/or urban mobility. Collaboration on freight transport and logistics could represent a useful complement to the priority areas for Euro-Mediterranean cooperation. Transport safety could be a possible priority for a Euro-African science diplomacy partnership. Cooperation on aviation safety, and on reducing greenhouse gas emissions, noise and adverse health effects may be engaged with some of the main international partners. Multilateral exchanges on transport R&I strategies and investment priorities could be pursued with the major international partner countries.

A novelty in Horizon 2020 is the Open Research Data Pilot which aims to improve and maximise access to and re-use of research data generated by projects. While certain Work Programme parts and areas have been explicitly identified as participating in the Pilot on Open Research Data, individual actions funded under the other Horizon 2020 parts and areas can choose to participate in the Pilot on a voluntary basis. The use of a Data Management Plan is required for projects participating in the Open Research Data Pilot. Further guidance on the Open Research Data Pilot is made available on the Participant Portal.

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CALL ‘MOBILITY FOR GROWTH’

H2020-MG-2016/2017

Transport is on the brink of a new era of "smart mobility" where infrastructure, transport means, travellers and goods will be increasingly interconnected to achieve optimised door-to-door mobility, higher safety, less environmental impact and lower operations costs. In order to achieve efficiency at system-level, targeted efforts are needed to develop and validate new solutions that can be rapidly deployed, notably on corridors and in urban areas. They will address transport means and infrastructure and integrate them into a user friendly European transport system of smart connected mobility and logistics. Research and innovation on equipment and systems for vehicles, aircraft and vessels will make them smarter, more automated, cleaner and quieter, while reducing the use of fossil fuels. Research and innovation on smart infrastructure solutions is necessary to deploy innovative traffic management and information systems, advanced traveller services, efficient logistics, construction and maintenance technologies.

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 has been structured as follows:

A) Areas addressing mode-specific challenges (technical and socio-economic)

1. Aviation
2. Waterborne

B) Areas addressing cross-modal and/or transport integration specific challenges (technical and socio-economic)

3. Safety
4. Urban
5. Logistics
6. Intelligent Transport Systems
7. Infrastructure

C) Cross-cutting issues

8. Socio-economic and behavioural research and forward looking activities for policy making

1. AVIATION

Aviation is vital for our society and economy. It provides mobility to citizens and freight, amongst the regions of Europe and beyond, whilst being an engine for economic growth and jobs. It is also a high-tech sector where Europe has a recognised worldwide leadership, both in terms of products and services. The forecasted market growth opens whole new opportunities for European aviation. The world air transport is expected to continue growing by 4 to 5% every year. However, in order to be successful and reap the awards of such growth, the European aviation sector has to sustain its leadership which is facing challenges from international competition. Aviation is also a sector with small but growing adverse impact on the environment and on the well-being of citizens due to emissions and noise respectively that can potentially curtail its growth.

It is therefore pivotal that growth is achieved in a sustainable manner, taking into consideration safety and security concerns as well as adverse environmental effects. In parallel, the wider expectations from users – citizens and business alike – regarding the quality and responsiveness of transportation services, will also require the air transport system to reach higher levels of integration with other transport modes.

Overall, the scope and magnitude of the ambitious European aviation goals to be achieved are set out in ‘Flightpath 2050’. The EU level, response includes contributions from public-private partnerships such as Clean Sky 2 and SESAR 2020 complemented by Research and Innovation Actions and other actions, which are the subject of this Work Programme. The Clean Sky 2 programme targets primarily the reduction of the environmental impact through integration and validation of existing technologies up to Technology Readiness Level 6. The SESAR 2020 develops solutions for a seamless, efficient and cost effective management of air traffic, including services of European GNSS and covers the full range of TRL from 1 to 6.

This Work Programme addresses mainly medium to long term research and innovation actions with a bottom-up approach for innovative technologies that will complement Clean Sky 2 and are outside the scope of SESAR.

The proposed topics are in-line with the Horizon 2020 Specific Programme and the Strategic Research and Innovation Agenda (SRIA) of the Advisory Council for Aviation Research and Innovation in Europe (ACARE):

- Reducing energy consumption and environmental impact
- Reducing noise
- Maintaining industrial leadership
- Breakthrough innovations

The actions related to seamless and safe mobility are addressed under the other parts of the Mobility for Growth call allowing tackling the air mobility in a cross-modal way. A number of actions related to the production of alternative fuels for aviation will be found under the ‘Secure, clean and efficient energy’ challenge, the actions related to cyber-security and to critical infrastructure will be found under the ‘Secure societies’ challenge.

Aviation has inherently and increasingly an international dimension. Globalisation poses additional challenges and opportunities for European aviation production and operation, notably in relation to global aviation markets and regulations and standards, covering issues such as interoperability, safety, security, environment and energy. In order to leverage resources, mitigate risks and effectively contribute to Flightpath 2050 goals, international cooperation is encouraged in certain topics of the work programme, e.g. related to noise and mobility. Further international cooperation can be targeted in 2017 and/or in the public-private partnerships based on the outcome of the ongoing coordinated calls with Japan, China and Canada and ongoing initiatives with United States, Russia, Brazil and Australia.

Proposals are invited against the following topics:

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

Specific challenge: The reduction of energy consumption in aviation leads to high social, environmental and economic benefits and will be important to ensure its sustainability. It leads to reduction of CO₂ emissions and improved resource efficiency and it has also an impact on the reduction of the pollutants (NO_x) and particulate matter (e.g. black carbon). Such a reduction is of utmost importance and if no actions would be undertaken, the impact of aviation on our environment in Europe would significantly grow due to the expected increase of air transport traffic by 5% every year. Fuel economy in aircraft can be achieved mainly through better engine efficiency, improved aerodynamics or reduction of the weight of an aircraft.

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

- Development of novel technologies contributing to more electric aircraft, including new power electronic devices, low energy systems, advanced power generators and actuation systems as well as innovative power and power management concepts.
- Advancements in core engine technologies to develop new innovative concepts towards improving thermal efficiency by increasing the Operational Pressure Ratio.
- Integrated aero-structures with self-sensing, morphing and multi-functional capabilities towards reduced weight and better aerodynamic performance as well as decreased manufacturing and operational cost.
- Development of screening and optimisation tools aiming at quantifying the added value of alternative fuels from the jet fuel as well as development of design tools aiming at assessing the impact of different fuel compositions on engine components and fuel systems.

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

The Commission considers that proposals requesting a contribution from the EU of between EUR 5 and 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: The actions will contribute towards greening the aviation through increased energy efficiency of the aircraft and wider use of alternative fuels. They will mature technologies capable of:

- Bringing measurable reduction of environmental impact towards the long-term goals of reducing CO₂ by 75%, NO_x and particles by 90% (per passenger and per kilometre) by 2050 (baseline year 2000).
- Facilitating the introduction of alternative fuels in aviation towards the long-term goal of 40% biofuels share in aviation fuels by 2050.

Type of action: Research and Innovation Actions

MG-1.2-2016/2017. Reducing aviation noise

Specific challenge: Exposure to aircraft noise has an adverse effect on population. High levels of perceived noise have also an important impact on future extensions of airports which are reaching their capacity limits. Despite significant progress on noise reduction at source and on noise abatement procedures, aircraft noise continues to cause important adverse effects on quality of life and on public health, notably in the neighbourhood of major airports. Ensuring that airports will have the capability to respond to the growing traffic demand requires more systematic approaches to aviation noise management. They should combine technological, operational and planning solutions in novel ways, capable of delivering mutual benefits to the aviation sector while further alleviating noise levels around airports. To address these challenges, stronger coordination between national, international and EU research activities is necessary.

Scope: Actions should address the development of new technologies and methodologies to enable 24/7 operations, including new methods for assessing, monitoring and managing the impact of aviation noise. They should also support the coordination of national and EU research activities related to aviation noise and consider possibilities for international cooperation. The actions should address one or several of the following areas:

- A coordination and support action to support the coordination of national and EU research activities related to aviation noise, notably towards establishing a common strategic research roadmap for aviation noise reduction.
- Development of new aircraft/engine technologies for noise reduction at the source.
- Novel approaches for assessing and managing the impact of aviation noise, including aspects such as new airport noise reduction strategies, novel cost-effective solutions for the monitoring of noise footprints and health impacts.

- Integration of aviation-related environmental assessment approaches in land-use planning practices and tools with the aim of enabling a higher level of effectiveness in scenario-analysis and decision-support capability whilst allowing heightened proficiency for use by non-specialists.
- Better understanding and testing of new emerging noise issues (e.g. sonic boom) towards international regulation.

Particular emphasis should be given to innovative approaches towards reducing noise at the source and for mitigating the noise impact of air traffic operations. The development of well-reasoned and scientifically-rooted decision-making approaches for purposes of deploying the latter should be stressed, notably ensuring a level of end-user friendliness compatible with their utilisation by non-experts – such as land-use and regional development planners.

The promotion of synergies with other industrial sectors which are confronted with similar noise-related problems is encouraged.

In line with the strategy for EU international cooperation in research and innovation¹, international cooperation is encouraged, in particular in relation to sonic boom, in order to contribute to the regulatory discussions at United Nations' International Civil Aviation Organisation.

The Commission considers that proposals requesting a contribution from the EU of between EUR 5 to 8 million each for Research and Innovation Actions, and EUR 0.5 to 1 million for a Coordination and Support Action, 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 lead to new and more holistic approaches for aviation noise reduction, coupling innovative aircraft/engine technologies for source reduction with operational, airport infrastructure and connectivity, and land-use planning solutions. They will also lead to easy-to-use decision-making aids for purposes of elaborating sustainable airport development plans fit for use by a non-specialist community.

Type of action: 1) Coordination and Support Action in 2016; 2) Research and Innovation Actions in 2017

MG-1.3-2017. Maintaining industrial leadership in aeronautics

Specific challenge: European aeronautics has never been stronger, however new opportunities and challenges lie towards 2020 and beyond. Research and innovation is the main response towards maintaining the competitiveness throughout the whole supply chain. While a number of technologies are already addressed under the Clean Sky 2 Public-Private Partnership, there

¹ COM(2012)497

are other promising ones at low maturity levels that need to be further advanced. Primes, suppliers including SMEs, research laboratories and academia should collaborate in an efficient and timely manner to bring these innovative technologies to higher maturity levels for these advanced and cost-efficient products and services.

Scope: Proposed actions should address one or several of the following priority areas:

- Condition-based health management, replacing scheduled inspections and thus decreasing maintenance costs and increasing safety and aircraft availability through accelerating the integration of innovative and existing sensor technologies, advancing data analysis methods and promoting standards for health sensing across dissimilar systems and structures, developing and validating multiple sensor technologies on systems and structures, and addressing relevant regulatory barriers.
- Advancements in composite integrated aero-structures towards solutions that address specific industrial needs and are presently at low Technology Readiness Levels (e.g. new generation materials and composite structures, validation of new simulation and design methodologies, advanced manufacturing methods, including out-of-autoclave, joining between composites and dissimilar parts as well as their structural health monitoring and repair methodologies). The development of new generation composite materials, including multifunctional nanomaterials and composites, is not in the scope of this call.
- Internal and external Electromagnetic Environment technologies addressing at large electromagnetic immunity problems stemming from the increasing complexity of on-board systems in a composite aero-structures and smart materials environment. Analysis of regulatory and standardisation issues should be provided and certification/qualification issues addressed.
- Development and validation of multi-disciplinary design tools that address key isolated or clustered industrial problems which are still marginally addressed. It includes activities advancing physics understanding, simulation of manufacturing processes and design of experiments, uncertainty quantification, cross-cutting computational procedures as well as high-performance computing opportunities for suppliers, especially SMEs.

The Commission considers that proposals requesting a contribution from the EU of between EUR 5 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: The actions will contribute towards maintaining the leadership of the European aeronautics industry through increased availability of new innovative design tools, materials, manufacturing and service processes:

- For the condition-based health management, the actions will quantitatively demonstrate potential improvements towards weight benefits, systems complexity and reduced maintenance costs and demonstrate that European primes and suppliers have an agreed common roadmap towards potential exploitation of the results.

- For the novel composite aero-structures, the actions will demonstrate their capability to drive costs down and production rates up using new generation composites as well as nonconventional manufacturing methods.
- For the internal and external electromagnetic environment technologies, the actions will demonstrate that an increase up to 60% of the confidence in the electromagnetic assessment process is feasible. The proposals will also demonstrate that the proposed concepts and development of tools will contribute to substantial reduction of cost (including qualification and certification) and time-to-market.
- For the development and validation of multi-disciplinary design tools, the actions will develop computing solutions for key industrial problems to facilitate the introduction of innovative products and services.

Type of action: Research and Innovation Actions

MG-1.4-2016/2017. Breakthrough innovation

Specific challenge: Very ambitious long-term goals are addressed by Europe's vision for aviation Flightpath 2050, in particular for maintaining and extending industrial leadership and for protecting the environment. As many evolutionary technologies are mature near to their maximum potential, new disruptive breakthrough technologies are needed to reach these ambitious goals.

Scope: The aim is to develop exploitable breakthrough technologies for the medium term – technologies that can potentially achieve Technology Readiness Level 6 by 2030-2035. The actions should focus to airframe, propulsion and on-board systems & equipment, including their integration and may challenge established practices. They should demonstrate the proof of concept and consider integration issues without assuming fundamental changes at airport level. The proposals may also include the advancement of numerical and experimental methods towards validating the proposed concepts. The actions should address one or several of the following areas:

- Innovative aircraft configurations and airframes (e.g. short take-off and landing, long wing span; personal vehicles).
- Propulsion systems (e.g. partially or fully embedded within the airframe; distributed propulsion technologies and revolutionary engine cycles; high-speed propulsion).
- Novel and integrated multifunctional systems.
- Autonomous, intelligent and evolving systems.

Actions should target new technologies and concepts that are not currently used or that have not yet being put in combination for civil aviation. The proposals should aim at demonstrating the validity of the technologies and concepts following a sound technical and scientific approach. The proposals should include a quantitative preliminary assessment against the relevant criteria (for example economic viability, time efficiency, safety, potential to cope

with evolutions of regulations, passenger friendliness, social acceptance, etc.) and demonstrate significant decrease in the environmental impact or high potential for new market opportunities for the European aviation industry. They should also assess the potential of the technologies to be developed further and identify regulatory and technological barriers that could prevent such developments.

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 propose new or develop further highly innovative and exploitable breakthrough technologies for the medium term that will make feasible a substantial decrease of the environmental impact of air vehicles, and enhance the competitiveness of the European aviation industry.

Type of action: Research and Innovation Actions

MG-1.5-2016. Widening participation in aviation research

Specific challenge: During the last decades the EU Framework Programmes for research and aviation has attracted a large number of participants from academia and industry. While the main aeronautics countries are well represented, there are number of other countries where the participation still stays at relatively low levels. In order to enlarge the collaboration, there is a need to identify potential partners from EU Member States and Associated States less represented in the EU-funded projects and to encourage their participation.

Scope: The action should set up a platform of communication between national organisations and governmental institutions supporting research and innovation in the field of aviation in the EU Member States and Associated Countries to the Horizon 2020. This platform should address countries and regions with lower participation in the EU Framework Programmes and recently Associated Countries such as Ukraine. It should stimulate cooperation in research and innovation and generate opportunities for trans-national cross-border cooperation by creating and enhancing the links between the stakeholders of these countries and other aviation research intensive regions. Win-win situations, barriers and solutions for improved trans-national cooperation in research, technological developments and innovation should be identified and recommendations should be made for future actions.

The Commission considers that proposals requesting a contribution from the EU of between EUR 0.5 to 1 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 lead to more efficient use of the available research capabilities in Europe through creating new links between the stakeholders of EU Member States and Associated Countries, strengthening the existing ones, increasing participation of stakeholders from target countries in the EU-funded projects and stimulating the creation of transnational cooperation mechanisms in the aviation research.

Type of action: Coordination and Support Actions

MG-1.6-2016. Identification of aviation research infrastructure needs

Specific challenge: The availability of the world-class research, development and testing infrastructures in Europe is essential for the European aviation sector to maintain its global leadership and to achieve the ambitious environmental goals set out in the Europe’s Vision for Aviation “Flightpath 2050”. Therefore it is necessary to review the current situation with the aviation research infrastructures, analyse the future needs, identify gaps and develop sustainable business models for their timely upgrade and new developments.

Scope: The actions will focus on the identification and assessment of the needs, gaps and overlaps for strategic aviation research, development and testing infrastructures in Europe. They should establish an overview of the existing situation taking into account the results of previous actions on this issue and also the work done in the European Technology Platform ACARE. The actions should also involve analysis on the potential sustainable business models and funding schemes to maintain existing or to develop new aviation research infrastructures. A close cooperation with the ACARE Working Group of “Resources” and involvement all relevant stakeholders should be ensured.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 to 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: The actions will result in providing solutions that will lead to improved infrastructure for the European aviation sector adapted to the needs for achieving the long term goals of the Flightpath 2050 vision of European aviation.

Type of action: Coordination and Support Actions

MG-1.7-2017. Identification of gaps, barriers and needs in the aviation research domains

Specific challenge: The Advisory Council for Aviation Research and Innovation in Europe (ACARE) has developed in 2012 a new Strategic Research and Innovation Agenda that describes the actions needed to meet the highly ambitious goals set by Flightpath 2050. In order to ensure the achievement of these goals, regular assessment of progress, gaps and barriers is necessary.

Scope: The actions should provide on an annual basis a review of the state of the art of research and innovation (capacity, main performers, main trends) including international benchmarking, identify gaps in the research landscape, bottlenecks to innovation (regulation, financing) and formulate recommendations to address these. Proposals should address one or

several of the following research domains of the ACARE Strategic Research and Innovation Agenda:

- Mobility
- Competitiveness
- Environment and energy
- Safety and security

A close cooperation with the relevant ACARE Working Groups and involvement of all main relevant stakeholders should be ensured.

The Commission considers that proposals requesting a contribution from the EU of between EUR 0.5 to 1 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 lead to thorough assessment of the progress towards Flightpath 2050 goals, identification of future needs, gaps and barriers, and make recommendations for further actions.

Type of action: Coordination and Support Actions

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2. WATERBORNE

Sustainability in all of its three dimensions (economic, environmental and social) remains a key challenge for waterborne transport. Equally important is a continued focus on improving maritime safety.

Bringing it to full bearing as Europe's commercial link to the rest of the world is as important as making it an efficient and essential part of exchange and transport processes in the European internal market in all of its dimensions from goods to people to energy. Therefore, attention should be given to enabling a modern, resource efficient, inter-connected, safe, secure and resilient waterborne transport system, encompassing deep sea shipping, coastal shipping around Europe, domestic and international ferry connections, the use of the internal waterways, including in the urban environment.

Significant quantifiable efficiency gains, a much improved use of energy sources (including alternative fuels) and the minimisation of environmental impacts, in particular with regard to pollutant and greenhouse gas emissions and to noise and discharges, are still possible and desirable. The waterborne sector continues to lag behind in these respects as compared with other transport modes.

Europe remains a world leader in the design, production and operation of waterborne assets (in particular marine equipment), but its industry is facing ever fiercer global competition, also in the production of smaller and specialised vessels that require advanced engineering concepts and solutions, new materials and adapted production methods for faster delivery. To stay ahead, the entire value chain needs an accelerated creation and deployment of research and innovation solutions that have tangible cost benefits whilst at the same time there is a need to explore new frontiers in terms of vessel concepts, operational paradigms and the industrial use of the oceans.

For all of this the social dimension in terms of new skills required and human-centred operational approaches needs to be taken into account.

Proposals are invited against the following topics:

MG-2.1-2017. Innovations for energy efficiency and emission control in waterborne transport

Specific challenge: Waterborne transport still has huge potential in terms of energy use reduction and emission control. The specific challenges are to defend the lead in world markets and introduce a step change in energy efficiency and emission reductions; to explore alternative fuels through real world demonstrators; to prepare the ground for vessel electrification where sailing distances and infrastructures are suited for a zero-emissions approach; and to optimise the basic performance of vessels.

Scope: In order to meet these challenges, proposals should address one or several of the following aspects:

- Safe, economical, environmentally sound and practical usage of improved, alternative, low carbon and renewable fuels in waterborne transport, in particular LNG and methanol.
- Advanced energy storage and DC energy systems on-board for full and partial vessel electrification, including hybridisation.
- Development, demonstration and evaluation of innovative pollution reduction and control technologies, including solutions for remote sensing and monitoring of emissions, aspects of human behaviour and training, decision support systems, and modelling and simulation of solutions with full scale verification.
- Reduction of frictional resistance through new hull coatings, boundary-layer control devices, and air lubrication, including the development of computational and experimental techniques to demonstrate the efficiency gain.

The Commission considers that proposals requesting a contribution from the EU of between EUR 9 to 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: Activities will contribute to a more energy efficient and less polluting waterborne transport in Europe in a tangible and quantifiable way through the demonstration of significant improvements in fuel efficiency (+15% compared to Best Available Technique), the demonstration of significant reductions in emissions (-80% for pollutants, -50% for greenhouse gases), and the proof of the full economic and operational feasibility of alternative fuels.

Type of action: Innovation Actions

MG-2.2-2016. Development, production and use of high performance and lightweight materials for vessels and equipment

Specific challenge: New lightweight materials and related construction principles can provide a step change in vessel efficiency, both in terms of energy use and maintenance costs. European technology leadership in this field (often held by SMEs) needs to be translated into market demand in current and future markets, also beyond the maritime transport sector. The specific challenges are to research the functional characteristics of new lightweight and high performance materials for waterborne usages (vessels and components); to develop the most appropriate design, construction and production principles for small, medium sized and large vessels and for components (also by learning from applications in other transport modes); and to influence the regulatory environment in order to eliminate existing barriers and facilitate market take-up.

Scope: In order to meet these challenges, proposals should address all of the following aspects:

- Conception, production and use of advanced composites (including those that are bio-based or using renewable resources) and other high-performance materials, including multi-materials construction and joining / bonding.
- Comprehensive performance analysis and simulation for new advanced materials and entire constructions (including characteristics such as durability, resistance to corrosion and fouling), full life cycle costs analysis, and technology transfer from other transport applications for lightweight materials where feasible.
- Assessing risks and enhancing fire resistance properties and thermal and noise insulation qualities.

The Commission considers that proposals requesting a contribution from the EU of between EUR 7 to 9 million each would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Activities will help the introduction of new lightweight and high performance materials in waterborne applications through the demonstration of full feasibility of the use of such advanced materials, including design and production of vessels and components; through proving significantly lower maintenance and life cycle costs (at least - 30% compared to conventional materials and processes); through the development of clear performance indicators covering the entire useful life; and through demonstrators (full scale where feasible) for clearly identified maritime applications. Inputs to pertinent regulatory regimes should be developed where applicable and necessary.

Type of action: Innovation Actions

MG-2.3-2016. New and improved transport concepts in waterborne transport

Specific challenge: Bringing waterborne much deeper into multi-modal transport concepts, in particular to the benefit of domestic shipping and inland navigation in the EU is a necessity. The specific challenges are to overcome the traditional barriers between transport modes; to work on the greening, expansion and optimisation of the entire (waterborne) transport chain, including in the urban environment; and to contribute to the EU's energy union through new energy transportation concepts for natural gas (in particular in short sea trades). Short sea, river and canal transport can offer particular opportunities for automation (in terms of operations as well as maintenance) that can improve safety and address current employment challenges. European GNSS services can play an important role in this.

Scope: In order to meet these challenges, proposals should address one or several of the following aspects:

- New or much improved systems for waterborne operations, feeding and short sea vessels, addressing one or several of the following issues: smart connections to deep sea shipping,

new unitised multi-modal cargo concepts, and reliable transport services even in extreme winter conditions.

- New cost-efficient vessel concepts for the transport and distribution of natural gas.
- Automation in all waterborne operations, including in inland navigation (with a view to bringing about a Digital Inland Waterway Transport Area) and in the urban environment; this may include remotely controlled and autonomous vessels and docking systems.

The Commission considers that proposals requesting a contribution from the EU of between EUR 8 to 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: Activities will offer tangible contributions to a more efficient waterborne transport, fully integrated into multimodal transport or energy supply chains in Europe, through the proof of concept for new and significantly improved transport systems including a full cost-benefit analysis and a quantitative and qualitative comparison to current systems. Concepts for the automation of waterborne transport operations will be proven, including an assessment of cost-benefits and the impact on the waterborne work environment and the skills requirements.

Type of action: Research and Innovation Actions

MG-2.4-2017. Complex and value-added specialised vessels

Specific challenge: European yards and marine equipment manufacturers, often consisting of SMEs, are world leaders in the construction of complex vessels, in small and medium-sized, value-added vessels and in highly specialised vessels. In addition to making the production and use of existing vessel concepts more efficient, new waterborne business cases require more specialised and customised vessels. The specific challenge is to explore the best design concepts and construction and production principles for complex, one off and small series vessels, and for modular standardised vessels, also in terms of marketability (technology push) and future skills requirements along the value chain.

Scope: In order to meet this challenge, proposals should address one or several of the following aspects:

- Develop and validate advanced ferry concepts for European waters (urban, inland waterways and short sea), covering hull designs, equipment and operations, including optimised land-side interfaces.
- Explore and validate low impact cruise and passenger ship designs and operations (noise, discharges, ballast water management), in particular for all seasons operations and challenging environments.
- Develop and validate modular standardised workboat concepts.

- Develop and validate vessel concepts and designs for new waterborne transport and transport support operations, including low-viscous resistance frames and where appropriate novel and more efficient ice-breaking technologies.

The Commission considers that proposals requesting a contribution from the EU of between EUR 10 to 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: Activities will contribute to the competitiveness of the sector by bringing forward innovative solutions that build on the current and future technological capacities and human resources of European companies: proof of concept up to the level of demonstrators including the assessment of cost-benefits (ferries/passenger vessels), development of standardisation approaches and modular production methods including demonstrators (workboats); market/marketability analysis and preliminary proof of concept (entirely new vessel concepts and ice breaking technologies).

Type of action: Innovation Actions

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3. SAFETY

Safety is of primary concern for any transport system. In the last ten years, safety has increased across all modes. The EU set ambitious targets in its 2011 Transport White Paper, e.g. moving close to zero fatalities in road transport by 2050, halving road casualties by 2020 and ensuring that the EU remains a world leader in the safety of all modes of transport, while optimising modal split for sustainability.

Research and innovation can play a major role to optimise the safety and efficiency of the transport system. Acting on transport safety means saving thousands of lives. In order to help achieve the policy objectives, Transport safety research aims at ‘reducing accident rates, fatalities and casualties’ in each mode and in the whole transport system by furthering knowledge and awareness, and by developing technologies, products, services and solutions that reconcile safety with efficiency and user-friendliness.

This chapter will address research priorities for all transport modes, covering actions in the field of transport infrastructure and vehicle/vessel design, traffic management and crash safety.

Another focus will be on research related to human behaviour aspect as a major cause for accidents including the assessment of changes of user behaviour following the introduction of new transport technologies and advanced driver assistance systems which could have unintended impacts, such as distraction and cognitive overload.

Proposals are invited against the following topics:

MG-3.1-2016. Addressing aviation safety challenges

Specific challenge: Safety is embedded in aircraft design and operations, making air transport one of the safest transport modes. EU-funded research has substantially contributed to this outcome. Nevertheless, new risks must be pro-actively identified and mitigated in continuous efforts to maintain the excellent records Europe has achieved over the last decades. This requires introduction of whole range of new system concepts, products and operational practices bringing significant new challenges for the stakeholders and for the European Aviation Safety Agency.

Scope: The research actions under this topic should support the implementation of the European Aviation Safety Plan by promoting a culture of safety in aviation, by developing and enhancing safety-related products and processes, and notably novel pathways to deliver the safety enhancements in a more cost-effective manner. Proposals should address one or several of the following areas:

- More robust, cost-efficient solutions for the whole life-cycle, based on novel methodologies and technologies towards improving the safety of the air transport system.

- Novel systematic identification of hazards and handling of data and processes tailored to the requirements of aviation that are efficient, effective and acceptable by all the relevant parties in the aviation value-chain.
- Performance of studies and research activities towards reinforcing old and developing new EASA capabilities that will contribute to its performance-based regulatory and certification mission. Proposals may address research areas linked to implementation and monitoring of safety rules, type-certification of aircraft and components and approval of organisations involved in the design, manufacture and maintenance of aeronautical products.

The proposals should be consistent with the European Aviation Safety Plan and should include the explicit commitment from the European Aviation Safety Agency to assist or to participate in the actions.

When applicable, the proposed actions should consider the mutual implications of safety and security, they should take into account ACARE's Strategic Research & Innovation Agenda and they should complement past and on-going EU-funded research.

In line with the strategy for EU international cooperation in research and innovation², international cooperation is encouraged, in particular in order to contribute to the regulatory discussions at United Nations' International Civil Aviation Organisation.

The Commission considers that proposals requesting a contribution from the EU of between EUR 5 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: The actions will contribute to enhanced level of safety to sustain public's trustworthiness of aviation services. They deliver more holistic approaches to aviation safety that enables higher performance, better resilience with lower levels of complexity and costs.

Type of action: Research and Innovation Actions

MG-3.2-2017. Protection of all road users in crashes

Specific challenge: The continued introduction of active safety systems has the potential to reduce accidents. Nevertheless, the risk of collision and particular crash situations will still remain. An approach will be needed that will ensure improved crash safety in those circumstances. A number of societal trends add to this challenge such as the ageing population, an increase in the number of powered and non-powered two-wheelers and the introduction of green, light, sub-compact cars.

An important step forward will be to develop fully integrated safety systems and deploy them so that they provide better protection for all road users. Emerging new vehicle types and the

² COM(2012)497

possible use of Cooperative Intelligent Transport Systems (C-ITS) would need to be considered. The application of advanced safety features and the development of personal safety equipment can also be seen as ways to reduce fatalities and injuries to pedestrians, cyclists and riders of Powered Two Wheelers (PTWs). In addition, simulation tools (including new virtual human body models) will need to be developed to assess new safety systems and determine their effectiveness and potential impact.

With respect to competitiveness, user protection has been an area where European industry has exhibited technology leadership, but this is now being increasingly challenged worldwide.

Scope: Proposals should focus on one or more of the following aspects:

- Vehicle based systems such as: solutions for improved crash compatibility; optimisation of restraint systems by including pre-crash information; and methods and requirements to assess safety performance in traffic of extremely low-mass vehicles.
- Personal protection such as: development and testing of focused personal safety equipment for various road user categories, to warn them adequately and/or protect them in the most safety critical situations; and integrated assessment methods for the overall safety of road users and solutions that enhance their protection.
- Crash simulation such as: computationally efficient and robust crash simulation tools; implementation of virtual testing; and development of virtual human body models of road users and situations not currently available.

Proposed actions should focus on fully integrated safety systems. Consideration should be taken of gender aspects such as body structure and stature and other demographic factors such as ageing, obesity, etc.

Links with Member State initiatives in this area are encouraged.

In line with the strategy for EU international cooperation in research and innovation³, international cooperation is encouraged, in particular with industrialised countries (i.e. US, Japan, Canada, Australia) and emerging economies (primarily China, India, Brazil).

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 and 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: By providing an integrated approach to safety systems, actions are expected to make a direct contribution to the reduction of fatalities and severity of injuries, as well as the number of injured persons. They will deliver measures that will make the 'triangle' of European road users, vehicles and infrastructure safer.

³ COM(2012)497

Proposers are expected to demonstrate how the project results will have a significant impact on road safety casualties and injuries and how they will make an effective contribution to the standardisation of products and testing techniques.

A credible strategy is expected to demonstrate the future full scale manufacturing of critical products developed in the project in Europe.

Type of action: Research and Innovation Actions

MG-3.3-2016. Safer waterborne transport and maritime operations

Specific challenge: More intense and more diverse waterborne traffic, also in areas so far underused, needs specific operational knowledge and information management, technology support as well as advanced vessel and equipment designs that are intrinsically safer and address safety issues holistically and based on goals (which ideally cover the entire life-cycle). The specific challenge is to build the enabling knowledge, develop designs, technologies, and operational procedures and test them in a real world environment with the aim of guaranteeing safe and environmentally sound waterborne operations, also taking into account the increasing use of low flash point fuels.

Scope: In order to meet this challenge, proposals should address one or several of the following aspects:

- Waterborne transport operations (including offshore operations), in complex traffic fairways and in extreme environments, simulation modelling and real time information management including big data.
- New and improved vessel and equipment design concepts that offer a clear risk reduction and intrinsic risk mitigation (including human machine interfaces), resilience, integrity, fire resistance and improved survivability in extreme conditions, cargo control including numerical simulations, and cost efficiency considerations, and better salvage and evacuation options.
- A comprehensive safety assessment for low flash point and volatile fuels, covering on-board use and installations as well as the shore side supply interfaces.

The Commission considers that proposals requesting a contribution from the EU of between EUR 5 to 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: Activities will improve waterborne safety through proof of concept for new operational and traffic management approaches (including those in extreme environments); through workable goal-based approaches to risk and impact minimisation covering the design and the entire life cycle of vessels and suitable as formal inputs to international regulatory regimes; and through a validated safety analysis for fuels with higher intrinsic risks which can be applied in practice.

It is considered that the expected impacts can be leveraged through international co-operation, in particular where the objective of inputs to the international regulatory regimes is pursued.

Type of action: Research and Innovation Actions

MG-3.4-2016. Transport infrastructure innovation to increase the transport system safety at modal and intermodal level (including nodes and interchanges)

Specific challenge: Infrastructure plays a vital role in increasing transport safety levels, in particular in road transport. In the last years the resources available to maintain and upgrade transport infrastructure have been declining. As a result, many elements of the surface transport infrastructure are in a deteriorating condition, facilities are ageing, and some are stressed more heavily than ever expected. Vehicle development and the introduction of connected systems represent new challenges to be met by infrastructure performances never considered in the past. Failure to meet infrastructure needs will have drastic consequences for the required functions of a modern network, and will negatively impact on the safety level of the whole European transport system.

Scope: In order to meet these challenges, proposals should address several of the following aspects:

- Infrastructure safety improvement by design and upgrading; new design methods and re-engineering to make infrastructure self-explaining and forgiving, including issues related to vulnerable users.
- Efficient maintenance methods to ensure continuity of high safety performance while allowing longer life-cycles of the infrastructure; development of embedded monitoring systems aimed at the implementation of predictive maintenance methods.
- Elaboration and implementation of the concept of transport infrastructure maintenance cycle, optimising all stages of maintenance, including design, monitoring, planning, as well as approaches to take account of other productive or leisure activities using the same infrastructure (e.g. inland waterways) and supporting decision-making between maintenance and structural interventions.
- Adaptation of the infrastructure to new vehicles characteristics, including V2I/I2V systems and information sharing.
- Improved safety in work zones and in links and interchanges at risk.

Particular attention has to be paid to links and interfaces between modes (e.g. level crossings). Integrated safety management systems will be required. It includes e.g. multimodal safety management criteria for emergency management in case of critical events.

In line with the Union's strategy for international cooperation in research and innovation⁴, international cooperation is encouraged. In particular, twinning of projects with US partners can be envisaged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 to 5 million each would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Near eradication of infrastructure-caused accidents; increased readability and forgiveness of the transport infrastructure; effectiveness of long-term, predictive maintenance systems; infrastructure responsiveness to connectivity and novel vehicle characteristics; safe coexistence of transport and other activities using the same infrastructure.

Type of action: Research and Innovation Actions

MG-3.5 -2017. Behavioural aspects for safer transport

Specific challenge: To make all transport modes safer (roads, rail, waterborne and aviation), an increased understanding is needed of the behaviour of individual users (in this case drivers, riders, pilots, cyclists and other transport users), and of their interaction with their associated safety-related systems and services (such as on-board technologies, mobile devices and infrastructure).

The challenge is to study those key factors that influence safe transport user behaviour, both individually and collectively, taking into account demographic factors (gender, age, socio-cultural aspects, etc.). Using the knowledge gained on the interacting parameters that define user behaviour and their combined effects, appropriate measures and systems should be developed that will ensure safe user performance, to pro-actively anticipate user response and reduce the number of errors and potential accidents in the transport system.

Scope: Proposals should address the following aspects:

- Distraction and health related factors such as: studying the parameters that influence user condition (fatigue, illness, use of drugs, medicines, alcohol, etc.); distraction caused by using on-board and mobile devices; behaviour causing unsafe conditions (e.g. switching off safety functions) affecting response in pre-crash situations; assessment of the psychological condition of those in charge of vehicles/vessels; and identification and development of suitable mitigation measures.
- Social and demographic factors such as: variations in safety behaviour, socio-cultural issues, gender, age and disability and their impact on risk assessment and exposure of each

⁴ COM(2012)497

individual or group; and identification and development of measures to address these factors and reduce their impact.

- Risk appraisal such as: development of analysis and assessment methods for factors affecting the level of risk users are willing to take, e.g. the ability to judge and manage conditions like weather, infrastructure condition and traffic levels; and development of means to reduce hazardous risk taking.
- Measures to modify transport user behaviour such as: novel enforcement and incentive schemes for high risk groups; focused and coordinated training schemes and tools for transport users based on reliable interaction and behavioural models piloted widely across different types of traffic and geographical regions; analysis of changes in users' behaviour from first use to familiarisation and confidence in new safety assistance systems.

Extensive knowledge on user behaviour has been developed within each transport mode, e.g. mental overload for pilots, the effect of shift rotation on train driver response time. Transfer of knowledge between transport modes and an effective deployment of multi-modal solutions are recommended, as well as the inclusion of non-traditional transport modes, such as personal mobility devices.

In line with the strategy for EU international cooperation in research and innovation⁵, international cooperation is encouraged, in particular with industrialised countries (i.e. US, Japan, Canada, Australia) and emerging economies (primarily China, India, Brazil).

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 and 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: Solutions will contribute to achieving the objective of the Transport White Paper to ensure that the EU remains a world leader in the safety of all modes of transport.

Research and innovation on this topic will result in: reduction of fatal, serious and minor accidents through measures to mitigate unsafe transport user behaviour patterns; safer use of vehicles and increased awareness of other users; effective enforcement and training schemes based on reliable behavioural models; safe integration of new types of vehicle and increased usage of 'soft' modes.

Type of action: Research and Innovation Actions

MG-3.6-2017. Euro-African initiative on road safety and traffic management

[Under discussion]

⁵ COM(2012)497

4. URBAN MOBILITY

Urban mobility figures prominently in the 2011 Transport White Paper which calls for achieving essentially CO₂-free city logistics in major urban centres by 2030, and for phasing out the use of conventionally-fuelled cars in cities by 2050. CIVITAS 2020 as part of Horizon 2020 addresses innovation in resource-efficient and competitive urban mobility and transport.

Reflecting citizen, business and city needs to progress major objectives of the Energy Union and thus reduce energy consumption, increase use of alternative fuels, become more resilient and create more liveable urban areas, a number of topics could integrate solutions from other sectors, notably energy, social sciences, ICT European GNSS and smart sustainable future city concepts.

Improving the efficiency of urban transport and mitigating the negative effects of transport effectively, while taking into account technological, socio-economic and urban development trends, is crucial for the performance and attractiveness of Europe's urban centres. This requires a transformation in the use of vehicles, more efficient and lower impact city logistics, and a reduction in urban road congestion, combined with a broad take up of cleaner vehicles powered by alternative fuels and drive trains.

The 2016-2017 topics will expand the CIVITAS initiative, that promotes the take up of innovation by strengthening the mechanisms for urban transport policy making and planning as well as the technical capacity building in the participating cities, by aiming at 2-3 challenge based research and/or innovation topics per year. Strong attention will be paid to deployment of innovations by a topic linking with the Connecting Europe Facility of sustainable urban mobility solutions and technical advice and by a topic that supports capacity building of local authorities through the ELENA facility (see 'Other Actions').

Proposals are invited against the following topics:

MG-4.1-2017. Increasing the take up and scale-up of innovative solutions to achieve sustainable mobility in urban areas

Specific challenge: Many innovative solutions (supported by STEER, CIVITAS, national, regional, local, international and other initiatives) for sustainable urban mobility were locally developed or developed as self-standing projects in a variety of social, economic and geographical contexts. The specific challenge is to increase the take up of innovative solutions by transferring them to new contexts and studying and comparing the impacts. Special attention should be paid to issues related to social issues.

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

- Traffic and travel avoidance: planning and location policy; innovative demand management approaches while providing citizens, businesses and organisations with minimum levels of access; less car dependent lifestyles.

- Optimising the use of existing infrastructure and vehicles: this may include smart pricing of parking, public transport and road use; increasing load factors in urban freight transport; integration between urban freight and passengers transport networks within appropriate city and transport planning governance; innovative use of passenger transport means; planning for increasing the resilience of the urban transport system to extreme weather events.
- Optimising design and use of multi-modals hubs and terminals for passengers and freight; integration of systems, (sustainable) modes and 'mobility as a service', more efficient transfers; transformation of districts; multi-purpose use of space for vehicles.
- Supporting modal shift towards more efficient modes: increased walking and cycling; urban waterborne transport; mobility management and travel awareness; increased attractiveness of public transport; new coordination and service concepts.
- New governance models for freight and passenger transport: better coordination and cooperation; synergies between passenger and freight transport; stakeholder engagement; public consultation and participation; education and training, policy transfer.

ITS solutions are covered in other topics of the Transport Challenge Work Programme and in other parts of Horizon 2020, but the integration of IT and ITS enablers for urban mobility measures needs to be fully considered.

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

Expected impact:

- The projects should demonstrate successfully transfer a single solution/approach or limited package of mutually reinforcing solutions/approaches from a small number of locations in Europe (indicatively not more than five) to at least ten new locations in Europe.
- Building on clear commitments from project participants for a further Europe-wide take-up and rollout of results during and following the project, the project will result in new insights into the practical transferability of innovative solutions/approaches.
- The project will demonstrate how their actions will lead to faster, more cost-effective and larger scale deployment of a range of innovative (technological and non-technological) solutions/approaches to achieve sustainable mobility in urban areas. Possible (technological and non-technological) barriers and ways to overcome them should be identified and addressed by the project.

Type of action: Innovation Actions

MG-4.2-2016/2017. Supporting 'smart electric mobility' in cities

Specific challenge: In order to integrate electromobility in their Sustainable Mobility Plans, European cities need to equip themselves with a network of electric recharging stations for electric cars and L-category vehicles. This will help the market to grow, as potentially interested consumers tend not to buy electric vehicles⁶ because they are not confident enough about the opportunities to recharge them. However, the real business models do not yet exist. The establishment of recharging infrastructure for electric vehicles is expensive and, without additional financial support and/or new approaches, there is a first-mover disadvantage until there are enough vehicles to make the investments profitable.

Scope: Proposals should focus on the development of integrated approaches and testing of "business" models for the local production and distribution of electricity together with electric vehicles fleet, to create the conditions for market take up in urban and sub-urban areas. This could include private and public recharging stations. Approaches could include e.g. charging at work places, private parking places, homes, public spaces, transport intermodal hubs, system integration of large fleets of electric vehicles (BEVs and PHEVs), multimodal platforms, etc. Specific tests and pilots focussing on the integration of solutions into transport system, in combination with a cross-site evaluation, could be carried out. Consumer incentives should be looked at.

The Commission considers that proposals requesting a contribution from the EU of between EUR 10 to 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: Tested and validated business models regarding:

- Large scale, sustainable and decentralized energy production and distribution (also from transport infrastructure itself) in balance with local use.
- Simple, interoperable, convenient and intelligent billing systems ensuring at the same time a safe and reliable data exchange in cities. This includes integrated energy infrastructure systems, bringing together technologies from the energy, infrastructure and transport domains.
- The feasibility of emergent integrated solutions (including for example billing systems and safe and reliable data exchange) and business models for recharging has been tested and established, looking – among others – at consumer acceptance, value models and ownership. Possible barriers and ways to overcome these barriers to deploy integrated solutions and business models for electric recharging should be identified.
- Projects should bring innovative tools and recommendations to integrate electromobility in SUMP, as well as recommendations for common standards of ultra-low emissions urban areas.

⁶ Definition of CPT directive

- On the basis of clear commitments from participants for a further Europe-wide take-up and rollout of results during and following the project are expected.

The project proposal should include an estimation of CO₂ savings obtained through the sustainable urban mobility solutions deployed in the project, on the basis of CO₂ intensity of the European electricity grid of 430 g CO₂/kWh⁷. It should also provide information on how this estimate is calculated, for example on the basis of the size of the entire vehicle fleet powered by electricity that will be deployed in the project, and/or on the number of the recharging in the infrastructure that will be deployed in the project.

In order to maximise the deployment of vehicles and infrastructure in this topic, the eligible cost is limited to 50% the additional cost of purchasing clean vehicles (in comparison with conventional vehicles) and their appropriate infrastructure, taking into account normal accounting practices for depreciation.

Type of action: Innovation Actions.

MG-4.3-2017. Innovative approaches for integrating urban nodes in the TEN-T core network corridors

Specific challenge: Better and more effective integration of urban nodes into TEN-T corridors could address issues around integration of efficient and sustainable (e.g. using alternative fuel vehicles) solutions for 'last mile' delivery; greater use of intermodal urban freight logistics, and approaches for linking long-distance with last-mile freight delivery in urban areas.

Scope: The efficient and effective integration of urban nodes into TEN-T corridors requires further research and innovation efforts for the development and related recommendations for deployment of innovative solutions in urban areas. The idea would be to set up 1 or 2 expert networks that develop current practices and opportunities, and produce recommendations. These expert networks could focus on how to deploy novel combinations of existing technologies/ services and involve new combinations of different stakeholder groupings, for example from research and innovation programmes, from urban planning, from infrastructure constructors and operators and from financiers, with a great emphasis on creating synergies between results of Horizon 2020 funded projects and CEF funding.

This topic will complement topic MG-5.1-2016 (Networked and efficient logistics clusters) in this Work Programme.

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

⁷ JEC WTW study value of EU MIX in 2010

Expected impact: The main impacts will be validated recommendations for wide-scale deployment of research and innovation solutions in some (if justified, a selection could be made) or all of urban nodes along the TEN-T corridors. These recommendations should also define funding needs and instruments, and in particular creating synergies between results of Horizon 2020 funded projects and CEF funding. TEN-T policy, both through "non-financial" action of the European Coordinators and funding under the Connecting Europe Facility can pick up these concepts and recommendations and potentially fund implementation-related studies, pilot action and works. The recommendations should also take into account socio-economic aspects of deployment of innovations.

Type of action: Coordination and Support Actions

MG-4.4-2016. Facilitating public procurement of innovative sustainable transport and mobility solutions in urban areas

Specific challenge: Market demand for sustainable urban mobility solutions can be boosted by increasing purchaser (and indirectly end-user) awareness about technologies and processes used in implementing sustainable urban solutions. Urban areas concentrate demand for sustainable transport and mobility solutions (such as alternatively fuelled vehicles and supporting (refuelling) infrastructure) by public procurers. The procurement of innovation can support the broad market take-up of innovative solutions through the jointly planning (across borders) demand created by public procurers.

Scope: Under this topic, support should be provided for the establishment of a number of cross-border networking activities that plan future public procurements of innovation (PPI⁸) and/or pre-commercial procurements (PCP⁹) of solutions that result in sustainable urban mobility, including vehicles corresponding to alternative fuels infrastructure as legislated in Directive 2014/94.

Proposals should be driven by clearly identified needs of the procurers, including life-cycle and cost-benefit assessments. It is envisaged that there will be a fairly small (about 5-10 organisations) consortium of public procurers that organises dissemination activities for a larger group of public procurers. Clear commitments from participants for a further Europe-wide take-up and rollout of results during and following the project are expected.

The members of the consortia should be public procurers, i.e. contracting authorities in the meaning of the public procurement Directives at all levels (local, regional, national and supra-national) that plan to establish implementation plans for improving the quality and efficiency

⁸ PPI - Public procurement of innovative solutions means procurement where contracting authorities act as a launch customer for innovative goods or services which are not yet available on a large-scale commercial basis, and may include conformance testing.

⁹ PCP - Pre-commercial procurement means procurement of R&D services involving risk-benefit sharing under market conditions, and competitive development in phases, where there is a separation of the research and development phase from the deployment of commercial volumes of end-products.

of their public service offering by procurement of innovative solutions¹⁰ for use in cities and communities. This includes both contracting authorities in the meaning of the public procurement directive for public authorities (2004/18/EC) and utilities (2004/17/EC), for example public transport operators, relevant ministries, utilities, communes and cities, police or fire brigades, e-government administrations, etc.

The activities funded by the topic do not finance the actual procurement(s) made by project consortia or their members.

The Commission considers that proposals requesting a contribution from the EU of between EUR 0.6 to 1 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: In specific areas of common purchasing needs for sustainable urban mobility services (defined in the proposal) by several European cities/local administrations, the network will establish a set of strategies to help public procurers of the consortium comprising for planning and implementing the cross-border, coordinated public procurement process by:

- Exchanging experience in procurement practices and strategies (organizing trainings and other information exchange tools) in the specific area(s) of common purchasing needs.
- Undertaking better harmonised (between the various procurers) and articulated technical specifications, new, joint approaches for doing the competitive dialogue and defining award criteria in the specific area(s) of common purchasing needs. For example, proposals could include new approaches for market consultations with suppliers, paying special attention to SME suppliers. Proposals should consider where possible strategies to plan and implement joint, cross-border procurement of solutions that are not yet available on a large-scale commercial basis - which entail a higher risk than purchasing products that are already commercially widely available.
- Setting up 'buyers groups' of public procurers; and by undertaking joint, cross-border or coordinated procurements
- A set of well-documented practices should be made available for replication
- Project(s) should increase awareness, contribute to capacity building and result in a demonstrated, ambitiously increased public purchasing

Type of action: Coordination and Support Actions

¹⁰ Broader applications possible in the reformed public procurement directives 2014/24/EU and 2014/25/EU

MG-4.5-2016. New ways of supporting development and implementation of neighbourhood-level transport innovations

Specific challenge: People oriented transport and mobility encompasses both new ways of translating people's (both passenger and freight) needs into mobility solutions and new ways of delivering (co-creating) these solutions. Despite the huge diversity in cultural backgrounds, demographic developments, economic potential and social conditions, neighbourhoods and urban districts could be an appropriate scale to pilot mobility innovations that address some common sustainable urban mobility issues. These could include improving access to mobility solutions, to healthcare, education, jobs and for businesses and sustainable lifestyles; behaviours, reducing greenhouse emissions from mobility, increasing the use of alternative fuelled vehicles and public/shared transport and safety issues. Also, new uses of public space for different mobility users could be developed and tested at neighbourhood level.

Scope: In this topic, the actions belonging to the following types of innovative approaches should be included in the project proposals:

- New approaches to involve end-users, consumers and citizens to validate the needs of the neighbourhoods involved, to assess the potential impact of the solutions, and to better understand the needs of the end-users whose problems are meant to be solved in the project.
- New types of innovations (technological and non-technological) such as: social innovation, workplace innovation, design, creativity, public sector innovation, open innovation or co-creation or gamification processes.
- New forms of the tools and approaches for measuring take-up, support, and impact of the innovative approaches so that results can be scaled up and disseminated to address common issues in neighbourhoods located in other EU countries.

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:

- The projects funded will lead to new innovation processes, new organisational and governance concepts, changes in planning processes, and new forms of urban mobility solutions at neighbourhood level.
- Proposals should include the development, testing and comparison of initial results of sustainable mobility solutions that are targeted to at least 5 European neighbourhoods or urban districts. The neighbourhoods could be located in urban areas of different densities and sizes, such as in small towns, peri-urban areas or scarcely populated urban neighbourhoods.
- Project proposals should implement a strategy to create scale and visibility, and to measure impacts of the innovative approaches, and how these can be embedded and mainstreamed in practice amongst providers, funders and policy-makers across Europe.

Type of action: Research and Innovation Actions

DRAFT

5. LOGISTICS

Freight transport logistics is an industry sector responsible for managing the flows of goods and information between a point of production and a point of destination in order to meet the requirements of clients and consumers. As regards the supply chain, logistics focuses on the planning, organisation, management, control and execution of freight transport operations.

In 2012, EU-28 freight transport was close to 3.8 trillion tonne-kilometres (t-km), of which about 45% was on the road, 37% by sea and 11% by rail. Eurostat surveys estimate that 24% of good vehicles in the EU are running empty and that the overall efficiency is 43%. Flow imbalance can only explain half of this loss while a 10% to 30% improvement in efficiency in the EU logistics sector has been estimated to give savings of between EUR 100 billion and EUR 300 billion per year.

The aim of the topics in this section is to increase efficiency and hence sustainability in the logistics supply chain, use opportunities provided by digitalisation, remove the communication bottlenecks in the interaction between the different stakeholders and thereby improve the potential for collaboration, the effective utilisation of equipment and seamless connectivity across the transport modes. The topics complement relevant topics in the sections on Urban Mobility and Intelligent Transport Systems.

Proposals are invited against the following topics:

MG-5.1-2016. Networked and efficient Logistics Clusters

Specific challenge: To meet the objective on a shift towards emission-low transport modes and consolidate freight for more efficient transport along green freight corridors we need to better integrate transport subsystems and modes. This integration and the trend towards bigger vehicles/vessels/aircrafts for long-haul transportation services, requires a strengthened role for hubs or transshipment points, connecting (sections of) the TEN-T freight network with each other and last mile delivery services. On the other hand, such nodes have a major impact on the area in which they are located, creating employment and connecting it to all other regions in Europe, as well as intercontinental transport through (air)ports. Both sections, long distance and local, will be operated by dedicated vehicles, optimised for their operating environment. Furthermore both will also need intelligent freight bundling to maximise equipment utilisation, requiring more efficient transshipment, cross and inter modes. These requirements can be met by automated cargo handling of Modular Load Units.

Scope: Proposals should cover the development and integration of several or all of the following issues:

- Identify opportunities to extend the role of hubs beyond transshipment (e.g. storage, handling, packaging, bundling and cleaning) and serve as seeds for smart specialisation and the formation of logistics clusters. Such clusters could integrate manufacturing (e.g. postponed assembly or other non-core manufacturing activities) and advanced logistics services (e.g. kitting for just in time delivery).

- Develop governance and business models for such smart specialised logistics clusters, including sharing of (manufacturing) resources to attract investments in new value-added services.
- Development of prototype Modular Load Units, optimised for automated handling and high load factors in all transport modes, in line with existing standards.
- Development of prototype automated loading and unloading systems, extending outside the building or site and taking into account (local) traffic management, thus maximising all assets utilisation and avoiding congested roads, large parking lots and increased capacity of the cargo handling equipment to deal with peak loads.
- Optimise environmental performance of logistics clusters and assess the carbon footprint of existing hubs and the proposed solutions to extend their role and automate their services.

The Commission considers that proposals requesting a contribution from the EU of between EUR 6 to 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:

- Increased added value of hubs, integrating manufacturing and sharing resources to create logistics clusters with a much higher impact on local economies
- Less congestion, energy, emissions, carbon footprint, noise and land-use
- Improved door-to-door logistics performance (faster, cheaper and more reliable).
- More efficient goods handling (30 % cost reduction) stimulating multi-modal transport solutions.
- Increased inter-modality and higher resilience of the transport system.

Type of action: Research and Innovation Actions

MG-5.2-2017. Innovative ICT solutions for future logistics operations

Specific challenge: In a logistics sector with highly increased collaboration, intermodal and dynamic re-routing of freight, there is a need to exploit ICT advances such as Internet-of-Things, big data, new satellite navigation infrastructure and Intelligent Transport Systems with business needs. We need to rethink the way we plan, book and execute freight flows, new systems should provide all stakeholders with reliable information and allow exploitation of the full potential of horizontal collaboration. Furthermore we will need to match the increased need for real-time and open data to plan and track shared freight with guarantees that the exploitation of this data is both safe and secure. Given the vast number small and medium sized enterprises active in the transport sector this project should have a clear focus on the ease of access to all future ICT solutions.

Scope: Building on previous work in the e-Freight domain (including developments on rail TAF TSI, road ITS, inland waterways RIS, maritime SafeSeaNet and aviation SESAR) and on the work of the Digital Transport Forum, proposals should cover the development and integration of at least 2 of the 3 following issues:

A) Planning and data

- Develop booking and planning systems for freight to find the best (combinations of) modes and optimal route (e.g. European GNSS based route analysis or opportunities for “milk runs”), allowing better network exploitation and more efficient logistics operations.
- Identify opportunities for increased availability of freight data (such as shipments, volumes, statuses, destinations, etc.) taking into account security, privacy, data ownership and policies for data sharing¹¹.
- Develop algorithms to increase both load factors and optimise the planned delivery route, based on the specifications of Modular Load Units, the vehicle or container and all required destinations.

B) Dynamic routing and business models

- Develop event management systems that create visibility and transparency and allow real-time exception management for faster traffic reconfiguration and increased resilience.
- Develop business models for dynamic transport services (e.g. cargo was automatically switched between barge and train because a truck encountered traffic congestions and was late at the hub).

C) Interoperability and everything connected

- Develop simple connection tools that allow low-cost integration of SMEs in the supply chain, offering two-way communication and allowing both efficient planning of their part of the supply chain and giving feedback to other stakeholders.
- Integrate simple and cost effective sensors or smart devices (IoT, ITS) into supply chain data management tool.
- Harmonise interoperability between supply chain partners, allowing easy information sharing and creating trust in the complexity of multi-modal transport. Solutions should link all public and private stakeholders.

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

¹¹ The methodological aspects of data handling and the development of necessary tools in order to allow for effective data mining and data exploitation will be addressed in topic 9.2

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

Expected impact:

- Better, more flexible integration of ICT solutions and operational processes, linking the digital and physical flows.
- Seamless freight transport execution across member states and modes of transport.
- Increased reliability and reduced transit times.
- 10% higher load factors and 10% shorter delivery routes.
- Viable business models

Type of action: Research and Innovation Actions

MG-5.3-2016. Promoting the deployment of green transport, towards Eco-labels for logistics

Specific challenge: In Europe, but also in other parts of the world, actions to reduce the carbon footprint of transport and logistics services as part of an integrated supply chain are gaining momentum because the industry sees this as an important domain of competition. However, there needs to be a level playing field amongst companies in Europe, and even world-wide, as regards transparency and comparability of methodologies and data used, including alignment with carbon footprint reporting from other elements of the supply chain. At the moment, the existence of different standards, initiatives and calculation tools, each with its own underlying methodology and data, makes carbon footprints practically incomparable thus hampering potential efficiency gains that would result from this measure.

The specific challenge is the establishment of a co-ordinated network, gathering regional, national and international activities and fostering communication, collaboration and consensus-building on harmonised methodologies for carbon footprint calculation along the transport supply chain. The network would also support the implementation of concrete actions in terms of carbon footprint measurement and reporting.

The work should be inclusive of the state of the art of ideas, trials and business endeavours on new mobility concepts and build on previous projects, as well as other relevant European and non-European initiatives, and with full consideration of the CEN 16258 standard.

Scope: Proposals should cover all of the following issues:

- Liaison with standardisation organisations, shippers, transport operators, logistic service providers, transport and trade organisations and other initiatives with a view to align existing methodologies and interpretative rules (with particular reference to CEN 16258) at the European, and preferably at the global level

- Developing harmonised guidelines for the measurement and reporting of emissions from freight services, based preferably on Scope 3 standard¹² and real world data (where possible)
- Developing mechanisms to facilitate and standardise data collection, handling, reporting and monitoring, with particular reference to data sensitivity issue
- Following and evaluating real world testing and implementation of carbon footprint calculations
- Certification of methodology and accuracy of calculations
- Designing educational tools, including training sessions on carbon foot printing of freight transport
- Exploring conditions for the introduction of carbon foot printing certification schemes (eco-labelling).

The work should be inclusive of the state of the art of ideas, trials and business endeavours on new mobility concepts and build on the FP7 COFRET project, as well as other relevant European and non-European initiatives, and with full consideration of the CEN 16258 standard and the work performed by GLEC.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 to 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:

- Collaborative strategies among industry and authorities for win-win solutions for greener transport: greener transport while not more costly.
- Streamlined business processes and efficiency gains.
- Fair competition and transparent carbon footprint calculations of transport services.
- A sound proposal for introducing an eco-label for logistics services

Type of action: Coordination and Support Actions.

¹² The Corporate value chain (Scope 3) standard covers the company's own (Scope 1 & 2) as well as sub-contracted processes (Scope 3), including all transport and location-related processes (e.g. transshipment, storage, administration, commuting). A detailed description of the transport carbon footprint calculation according to the Scope 3 Standard was published in the "Technical Guidance for Calculating Scope 3 Emissions" (WRI; WBCSD, 2011c) in 2013.

MG-5.4-2017. Potential of the Physical Internet

Specific challenge: Ongoing research efforts show that the translation of the working principles of the Digital Internet to the routing of freight, thus creating the Physical Internet (PI), has the potential to be a real game-changer. In the PI world freight travels from hub to hub in an open network rather than from origin to destination directly. Each parcel is routed automatically and at each section it is bundled for efficiency. In the PI network of networks many (if not all) transport and logistics services would be accessible on demand to all users. This will however require the successful integration of many innovative concepts and non-the-least the mental-shift to adopt a very different governance structure. The Internet of Things for example, which could link every future container, load unit or parcel to the internet, can be considered a pre-requisite for the Physical Internet to work as there will be an increased need to track all goods in a freight environment lacking a fixed and known transport route. The main challenge is to model a future Physical Internet network topology and assess the benefits it could generate in terms of carbon footprint, throughput times and cost reductions. Additionally the concept of the Physical Internet needs to be detailed into a strategic and operational vision which has the capability to get industry-wide endorsement of all stakeholders.

Scope: Proposals should cover all of the following issues:

- Set up a case study to identify the position, size and number of hubs needed for efficiently linking the long distance network and providing sufficient access points to urban areas.
- Map the influence sphere of each node and its benefits across borders to fuel future shared investments.
- Develop simulation and modelling tools to assess the possible impact of the PI, including the socio-economic aspects.
- Develop a roadmap towards the Physical Internet (milestones, first implementation opportunities, etc.) defining which changes are required for migrating to a PI and how these could take place (e.g. current vs future logistic practices, IT applications, business models, mental shift, customer behaviour, etc.).
- Create support and consensus between research and industry stakeholders on opportunities, barriers and next steps towards a PI.
- Explore the need for legislative initiatives by authorities, including a legal contractual framework for participants to the Physical Internet.

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

- Kick-Start the development of the Physical Internet through building industry-wide support.
- Improved asset utilisation.
- 30% reduction in terms of congestion, emissions and energy consumption.

Type of action: Research and Innovation Actions

DRAFT

6. INTELLIGENT TRANSPORT SYSTEMS

Intelligent Transport Systems (ITS) provide the key to achieving the vision of seamless transport both in passenger and in goods transport markets. ITS is also one of the essential elements for making mobility as a service a reality, by connecting all elements of the multimodal transport system – travellers, goods, vehicles, ICT infrastructure, satellite navigation, and the regulatory framework – and thereby forming a major building block of a digitally integrated transport system. For passengers, seamless transport across modes and across countries will better meet their mobility needs by ensuring a wider choice of transport services. Seamless transport, provided through mobility as a service, should also allow European citizens to make better use of the existing infrastructure when travelling and could lead to a shift to more environmentally friendly modes of transport. To reach this goal a number of issues have to be tackled, including the development on a European-wide basis of a transport information system that provides real-time data, to enable cross-border trips throughout Europe and beyond, combining up-to-date information from each relevant transport mode source. The customer should have easy (one-stop-shop) access to online booking, payment and ticketing services, as part of an integrated transport system.

The availability of open and high quality transport data will provide substantial improvements for the performance of transport networks by raising their efficiency, visibility, resilience and facilitate collaboration.

The time has come to consolidate the work performed to date to make substantial advancements and demonstrate current and future opportunities arising from the deployment of ITS.

Topics under this section complement topics under the Call ART 2016/2017 on "Automated Road Transport". Achievements of past/current pilots should be taken into consideration by proposals being submitted and, wherever relevant, activities should be coordinated with ART activities.

Proposals are invited against the following topics:

MG-6.1-2016. Innovative concepts, systems and services towards 'mobility as a service'

Specific challenge: Full implementation of ITS will allow advanced capabilities across national boundaries and transport modes, to respond to multiple users' needs and enable improved travel performance. Analysis and development of coherent concepts, encompassing all relevant elements, systems and services to bring Europe's transport system towards a more user-centric, digital and intelligent mobility model (e.g. Mobility as a service) to make advanced travel planning a reality need to be ensured. Utilisation of open data (produced by both the public and private sector) in the establishment of novel services is a key element. Data protection must also be ensured. A paradigm change in transportation is expected to take place through mobility as a service, where the service providers could offer travellers easy, flexible, reliable and price-worthy everyday travel, including for example public transport, car-sharing, car leasing and road use, as well as more efficient goods shipping and delivery

possibilities. Although activities in this field are on-going in some of the EU Member States, at present, there is no quantifiable evidence on its costs and benefits, as well as on its influence on travel patterns and behaviour of the end users.

Evidence-based decision support is needed, for full utilisation of data and automation as an integral part of transport system, to facilitate the development of mobility service business models and innovative financing, pricing and taxation methods to steer users to choose smart mobility, as well as linking transport, communications and energy networks together to support an effective deployment of novel transport services.

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

- Multi-modal, cross-border traffic management, information and planning systems, to serve passengers and/or other users.
- Analysis of the range of services to be made accessible under each interface, by taking into account differences between various user groups.
- Identification of the success and failure factors of the new concept(s), such as mobility as a service, with particular attention to the users' acceptance factors.
- Identification of the necessary framework (regulatory, technological, financial, etc.) to support the implementation of new services, including the needed private-public collaboration requirements.
- Identification and development of viable business models suitable for future market take-up.
- Identification and validation of measures apt to induce socially-responsible (e.g. vis-à-vis the environment) travel behaviours and advanced planning (e.g. via integrated intermodal paperless ticketing).

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

- Advanced, cross-border, multi-modal travel planning and booking/ticketing for today's needs, as well as identification of future framework requirements, including socially responsible behaviour.
- Proof of concepts, including development of private-public collaboration, supported by appropriate technological systems and services.

- Novel business models for (large scale) deployment of innovative intermodal/integrated mobility concept(s) and services, including service definition(s), organisational structure/value chain, financial framework and technology harmonisation.

Type of action: Research and Innovation Actions.

MG-6.2-2016. Large-scale demonstration(s) of cooperative ITS

Specific challenge: Despite a number of ITS developments in recent years, several initiatives were undertaken in very specific environments, on an ad-hoc, isolated local or national basis, focusing mostly within a particular transport mode (e.g. Road). On top of this, the cooperative dimension of ITS and the applicability in different settings (e.g. urban, highway, long-distance, etc.) has so far not been sufficiently addressed. The time has come to bring this all together, leverage the achievements of past and current pilots and perform large-scale, real-life demonstrations in a specific (for example highly dense population) or combinations of environments that would not only showcase the current status of development and the large potential of C-ITS, but also reveal key areas for future research, innovation and deployment-related issues. An integral part of this challenge is the demonstration of functioning partnerships of multiple stakeholders, namely private (including telecom, infrastructure and transport service operators and service providers, and Original Equipment Manufacturers), public authorities, emergency services, and other stakeholder groups and users, including actual commitment from the test sites. It should also be supported by thorough post-demonstration impact and cost-benefit assessment and evaluation of C-ITS concepts and technologies, including implementation issues. This will also offer an opportunity for stakeholders and partners to address issues and identify relevant technologies and processes to develop operational systems to be kept in place beyond the life of the pilot and lead towards automated transport. A challenge towards full deployment of C-ITS remains the lack of a detailed testing methodology to validate developments of cooperative services and architectures.

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

- Enable services based on appropriate access and sharing of data leveraging in-vehicle resources and 2-way V2V, V2I, I2I and vulnerable road users connectivity in complex urban environments.
- Enable interoperability across systems including testing and validating standards.
- Demonstrating and validating cross-modal integration (e.g. including vehicle crossing) and potential for cross-border inter-operability.

Proposals should foresee twinning with entities participating in projects funded by international partner countries and/or regions, such as US and Japan, to exchange knowledge and experience and exploit synergies, namely for the development of validation methodologies.

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

- Improved level of performance for the entire transport system, including more efficient traffic management and safety improvements.
- Demonstration and testing of fully integrated C-ITS concepts in practical, real-life, complex environments,
- Greater collaboration (and partnerships) between multiple stakeholders to deploy applications and facilitate the interoperable interactions across all elements of the transport system, including the use of data from multiple sources (e.g. vehicle, mobile device and infrastructure).
- Through a cost-benefit analysis of the pilot, demonstrate the value-added for users and the economic viability of solutions through a more elaborate cost-benefit analysis of C-ITS services.
- Assessment and evaluation of the effects and impacts on user acceptance, safety, and security with respect to transport demand and the environment.

Type of actions: Innovation Actions

MG-6.3-2016. Roadmap, new business models, awareness raising, support and incentives for the roll-out of ITS

Specific challenge: ITS business models have not evolved sufficiently to take into account the broad range of new technologies, systems and services, as well as user needs. A key challenge for ITS remains the "last-mover advantage", where many parties wait for others to deploy first, to maximise their own immediate benefits at lowest possible implementing cost. It is a challenge to address market sizing, customer demand versus production, project feasibility and financial returns, as well as security aspects of relevant mobility services. The implementation of Key Performance Indicators (KPIs), building on on-going activities¹³ for the assessment and measurement of ITS deployment (infrastructure and vehicle based) and associated benefits (contribution to public policies and objectives) is at the centre of this challenge. Building upon the EU strategy for the deployment of C-ITS, the action should develop tools and guidance to support public and private stakeholders, in particular Member States, with the development of efficient policies for C-ITS deployment based on consolidated knowledge across the EU.

¹³ EC study on KPIs for ITS; TEN-T European ITS Platform (EIP+) and ITS corridors projects (from TEN-T Call 2013).

Scope: In order to meet this challenge, proposals should address one or several of the following aspects:

- Building upon the latest developments, raise awareness of the benefits of C-ITS through knowledge-enhancing education and training practices (e.g. tools and guidance to support public and private stakeholders).
- Implementing Key Performance Indicators (KPIs) for the performance assessment and measurement of ITS deployment and benefits/impact assessment.
- Financing measures to support inter alia the development, purchase, installation and maintenance of new ITS systems.
- Market sizing, customer demand vs. production, project feasibility and financial returns, as well as security assessment (cyber-attacks / unintended exploitation) of mobility services.

Proposals should foresee twinning with entities participating in projects funded by international partner countries and/or regions, such as US and Japan to exchange knowledge and experience and exploit synergies.

The Commission considers that proposals requesting a contribution from the EU of between EUR # and # 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:

- Study and analyse the dynamics behind the current status of ITS implementation across Europe.
- Actively contribute to the development of more efficient policies for C-ITS deployment across the EU, accelerating the roll-out of related services.
- Develop new business models that are able to inform decision-making across a variety of stakeholders and identify potential incentives to accelerate deployment.

Type of action: Coordination and Support Actions.

7. INFRASTRUCTURE

Efficient and high quality transport infrastructure is fundamental for the mobility of people and goods and for Europe's economic growth, competitiveness and territorial cohesion.

The whole of Europe is faced with a growing need to make infrastructure more resilient, including to climate change, to keep pace with the growing mobility needs and aspirations of people and businesses and to reduce the impact of infrastructure on the environment (air pollution, fragmentation of ecosystems, health and noise). At the same time the resources available to maintain and upgrade transport infrastructure have been declining. Remediating to this problem will ensure an adequate performance level that, in many modes and reflecting also vehicle and ITS developments, needs to be enhanced via new design and maintenance methods.

Set against these multifaceted challenges, key in the future will be to find innovative solutions to increase the productivity, robustness and efficiency of infrastructure for all modes of transport, finding solutions to ensure the resilience of the whole transport system in case of extreme events and to allow an optimal use and management of multimodal transport infrastructure.

Proposals addressing rail in a multimodal approach (rail-only proposals are not eligible) and proposals addressing aviation infrastructure should ensure complementarity with 'Shift to Rail' and 'SESAR' activities, respectively.

Projects aiming at fast implementation of results, should demonstrate their readiness for timely deployment. They could then be considered for further support under the EU complementary schemes available at the moment of project conclusion (e.g. follow-up of CEF).

Proposals are invited against the following topics:

MG-7.1-2017. Resilience to extreme (natural and man-made) events

Specific challenge: Extreme weather conditions, climate change, damages to the infrastructure and traffic impediments negatively impact the reliability of mobility solutions. Adaptation measures and strategies need to be developed that enable minimising the impact of both natural and man-made extreme events on seamless transport operation, protect the users of the transport network in case of extreme conditions, as well as provide optimal information to the users of the transport infrastructure.

Scope: Building on results obtained by FP7 projects and EUROCONTROL studies, proposals should address several of the following aspects:

- Identification of risk factors and mapping of the climate risk 'hot spots' and their possible impact on the European transport network; identification of the appropriate adaptation measures, and development of cross-modal implementation strategies that optimise cost-performance-risk.

- Strategic application of new materials, techniques and systems for construction, operations and maintenance in order to ensure reliable network availability during unfavourable conditions.
- Integration of terrestrial and satellite systems for the structural health monitoring of key infrastructures located in a natural risk (earthquakes, landslides, floods) prone area.
- Innovative engineering of links and connections to allow a smooth transfer from one mode to another in case of extreme disruption in one transport mode.

In line with the Union's strategy for international cooperation in research and innovation¹⁴, international cooperation is encouraged – in particular twinning of projects with US partners can be envisaged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 to 5 million each would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Substantial improvement of smooth continuity of mobility of people and freight even in case of serious disruptions due to natural or man-made circumstances. Individual mode components' resilience to damage due to extreme weather conditions, including reduction of maintenance and retrofitting needs. Reliable modal interchanges allowing continuous fluid traffic flow even during or after disruption.

Type of action: Research and Innovation Actions

MG-7.2-2017. Optimisation of transport infrastructure multi-modal corridors and terminals

Specific challenge: European transport network is highly developed, even if not fully balanced between Regions and Countries. Whilst some links are still missing and an effort is needed to complete trans-European connections, other corridors and nodes face increasing problems of congestions and under-capacity compared with traffic evolution. Key to improving capacity and availability of the existing transport infrastructure network are innovative systems and processes for re-engineering, retrofitting and upgrading that support a transition to zero intrusion from inspection, construction and maintenance (less, faster and better planned interventions with maximum safety for the workers) and drastically increase the productivity of the system.

Scope: In order to meet these challenges, proposals should address one or several of the following aspects, according the specific situation addressed:

¹⁴ COM(2012)497

- Re-engineering/re-design methods to adapt the network to new needs and ensure higher efficiency.
- Innovative design and construction methods that are fast, cost-efficient, using low maintenance and environment-friendly materials and flexible enough to accommodate increasing/changing demand. In particular, implementing advanced construction concepts and processes for corridors and hubs, i.e. flexible design and modular concepts, and advanced predictive models.
- Assessment of the multimodal network capacity in view of optimised use and future planning, taking due consideration of the uncertainty of demand evolution.

Attention is to be paid to the design, construction and operation of corridors, terminals, hubs and gateways as points of interchange (within the same mode) or transfer (between the modes). Airports of all sizes and operations are included. The action could also address synchro-modality over key transport corridors, where inland waterways represent a major challenge.

In line with the Union's strategy for international cooperation in research and innovation¹⁵, international cooperation, in particular with Neighbouring Partner Countries, is encouraged – twinning of projects with US partners can be envisaged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 0.5 to 6 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: More optimal use of the multimodal transport system; avoidance of over-dimensioning of the physical network whilst reducing congestion and overload of specific network components and accommodating future demand; accessibility and operational efficiency of multimodal hubs.

Type of action: Research and Innovation Actions

MG-7.3-2016. The Port of the future

Specific challenge: Ports are a major example of hubs' need for modernisation. Ports are essential for the European economy as a global player and for the internal market. They are a main catalyst for regional development and their optimisation and inclusion in the territory is fundamental to ensure that efficient operations will not affect negatively the surrounding areas. Specific issues (like dredging, emission reductions, and energy transition, incl.

¹⁵ COM(2012)497

electrification, smart grids, and the use of renewables management and emissions) are combined with other challenges common to all multi-modal terminals.

Scope: Research is needed to implement new port concepts, and innovative design, engineering, construction and operation technologies solutions for full customer satisfaction. The topic is articulated in two parts:

1) Research and innovation actions should address several of the following aspects:

- Multi-modal optimised cost-effective and flexible operations inside the terminal and in the wider port area.
- Sustainable maintenance, repair and reconfiguration.
- Better capacity management with reduced costs and land use.
- Low environmental impact, climate change adaptation, and moves towards the circular economy.
- Advanced and efficient links and integration in the socio-economic industrial and urban surrounding environment efficient connections with the hinterland transport network.
- Efficient connections with the hinterland transport network contributing to an increased use of the most energy-efficient transport modes, in particular rail.

Inland waterways and short sea shipping ports deserve particular attention. Proposals should consider the possible transferability of solutions to other ports and multimodal hubs such as rail-freight terminals, inter-ports, airports and dry ports.

2) One coordination action should focus on clustering retained proposals, identifying appropriate KPIs and relevant monitoring and evaluation of results of actions stemming from this call, from other calls of this programme and other ongoing activities in the sector.

In line with the Union's strategy for international cooperation in research and innovation¹⁶, international cooperation, in particular with Mediterranean and other Neighbouring Partner Countries, is encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 to 5 million each for Research and Innovation Actions, and up to EUR 1 million for the Coordination and Support Action, would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

¹⁶ COM(2012)497

Expected impact: Reduction of environmental impact of port activities, their operational and infrastructural costs, improvement of logistics efficiency and better integration of the port in the surrounding socio-economic area.

Type of action: Research Innovation Actions; Coordination and Support Actions.

DRAFT

8. SOCIO-ECONOMIC AND BEHAVIOURAL RESEARCH AND FORWARD LOOKING ACTIVITIES FOR POLICY MAKING

The social sciences and humanities are integrated in the Transport work programme at several layers, in order to achieve the required degree of incorporation while maintaining sufficient visibility. In this context, the 'social sciences and humanities' dimension is 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 in particular topics aimed at exploring new user preferences and attitudes with respect to ownership and sharing, potential changing values of travel time, analysing the research and innovation capacities of the European transport manufacturing industries, examining new research opportunities and limitations offered by the use and exploitation of big data, looking at how new tools and business models may improve accessibility, inclusive mobility and equity across different geographical areas and assessing future skills requirements in transport.

Proposals are invited against the following topics:

MG-8.1-2016. Research, technology development and market trends for the European transport manufacturing industries

Specific challenge: European transport manufacturing industries across different sectors are well positioned in the global market. However, they are faced with new challenges stemming from the need to move to smart, green and sustainable transport technologies and systems within a relatively short period of time, as well as from the changing mobility demand, increasing international competition and the appearance of new players (for example, in the area of automation, data analytics, etc.). The challenge is to provide an overview of research, technology development and innovation capacities and strategies of the European transport manufacturing industries, and identify present and emerging market trends at a global scale, making use of diverse data and information sources.

Scope: Proposals should address the following aspects:

- Analyse the investment trends, productivity levels, technology choices and options, industrial strategies, research and technology development capabilities and funding efforts of the European producers of transport means, including manufacturers of vehicles, equipment, components and systems, in the automotive, aeronautical, ship-building and rail vehicle industries.
- Assess the competitive advantages and disadvantages of those industries in relation to their main competitors world-wide, including new players from other areas who are active in new fields like automation; project their global market share prospects and predictable employment level scenarios.

- Analyse the economic potential of new technologies, products and markets and their role in the determination of the industrial and commercial strategies of the major players; and assess the success factors of those strategies.
- Consider the incidence of legislation and regulation at national and supranational level on industrial practices, innovation potential and global competitiveness.

The expected duration of actions is between 12 and 18 months.

The Commission considers that proposals requesting a contribution from the EU of between EUR 0.5 and 1.5 million each would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact:

- The work is expected to provide a comprehensive picture of the research and technology development capabilities, innovation challenges and market prospects of the European transport industries, taking into account the heterogeneous nature and future demand of the transport sector.
- Proposals are expected to demonstrate how the knowledge produced will enable stakeholders and policy makers to identify possible gaps in the research, technology development and innovation capacities and strategies of the European transport industry, particularly with regard to emerging market prospects, and elaborate appropriate measures at a corporate and policy level.

Type of action: Coordination and Support Action

MG-8.2-2017. Big data in Transport: Research opportunities, challenges and limitations

Specific challenge: Technological developments, particularly related to the extended and expanding use of ICT in the transport sector, allow the collection of unprecedented volumes of data across all modes and transport systems. These volumes of data, known also as "big data", have generated a strong interest in the transport research community as well as in the relevant industries and among policy makers.

From freight transport and supply chain optimisation to evacuation modelling and crowd dynamics under extreme phenomena, and from short-term traffic forecasting to travel behavioural research and the use of social media for efficient transport operations, the so-called trend of big data has created a wide spectrum of challenges and opportunities in the field of transport research. Indicative areas of research could, for example, cover travel behaviour (by incorporating in modelling processes heterogeneous sources of information), logistics and consumer preferences, network capacity planning and optimisation (e.g. in the case of toll roads), risk management, response to extreme weather events or other emergency situations. At the same time, the collection and possible exploitation of "big data" pose a

number of questions both in methodological terms as well as in legal, institutional and social ones, which need to be addressed. The main challenge is therefore to investigate the implications of the utilisation of big data in the transport field.

Scope: In order to meet this challenge, proposals should address the following aspects:

- Identification of areas and contexts in which ICT investments and exploitation of data should be implemented. Examination of a series of different case studies and contexts throughout Europe, in order to provide useful information and suggestions on the prerequisites of successful big data implementation in the transport sector from a socio-economic point of view.
- Identification of methodological issues and the development of necessary tools in order to allow for effective data mining and data exploitation.
- Analysis of the barriers and limitations of the transportation system to exploit big data opportunities. This point should address issues that range from technical to institutional. For example, many transportation agencies and authorities, transport industries, etc. may not consider profitable the investment in collecting and analysing big data, worrying also about the associated costs and risks of data collection and sharing.
- Examine the institutional and governmental issues and barriers concerning the application of big data in transport providing policy recommendations towards "data openness" and sharing. Issues of legitimacy and public acceptance (e.g. privacy, data security, etc.) are important and should be adequately addressed.

The Commission considers that proposals requesting a contribution from the EU of between EUR 0.5 and 1.5 million each would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Appropriate exploitation of big data can help policy makers at the EU, national and regional level, as well as relevant decision makers to take informed decisions. Better data can help transport authorities and industries to understand travellers' and consumers' behaviour, provide targeted information and identify policy interventions.

Work under this topic is therefore expected to contribute to evidence-based decision making by improving knowledge on methodological and exploitation issues taking also into account economic and technical considerations.

It is also expected to contribute to an early identification of critical issues linked to privacy, data security, legal and institutional aspects. It may therefore facilitate the development of an appropriate legal framework for the collection and exploitation of big data in the area of transport.

Type of action: Coordination and Support Actions

MG-8.3-2016. Assessing future requirements for skills and jobs across transport modes and systems

Specific Challenge: Transport is a rapidly developing and changing sector which faces problems to develop, attract and retain appropriate staff. As the overall trend is to increase automation, the sector will depend more and more on specialised equipment and products. Future jobs will therefore require new and advanced skills in engineering as well as in back office operations, but at the same time, the growing interdisciplinary elements of transport activities will also require transport professionals with developed skills in safety, security, logistics, IT, behavioural sciences, marketing and economics. As a consequence a new paradigm needs to be developed in training and education cross-fertilizing the disciplines and combining traditional training methods (e.g. face-to face classrooms, on the job training, etc.) with alternative methods and learning systems (such as web-based training, immersive virtual learning environments /IVLE, etc.) addressing the different needs of the various skill levels (from low skilled workers to high skilled managers/researchers) and incorporating lifelong learning aspects which seem particularly important for the low and middle-skills segments of the workforce.

The specific challenge of this topic will be to identify and assess future requirements for skills and training tools/methods across transport modes and systems, in order to improve the potential of the workforce in the field of transport.

Scope: Proposals should address all of the following aspects:

- Explore the impact of the deployment of new technologies new business models, growing internationalisation, increased intermodality and interdisciplinarity of transport activities on employment profiles and identify future requirements of skills and competences across all skill levels of the transport workforce.
- Identify critically review (and benchmark) existing and/or innovative training and learning methods and tools with a view to address the needs of the workforce in transport modes and systems of a growing complexity.
- Identify critical issues to be addressed and subjects to be taught in order to meet the future needs of transport across all skills levels; identify and/or propose specific curricula for training in particular for the mid-low skilled workers and those who need to upgrade their skills through lifelong learning.
- Define the competences of trainers and design new profiles of teams devoted to facilitating the transfer of knowledge through innovative ideas/methods.

Issues of gender and age are important and should be appropriately considered.

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: As described in the specific challenge, the transport sectors will undergo significant changes over the next years with the gradual deployment of new technologies, increased intermodality and internationalisation. These changes will lead to new requirements for skills and competences of the workforce in practically all relevant sectors. Work under this topic is expected to provide the identification of these new requirements, a critical review and analysis of educational and training needs and methods thus contributing to the elaboration of new training curricula, tools and methods to be used for the development of a workforce capable of meeting the future needs of the sector across Europe. While, in the mid-term, work under this topic is expected to contribute to a better qualified labour force in the various transport sectors, in the longer term is expected to contribute to improved transport services and the employment prospects of the sector.

Type of action: Research and Innovation Actions

MG-8.4-2017. Improving accessibility, inclusive mobility and equity: new tools and business models for public transport in prioritised areas

Specific challenge: Accessibility is a concept used in order to address both travel patterns, attitudes and needs of particular social groups – e.g. women's needs, unemployed persons, elderly, disabled, etc., as well as the mobility needs and transport use characteristics of people living in different types of areas such as rural, remote or deprived urban areas. To obtain a more comprehensive view which will allow the elaboration of measures and transport systems that will improve inclusive mobility and equity, it is necessary to incorporate both approaches considering specific geographical factors as well as the mobility needs and capabilities of particular population groups.

Rural areas, for example, are faced with continuous challenges linked to demographic, socio-economic and mobility factors such as: declining populations characterised by more pronounced ageing; income factors; reduced number of services and economic viability of public transport schemes; longer distances and different mobility needs related to public transport. Urban peripheral, suburban and deprived urban areas on the other hand are often characterised by population groups which face acute social, demographic and economic problems which impact on their mobility and on their ability to use available transport systems on equal terms.

In this context, the main challenge of this topic is to examine whether organisational and technological innovations (including extended use of ICT) in public transport can lead to improved accessibility, inclusive mobility and equity in prioritised areas, by responding better to their specific needs and demographic/socio-economic characteristics.

Scope: Proposals should address all of the following aspects:

- Analysis of the characteristics of prioritised areas in terms of spatial, demographic and socio-economic characteristics and identification of the factors that influence mobility and accessibility.

- Exploring travel behaviour and social habits of the population and assessing travel demands in prioritised areas.
- Addressing mobility needs of specific population groups such as: elderly, women, youth, disabled, people in poverty etc, as well as possible limitations to the use of new transport business models (e.g. IT illiteracy of elderly or low educated persons, pricing, etc.).
- Critical assessment of existing innovative organisational and operational frameworks aimed at delivering new mobility solutions and their impact on inclusive mobility and equity.
- Identification and/or development of new, efficient, inclusive, affordable and accessible mobility solutions and public transport models taking also advantage of IT applications (such as social media, app-oriented services, etc.).

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: As described in the specific challenge, certain geographic areas (such as rural, remote and deprived urban areas) as well as population groups (such as the elderly, disabled, in poverty, etc.) are faced with particular challenges regarding their mobility needs and capabilities, to which current public transport systems do not always respond adequately. Work under this topic is expected to contribute to:

- The identification and critical assessment of sustainable and inclusive mobility options for European citizens in prioritised areas and improve accessibility offered by public transport systems.
- The development of effective, efficient and affordable mobility solutions which respond to the specific needs of particular population groups such as the elderly, the young, the disabled, taking into consideration the gender aspect.
- The elaboration of new business models for public transport, with the deployment of organisational and technological innovations (such as IT and app-oriented services) taking into account possible social and demographic barriers for their effective use.

Type of action: Research and Innovation Actions

MG-8.5-2017. Shifting paradigms: Exploring the dynamics of individual preferences, behaviours and lifestyles influencing travel and mobility choices.

Specific challenge: There are indications that transport may be entering a period of paradigm shifts due to the introduction of disruptive technologies but also due to changes in individual preferences, behaviours, lifestyles and the emergence of new concepts which are likely to impact on the future transport models and management. Some of these changes are already

present, as for example, the growing trend towards vehicle sharing practices in many European cities, while others may still be at their very early stages, as for example, changing values of travel time.

Car sharing has been gradually developing over the past two decades and new business models are likely to emerge in the forthcoming years fostered also by new IT applications (app-based services). This relatively short period of time has not allowed for a comprehensive and established assessment of its various impacts in social, economic and environmental terms. Estimates for its growth potential over the next decades vary considerably, so do estimates about the "replacing capacity" of car sharing. Similarly, its effects in reducing congestions and emissions – especially in urban areas – as well as the impact on car manufacturing industries have not been sufficiently explored.

Travel time savings is often the principal benefit of a transportation project and efforts to achieve faster travel have been long dominating decision making. The value of travel time has been perceived as a cost which includes costs to businesses of the time their employees and vehicles spend on travel, and costs to consumers of personal (unpaid) time spent on travel. However, as technology evolves (particularly ICT), people can use their time during travel for business or leisure thus "reducing" the cost of travel in economic terms and allowing other considerations (such as energy savings, pricing, environmental and social considerations) to affect their travel time preferences.

Transport research is needed to explore at an early stage the dynamics of such changes and their impacts in socio-economic and environmental terms. The specific research challenges of this topic are to provide comprehensive analyses of these new preferences, behaviours and lifestyles, identify the main factors that influence them and assess their potential economic, social and environmental impact.

Scope: In order to meet this challenge, proposals should address one of the two following parts:

1. Shifting from car ownership to sharing. Proposals should:

- Compare the existing trends and forecasts across the EU and identify the factors (economic/social/demographic/spatial/cultural aspects), that influence the varied implementation of such schemes in different countries/regions/cultures including the growing use of app-based services.
- Compare and benchmark existing business models and identify possible new ones. Assess the implications of car sharing schemes for the European car industry (impact on foreseen sales of conventional and electric cars, other revenues, etc.). Assess the potential impact on emissions and congestion, especially in urban environments.

2. Changing value of travel time. Proposals should:

- Analyse differences between various travel motivations (leisure, business) and the related travel time value and examine the extent to which the proliferation of ICT applications such as wifi connections (e.g. in trains, ships) tend to reduce the perceived cost of travel time for private and corporate travel.

- Identify possible areas where a shift away from the "speed paradigm" would be feasible and provide estimates of environmental, socio-economic and organisational implications.
- Propose cost-benefit analyses of additional time savings in case of already advanced transport connections (e.g. need for faster high speed trains, for new sections of motorways in certain "almost saturated" areas, etc.) taking into account the possible new concepts of value of travel time and their environmental and socio-economic implications.

The Commission considers that proposals requesting a contribution from the EU 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: As mentioned in the specific challenge the topic seeks to provide comprehensive analyses of the dynamics of new preferences, behaviours and lifestyles, to identify the main factors that influence them and to assess their potential economic, social and environmental impact. Work under this topic is expected to collect and provide up-to-date information on the present state of development of new business models, a reliable assessment of their growth potential across different geographical cultural and economic environments and an assessment of their impact in areas of key policy interest, such as urban congestion and emission reductions. In addition, it is expected to provide concrete assessments of their impacts on the European car industry (including electric vehicles) over the mid-long term.

The collection of updated and reliable data on the car sharing market and its prospects as well as assessments on their social, economic and environmental impact will facilitate evidence-based policy making particularly with regard to urban congestion/emissions/re-organisation of urban transport. It will also contribute to a forward looking analysis of the prospects of the European car industry market.

Work is also expected to contribute to the generation of new knowledge in a new and under-researched area which may lead in the short-medium term to different cost-benefit assessment methods of transport projects and in depth knowledge of users attitudes and choices with respect to travel time and in the longer term in possible energy savings and emission reductions as well as re-organisation of transport routes and schedules based on different perceptions of the value of travel time.

Type of action: Research and Innovation Actions

MG-8.6-2016. Innovation awards for students and researchers in the context of the Transport Research Arena conference - TRA 2018

Specific challenge: To promote the interest of students and researchers on research and innovation in the transport sector, by rewarding the best innovative ideas and research achievements in this field.

Scope: The action should focus on organising two competitions for transport research and innovation awards to be assigned at the TRA conference in 2018:

- 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 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 0.6 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: This action is 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. The TRA conference is expected to efficiently disseminate knowledge and results of European and national research projects in the area of transport and thus improve the development and deployment of innovative solutions for transport in Europe.

Type of action: Coordination and Support Actions

CALL ‘AUTOMATED ROAD TRANSPORT’

H2020-ART-2016/2017

Road vehicle automation is one of the major trends that will shape the future of road transport and of our mobility. It holds the promise to help address many of the major challenges of today's transport system, such as user safety, energy efficiency, air quality and congestion, and to enhance the drivers' individual comfort and convenience. At the same time, it represents a critical testing ground for the ability of the European automotive industry to preserve and consolidate its global leadership. Automakers around the world are unanimous in predicting the emergence of systems for automated driving sometime in the near future.

Current technology will evolve further towards semi-automation and eventually towards full automation in real moving traffic. This evolution is very promising and may help to drastically reduce fatal traffic casualties to near zero, as more than 90% of road accidents are due to human errors. Nevertheless, there are still many challenges related to technology, digital infrastructure, user and societal acceptance, driver behaviour, regulation and legislation, business models, which need to be tackled to enable the deployment of automated driving on European roads.

The main contribution of this call will be to support the short term introduction of passenger cars automated driving level 3 (Conditional Automation - Full driving performed by an automated driving system with the expectation that the human driver will respond appropriately to a request to intervene in real traffic conditions), and of truck platooning in real traffic conditions from 2020 onwards. The main focus of this call is on demonstrations of automated driving systems for passenger cars, trucks and urban transport. Demonstrations will be complemented by further research on digital infrastructure to ensure the necessary level of safety, reliability and efficiency of automated driving systems and by a comprehensive analysis of safety aspects in relation to mixed traffic conditions and their influence on end user acceptance. This call includes also an action to assess road infrastructure requirements for higher levels of automation and to coordinate and support all research and innovation activities on automated driving both at European and international levels.

Cooperative systems and connectivity, based on Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) communication of real-time operational data, as important means to increase the performance of automated driving will also be addressed in other calls, such as Mobility for Growth (topic MG-6.2-2016 on "Large-scale demonstration(s) of cooperative ITS"). There is considerable complementarity between the development and deployment of Intelligent Transport Systems and that of Automated Road Transport. ICT components e.g. sensors and microsystems and data fusion are important elements of automated road transport however these will be addressed in the LEIT/ICT Work Programme, in particular via the calls from the ECSEL Joint Undertaking.

Proposals are invited against the following topics:

ART-01-2017. ICT infrastructure to enable the transition towards road transport automation

Specific challenge: Building on the rapid development of ICT technologies, cooperative ITS and more accurate and reliable satellite navigation, automated road transport will enable driving strategies which are safe, sustainable and efficient on the level of the whole transport system. There are still many ICT-related challenges to overcome, in particular those related to the connectivity required for advanced levels of automation and the architecture of such a connected ICT infrastructure.

Scope: The focus will be on the development, testing and validation of ICT infrastructure architectures, integrating state-of-the-art ICT technologies, systems and functions to enable the transition towards road automation (up to automation levels 3 and 4). Proposals should bring together actors from automotive, IT and telecommunication industries as necessary to address one or more of the following areas:

- Functional requirements and technical requirements for the required connectivity (V2V and V2I) for large-scale deployment of automation levels 3 and 4, by analysing the use cases for connectivity deployment over the existing commercial telecom networks versus dedicated ITS spectrum. Proposers should address cyber-security aspects in depth;
- In relation to connectivity: architecture, functional requirements and technical requirements for data generation, processing, storage and retrieval in the context of large-scale deployment of automation levels 3 and 4. Decision making processes to operate vehicles and/or infrastructure should be distinguished from the provision of infotainment services and from other third party services. Proposers should address cyber-security aspects in depth;
- Tamper-proof in-vehicle platforms for automated vehicles building on and advancing the principles of cybersecurity for automated vehicles.
- Dynamic and accurate localisation and mapping, using cloud-based spatial data for highly automated driving (including sourcing, processing and information maintenance); accurate mapping and precise localisation based on European GNSS, using fully the capacity of vehicle connectivity and sensors and map data feedback loops; security of information enabling automated transport systems.

The Commission considers that proposals requesting a contribution from the EU of between EUR 5 to 15 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:

- Improved evidence-based knowledge of required ICT-infrastructure architectures, based on the analysis of costs (investment, operations and maintenance) and requirements for interoperability, latency, throughput, congestion strategies, data verification and data integrity.

- Concrete, evidence-based input feeding into standardisation processes (notably supporting interoperability and cyber security) and policy decisions (e.g. for spectrum policy).
- Considerable progress in terms of real time control systems for automated driving.
- More reliable processing of information for automated transport based on data fusion algorithms to combine V2V and V2X information with on-board sensor information.
- Opening up a services market, as well as advancing public interest applications based on data captured from automation processes concerning e.g. the driver, the vehicle and the journeys made.

Type of action: Research and Innovation Actions.

ART-02-2016.Automation pilots for passenger vehicles

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

Scope: The action will integrate and test enabling technologies for up to automation level 3 (Conditional Automation) and evaluate the benefits in trans-national Field Operational Tests (FOTs) for passenger vehicles. This needs the active involvement of all stakeholders such as vehicle manufacturers, automotive suppliers, road users, insurance companies, road and traffic authorities, the EU Member States, etc., because the responsibility and liability of all stakeholders relating to the testing, demonstrating and use of highly automated vehicles requires clarification before market introduction. Consortia should commit to open the data resulting from the pilots.

The automation pilots should consider all of the following aspects:

- Demonstrate the robustness and reliability of technologies, systems and functions needed to support the gradual progress towards full automation, in particular from level 2 – Partial Automation (Human driver monitors the driving environment) to level 3 Conditional Automation.
- Evaluate effects in mixed traffic conditions with automated and non-automated vehicles.

- Human factors: focus on the in-vehicle evaluation of the driver under real traffic conditions in particular during the transition of control from the vehicle system to the driver and vice versa e.g. expectations, adoption, acceptance, trust, usability driver position; Human Vehicle Interaction/ monitoring strategies. Evaluate fail operational solutions (e.g. emergency stop).
- Conduct impact assessment (e.g. safety, energy use, pollutant emissions, traffic congestion, mobility behaviour, social inclusion, quality of transport services, etc.) on real world data sets.
- Establish a pan-European common catalogue on necessary characteristics of cooperative decision, planning and control algorithms, including self-adaptation and learning features and ethical questions.
- Fulfil all security requirements to protect the system to any threats and avoid any conscious manipulations of the information enabling automated transport systems.

Proposed actions may consider the demonstration of V2X communication (including cooperative ITS and European GNSS) as a possibility to improve the safety and reliability of automated transport systems in the future.

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

The Commission considers that proposals requesting a contribution from the EU of between EUR 15 to 30 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:

- Demonstrate the technological readiness of level 3 automated driving systems and gain a better understanding of the interaction between the driver, the vehicles and the traffic environment (including other road users) in different real traffic conditions.
- Better understand the wider socio-economic impacts of automated driving and the benefits for the driver in terms of comfort, convenience and safety
- Produce insights on the feasibility of new automated transport business models.
- Increase road safety and reduce energy use, pollutant emissions and traffic congestions through safe, reliable and efficient automated driving systems.

Type of action: Innovation Actions.

ART-03-2017.Multi-Brand platooning in real traffic conditions

Specific challenge: Multi-Brand platooning (platooning of heavy duty vehicles of different brands and size) and automated heavy duty vehicles for long-distance transport are effective technologies to improve the energy efficiency, safety and management of European road

traffic. In the past years, there have been significant efforts to develop the required technologies for platooning. However, substantial challenges remain on the path to a Europe wide deployment of platooning, such as platooning with different types of vehicles in real, mixed traffic conditions, better understanding the requirements with regard to logistics, data exchange, sharing of cost savings or the perception and behaviour of other road users in presence of road trains and automated heavy duty vehicles, for instance at motorway exits..

Scope: The focus of this topic is to develop, test and validate platooning concepts, technologies and functionalities and to demonstrate the robustness of multi-brand platooning using V2X communication and automated heavy duty vehicles on a real corridor use case (which preferable goes across national borders). The proposed actions should include following: automated transition from single automated vehicles to platoons, supporting models for forming and dissolution of platoons (with different vehicles from different manufacturers), analysis of different platooning strategies (incl. logistical optimisation) to achieve good cost-benefits, integration in intelligent traffic and logistical information systems, suitable lane management, design of road interfaces between corridors for platooning and non-adapted roads and optimisation of road infrastructure to optimally support platooning (technical, capacity, management). Proposals should also consider the analysis of road users' perception of platoons and their behaviour, impact of road trains on transport infrastructure and existing regulations and standards.

The Commission considers that proposals requesting a contribution from the EU of between EUR 10 to 15 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:

- Demonstrate the feasibility of robust multi-brand platooning systems on a real corridor use case
- Increase of energy efficiency of heavy duty traffic by about 15%.
- Improvement of safety of heavy duty traffic.
- Better traffic management due to more efficient utilisation of road capacity.
- Total cost reduction of logistics and supply chain leading to improved competitiveness of the EU in general.
- Increased competitiveness of European Original Equipment Manufacturers and supply industry.
- Better understand road users' perception of platooning and the requirements in terms of infrastructure to optimally support platooning,
- Innovative business case for operators (for example due to the impact on driving time and rest periods of drivers).

Type of action: Innovation Actions.

ART-04-2016. Safety and end-user acceptance aspects of road automation in the transition period

Specific challenge: Automated vehicles will be accepted by customers and society only when they will be deemed easy-to-use and fully reliable and safe regarding the planned manoeuvres and their execution. A key challenge is to ensure safe vehicles handling with reduced driver attention. Especially for level 3 automated driving systems an effective interaction between the driver and the automated vehicle plays an important role. To act in harmony with driver expectations, these systems should be engineered following a user-centric approach. User acceptance is particularly important for the design of , driver interfaces that will facilitate the transitions between human and automated driving. Moreover, the automated driving systems should be resilient to both system and driver failures and guarantee sufficient reliability and robustness in each and every situation in real world traffic. The introduction of automated vehicles into the existing traffic poses specific issues regarding safety, in particular during the transition period where will be interactions with other vehicles (of any degree of automation or none) and when interaction with other traffic participants such as pedestrians or cyclists is considered.

Scope: Proposals for research and innovation activities should address one or more of the following domains:

- Users requirements of automated driving systems: analyse user requirements, expectations and concerns (e.g. interaction with the system, trust, liability, privacy concerns, security, etc.) related to the use of automated driving systems.
- Design safe human-machine interface and driver monitoring strategies to maximise the intuitiveness and situation awareness; enable safe and appropriate driver take over strategies; monitor drivers' behaviour, predict drivers' actions, and increase drivers' acceptance.
- Safety of automated driving in mixed traffic situations. Develop fail-safe/fault tolerant systems and solutions for highly reliable and safe operations of automated vehicles in any kind of complex and mixed traffic situations in the transition period.

In line with the strategy for EU international cooperation in research and innovation¹⁷, international cooperation is encouraged, in particular with the US.

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

¹⁷ COM(2012)497

Expected impact:

- Reliable, safe and easy to use automated vehicles, in particular in mixed traffic situations.
- Safe and smooth integration of upcoming automated vehicles into the existing transport system.
- Reduction of the number of accidents caused by human errors, such as inattention and distraction. Research will therefore contribute to the achievement of the European policy objective of halving road deaths by 2020, and, in the longer term, to the Transport White Paper's "Vision Zero" objective by preventing road accidents caused by human errors.
- Maintaining the leadership position in developing safe and reliable systems of vehicle automation of the European vehicle manufacturers and their suppliers.
- Contribute to proper validation procedures for automated driving systems to assess and test functional safety and performance
- Strong cooperation with the leading centres of the world in the area of vehicle automation (in particular in the US).

Type of action: Research and Innovation Actions.

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

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

Scope: Proposals should address all the following aspects:

- New methods of traffic flow modelling depending from the introduction of automated vehicles.
- Design, upgrading and adaptation of “hybrid” infrastructure (able to take into account the coexistence of fully or partially automated (connected or autonomous) and conventional vehicles).
- New forms of visual and electronic signalling, ensuring readability by both automated and conventional vehicles.
- New safety performance criteria for road infrastructure, with the goal to set the basis for a timely deployment of automation-appropriate infrastructure network.

Urban and extra-urban roads should be included.

In line with the Union's strategy for international cooperation in research and innovation¹⁸, international cooperation is encouraged – in particular twinning of projects with US partners can be envisaged.

The Commission considers that proposals requesting a contribution from the EU of between EUR # to # 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: Proof of concept of innovative modelling, design and engineering of road infrastructure to facilitate the step-wise introduction of automated driving systems.

Type of action: Research and Innovation Actions

ART-06-2016. Coordination of activities in support of road automation

Specific challenge: Many developments and testing of automated vehicle solutions are already on-going in different European Member States and worldwide with varying framework conditions. There is a great need for creating a solid knowledge base of all these activities and a coordinated and harmonised approach at European and international level. Moreover, it is necessary to achieve a more efficient sharing and re-use of data and experiences of the different Field Operational Tests (FOT) up to the automation level 3 carried out at National and European levels.

Scope: Proposals should address one or all of the following areas:

Area 1:

- Monitor the status of progress, coordinate and create a knowledge base on all ongoing research activities in Europe and in the rest of the world in the area of road vehicle automation.
- Identify and analyse automated driving scenarios in European Countries and worldwide, taking into account the available transportation system and infrastructure in these countries, including an analysis of the expected user behaviour for different user groups and the impact on the economy.
- Create a forum for National, European and worldwide stakeholders of road automation to exchange experiences and knowledge on the development and deployment of road automation systems and to discuss future challenges.

¹⁸ COM(2012)497

Area 2:

- Establish a platform of data exchange in order to let individual Field Operational Tests of vehicle automation (up to the automation level 3) carried out at National and European levels benefit from each other's' learning experiences. A strategy for sharing and exploiting collected data in National, European and international FOTs should be developed.

In line with the strategy for EU international cooperation in research and innovation¹⁹, international cooperation is encouraged, in particular with the US.

The Commission considers that proposals requesting a contribution from the EU of between EUR 0.50 to 3.00 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 comprehensive picture of the state of the art of research and deployment activities in Europe and worldwide in the area of vehicle automation, in particular with regard to emerging market prospects, standardisation and regulation, legal and regulatory framework.
- Better visibility, comparability and transferability of available results and data of Field Operational Tests of vehicle automation at National and European level.
- Higher penetration of automated driving functions in the market resulting in both increased safety on the roads and lower emissions.
- Stronger market position of European industry in systems for vehicle automation.

Type of action: Coordination and Support Actions.

ART-07-2017. Full-scale demonstration of urban road transport automation

Specific challenge: Fully automated road transport systems have the potential to revolutionise urban transport offering high quality public transport services which are not feasible with conventional public transport systems. Low speed full automation systems have been demonstrated in several European cities. However full-scale demonstrations are still necessary to prove the reliability, safety and robustness of fully automated road transport systems in complex scenarios in urban areas. In addition, it is necessary to address the remaining questions, such as user acceptance and legal issues. In addition, it is necessary to address the remaining questions, such as user acceptance and legal framework and to develop business cases to make fully automated urban road transport systems economically viable.

¹⁹ COM(2012)497

Scope: Proposals will build on existing knowledge and demonstrate fully automated road transport systems which should be complementary to mass transit to reach low to medium demand areas with high quality transport services. A fleet of automated road transport vehicles (e.g. light weight vehicles, cyber cars, small buses,) should be implemented at pan-European level in urban and /or sub-urban areas. The demonstrated systems shall be fully integrated into existing public transport systems and must provide evidence of their safety, reliability and fault tolerance in complex traffic scenarios (with automated and non-automated vehicles, pedestrians, cyclists, etc.)

Proposed actions should assess the user acceptance and effects on transport demand and modal transfer. Attention should also be paid to the analysis of socio-economic impacts and benefits of urban automated vehicle fleets as part of an integrated transport system, such as improved accessibility of persons with reduced mobility, elderly, etc. Recommendations for local and national authorities to deploy fully automated road vehicles should be developed.

In line with the strategy for EU international cooperation in research and innovation²⁰, international cooperation is encouraged, in particular with the US.

The Commission considers that proposals requesting a contribution from the EU of between EUR 8 to 10 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 selected actions are expected to:

- Innovative solutions for the safe and smooth integration of automated vehicles into the existing transport system in urban areas.
- Door-to-door public transport services, which can change radically the mobility paradigm of European cities and make urban mobility more sustainable
- Detailed knowledge and recommendations which enable transport authorities, policy makers and business to invest in urban automated vehicle systems and support the development of innovative mobility services e.g. car sharing, road train systems, etc..

Type of action: Innovation Actions

²⁰ COM(2012)497

CALL ‘EUROPEAN GREEN VEHICLES INITIATIVE’

H2020-GV-2016/2017

The European Green Vehicles Initiative (EGVI) represents an essential component of road transport research and innovation. It includes research, technological developments, innovation and demonstration in support of improvements in energy efficiency of road transport vehicles and the use of new types of non-conventional energies in road transport such as electricity, CNG and LNG, renewable and tailored fuels. All this is also aimed at achieving a positive impact on health issues due to polluting emissions, particularly in urban environments.

The scope of the EGVI activities include both advanced power-train technologies and new vehicle architectures, weight reduction, improved aerodynamics and rolling resistance and component development for alternative fuel vehicles. Concerning new forms of energy, the interfaces between the vehicles and the recharging infrastructure will also need to be taken into account with particular attention to standardisation issues. Demonstration activities will play an essential role in ensuring a proper and timely deployment of the new technologies.

This call has been defined taking into account the other calls and initiatives where the Transport Challenge is concerned, particularly the calls on ‘Mobility for Growth’ and ‘Smart Cities and Communities’, and the ‘Fuel Cells and Hydrogen 2’ joint undertakings. Multi-sectorial research involving other research and innovation areas such as Energy and Environment coupled with research on new materials, advanced production and Information and Communication Technologies will be encouraged, particularly in fields such as advanced energy storage systems and interfaces between vehicles and energy recharging infrastructures.

In addition to the topics of this call, a topic on affordable weight reduction of high-volume vehicles and components taking into account the entire life-cycle (NMBP ## – 2016) is included in “Nanotechnologies, Advanced Materials, Advanced Manufacturing and Processing, and Biotechnology” under “Leadership in Enabling and Industrial Technologies” (LEIT).

Proposals are invited against the following topics:

GV-01-2017. Optimisation of heavy duty vehicles for alternative fuels use

Specific challenge: The EU has a strong dependence on diesel, particularly for operating heavy duty vehicles (HDV). The use of alternative fuels in internal combustion engines could reduce this dependence in the short and medium term as well as achieve a significant level of GHG and pollutants emission reduction. Several gaseous and liquid alternatives could be appropriate fuels for trucks running over short, medium and long distances. The specific challenge is to optimise and develop new powertrains (engine / exhaust after treatment systems) for heavy duty vehicles running on alternative fuels with the perspective of achieving higher efficiency and lower pollutant emissions compliant with Euro VI standards and meeting CO₂ emission targets under discussion.

Scope: Proposals should focus on one or several of the following fuel options:

- Bio-methane mixed into liquefied natural gas: LNG is an attractive option to mitigate the high dependence of HDV on diesel. However, to achieve a significant level of GHG emission reduction, it is essential to shift from natural gas to bio-methane. Proposals should consider the results of the LNG Blue Corridors projects and other projects funded by the EU under the European Green Vehicles Initiative.
- Biofuels ED95 and B30: the use of E95 (95 % ethanol and 5% ignition improver) and B30 (30% Biodiesel and 70% of diesel) for HDV could reduce the EU dependence on diesel. E95 has been already been demonstrated in urban fleets but could be an appropriate fuel for trucks running over short and medium distances. Proposals should contribute to the transition from the 1st to the 2nd generation of such biofuels.

Proposals should focus on the following specific objectives:

- Optimise and develop new powertrains (engine/after treatment systems) for the use of alternative fuels in HDV.
- Evaluate energy efficiency, costs, performance, environmental benefits and durability of HDV running on alternative fuels.

Proposals should include prototype validation of the new vehicles. A small demonstration should be carried out to assess the energy efficiency and the environmental and economic benefits of the trucks running in real conditions.

Proposals should provide recommendations for the development of relevant standards, in particular for fuel quality requirements and for the type-approval of the heavy duty vehicles.

When biofuels are considered by proposals, they should contribute to the assessment of sustainability and demonstrate compliance with sustainability criteria as specified in the article 17 of the Directive 2009/28/EC on the promotion of the use of energy from renewable sources.

The Commission considers that proposals requesting a contribution from the EU of between EUR 5 and 10 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 contribute to:

- Oil substitution through the use of alternative fuels.
- Reduction of GHG and pollutant emissions from transport using sustainable renewable fuels in heavy duty vehicles.
- Market development for heavy duty vehicles running with sustainable renewable fuels

The demonstration part of actions will help to improve the knowledge and general awareness of the alternative fuel as appropriate for short, medium or long distance road transport. Actions will also serve to remove the existing barriers for heavy duty vehicles running on renewable fuel.

Type of action: Innovation Actions

GV-02-2016. Technologies for low emission powertrains

Specific challenge: Growing road traffic in Europe entails detrimental effects on the environment and public health to a level that is becoming unsustainable, while generating a large contribution to climate change, this in spite of increasingly stringent emission standards. Advanced technologies offer solutions but need to be further developed: on the one hand a new generation of engine components has reached the level of maturity but more research for their optimal combination in a new generation of gasoline engines, on the other hand, hybridised engines where ICE are coupled with electric drives that are able to supply instantaneous torque still need to be optimised introducing radically new combustion processes to reach much higher energy conversion pushing it towards its physical limits.

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

- Future spark-ignited non-hybrid engines: the proposals will address the optimal combination of innovative engine and robust after-treatment technology as well as modelling and testing to improve the design and control capability.
- Next generation of combustion engines for electrified powertrains: new combustion processes, sensing, control and after treatment systems, supported by advanced modelling technologies where needed to allow these engines to meet future ambitious energy and emission targets at the same time.

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

Expected impact:

- For future spark-ignited non-hybrid engines, demonstration vehicles incorporating each of the developed new engine technologies will prove, by independent testing (including the measurement of coast down parameters), real driving emissions at least below upcoming Euro 6c RDE limits, targeting for the longer term the establishment of a future 'Super Low Emission Vehicles' standard with emission targets which are ambitiously lower than Euro 6.
- For the next generation of combustion engines for electrified power-trains, light duty engines are expected to meet long term fleet targets of 50 g/km CO₂ on the WLTP by achieving a conversion efficiency of # kW/gCO₂ while demonstrating real driving emissions of half the Euro 6 values with no conformity factor, in view of the establishment of a future 'Super Low Emission Vehicles' standard. Currently non regulated emissions, such as NO₂ and

PN measured with a cut-off of 10 nm, will be reduced to #. Heavy duty engines are expected to demonstrate specific consumptions below # g/kW while respecting Euro VI regulation with a 1.2 conformity factor.

Type of action: Research and Innovation Actions

GV-03-2016. System and cost optimised hybridisation of road vehicles

Specific challenge: Hybridised road vehicles combining internal combustion engines and electric motors are already available in the market and contribute to the uptake of electrified vehicles. With the advantages of two different propulsion systems, hybrid electric vehicles can offer the possibility to both drive with zero emission and over long distances. They constitute a major enabler to reach future CO₂ targets and reduce greenhouse gas emissions in general, and play an important role in ensuring better air quality in urban areas and energy savings. However, a major challenge for this type of vehicle is the cost of its technology in relation to the benefit for end users and the variety of configurations that are possible. This topic is focused on the development of advanced solutions which reduce both the cost and complexity of hybrid, plug-in hybrid and range extended electric vehicles, and their effective mechanical, thermal and electrical integration into the vehicle.

Scope: Proposals should address the following aspects:

- System integration of hybrid powertrains into light-duty and heavy duty vehicles, including plug-in hybrid and range extended electric vehicles.
- Identify potential for cost reduction by technical simplification of engine and/or transmission systems and research into lower cost alternatives to electric batteries.
- Power-train system optimisation through the re-use of waste heat, advanced control, downsizing of ICEs and novel high temperature electronic components.
- Improved after-treatment operation, control of emissions, particularly in case of cold (re)start and optimised use of auxiliary systems.

The Commission considers that proposals requesting a contribution from the EU of between EUR 7 and 10 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: In general, the cost premium for hybrid powertrains can be greater than the value of benefits to the user. The impact from this work will be to deliver improved benefits to the consumer and/or cost reductions that will lead to greater market penetration for this technology. Specifically, the expected impacts will consist of:

- Reduction of cost at system level to a #% premium when produced at a rate consistent with a 10% market penetration.

- Improvement of energy efficiency, resulting in higher fuel economy over the WLTP of 20% in the short to medium term and improvements in electric drive range of more than 25%.
- Reduction of combustion engine raw emissions, thereby allowing cost reduction in the exhaust after-treatment system. Demonstration of real driving emissions compliance with a 1.5 compliance factor is mandatory for each developed technology.
- Improvement of gradeability, drive-off performance and acceleration performance compared with a conventional vehicle.
- Improved user acceptance for range extender systems delivering an improved driver experience and utility.

Type of Action: Innovation Actions

GV-04-2016. Next generation electric drivetrains for fully electric vehicles, focusing on high efficiency and low cost

Specific challenge: Developments have already been undertaken in recent years to optimise drivetrain components for fully electric vehicles (FEVs), in particular in terms of efficient use and recovery of energy. However, the next generation of electric drivetrains should be conceived to also take into account manufacturing, design, subcomponents and material cost. .

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

- Functional system integration of electric machines (e.g. high speed motors) with transmissions, integration of energy recovery with braking systems.
- Lower cost electric machines through reduced need for rare earth magnets and designs optimised for lower cost manufacturing processes.
- Integration of wide bandgap semiconductors providing high temperature, high power density, and high frequency capabilities.
- Modular electric power train components compatible with both full electric and hybrid applications, sub-systems and topologies with enhanced fault tolerance and robustness, fit for mass manufacturing.
- NVH, reliability and safety and fault tolerance.

The Commission considers that proposals requesting a contribution from the EU of between EUR 5 and 10 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 lead to the next generation electric drives, with reduced costs through systems integration and optimised design and configuration of motors and power

electronics for volume manufacturing processes. The impacts from actions will be demonstrated on full size working prototypes as follows:

- An incremental reduction in total motor and power electronics system costs through optimised design for manufacture.
- A 30% increase in specific torque and specific power of electric motors with a 50% increase in maximum operating speed whilst halving motor losses.
- A 50% increase in the power density of motor power electronics, a 50% reduction in losses and the ability to operate with the same cooling liquids and temperatures used for the combustion engine in hybrid configurations.

Type of Action: Research and Innovation Actions

GV-05-2017. Electric vehicle user-centric design for optimised energy efficiency

Specific challenge: Increasing the range of vehicles, and in particular EVs, requires the minimisation of the overall energy consumption of which a significant share, depending strongly on the ambient conditions, is often due to the systems (for de-icing/de-fogging, heating, cooling, etc.) required to ensure the safety, comfort and well-being of the vehicle occupants. Correspondingly, there is a need to focus on all aspects of the user-centric design of EVs (mainly cars, with potential synergies with heavier vehicles) from the perspective of energy consumption in order to develop advanced solutions which will enable the range of the vehicle to be increased significantly without compromising safety, EV users requirements, all factors that directly affect the competitiveness of EVs with respect to conventional vehicles.

Scope: Proposals should address the following aspects:

- Analysis of all aspects of the user-centric design of vehicles which directly or indirectly impact energy consumption in a significant way (including visibility, thermal comfort, HMI, ergonomics, postural comfort, noise and vibration, etc.) that may require the development of new methodologies and design tools.
- Development of solutions, including the application of novel materials, to improve the thermal insulation of vehicles and hence reduce the energy consumption needs over a wide range of ambient conditions.
- Integration of advanced systems and components, and their control, considering also preconditioning, in order to optimise occupant comfort and well-being with respect to energy consumption.
- Reducing the weight and thermal inertia of systems and components (including the windshield and window, seats, dashboard, trim, etc.) in the vehicle in order to improve efficiency without reducing performance.

- Implementation and testing of the different solutions at the full vehicle level in order to ensure that the safety and perception of comfort and well-being remain uncompromised.

An assessment of the applicability of the solutions developed across different types of EVs should be carried out.

The Commission considers that proposals requesting a contribution from the EU of between EUR 7 and 10 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 increase 25% the electric drive range of EVs across a wide extent of ambient conditions. This improvement will be achievable on production in the short- to medium-term. Improved energy efficiency will be achieved without any compromise in terms of both the performance of the respective systems and components (including de-icing/de-fogging, heating, cooling, lighting) and the safety, comfort and well-being of the vehicle occupants. Furthermore, through comprehensive impact assessment, the solutions will be demonstrated to be viable in terms of cost and production, and the potential improvement in the competitiveness of EVs with respect to conventional vehicles in the long-term will be analysed.

Type of Action: Research and Innovation Actions

GV-06-2017. Physical integration of hybrid and electric vehicle batteries at pack level aiming at increased energy density and efficiency

Specific challenge: In order to make hybrid, plug-in hybrid and fully electric vehicles fit for the mass market, the energy density and efficiency of battery packs need to increase so that this results in higher electric ranges. Besides research on advanced electro-chemistries, the integration of batteries primary cells into battery packs has a major role to play. Advanced physical integration technologies for high energy/power density battery packs should take into account safety and modularity aspects as well as related production and testing methods in order to maintain the strength of the European automotive supply industry in this area. Even though the solutions for system integration depend on the properties of the cells and their control, the further development of electro chemical and battery management systems is not a subject of this call.

Scope: Proposals should address the following aspects:

- Thermal, electrical and mechanical design of battery systems based on Li cells aiming at highly increased energy density and modularity.
- Design for manufacturing, recycling and second use.
- Prototyping and mass-production technologies for battery systems.

- Demonstration of performance, lifetime and safety behaviour including bench testing and demonstration under real life conditions in vehicles.

The Commission considers that proposals requesting a contribution from the EU of between EUR 5 and 10 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 produce:

- Energy density improvement of battery packs in the order of 15-20%
- Battery integration costs (excluding cell cost) reduced by 20 to 30%
- Strengthen the EU value chain, from design and manufacturing to dismantling and recycling.

Type of Action: Innovation Actions

GV-07-2017. Multi-level modelling and testing of electric vehicles and their components

Specific challenge: Detailed modelling and testing at component and sub-component level (for instance in electrochemistry and electromagnetics) can be used to improve the understanding and design capabilities for higher performance and lower cost, allowing to recover or maintain technological leadership in key sectors of the EV value chain. Whenever the knowledge is fragmented, a truly European effort is preferred to help shorten the development and validation time of the tools. New technologies and new materials will enable further improvements in EV-efficiency but will also add complexity in control, calibration and safety analysis. Novel tools are required particular for covering the entire chain of integration into vehicles and subsystems.

Consequently there is a need for advanced testing methods and tools as well as scalable and easy to parameterise real-time models for usage in different development environments in order to ensure safety and improve efficiency of future EVs and hence reducing development and testing efforts significantly.

Scope: Proposals should address the following aspects:

- Investigations on scalable real-time models for e-drive components (e-motor, batteries, inverters, fuel-cell, etc.) that seamlessly can be used for design, simulation, diagnosis and testing based on existing models and corresponding test and modelling procedures to automatically identify parameters of these models.
- Development of heterogeneous testing facility for electric traction drive and storage system that enable the functional optimisation, testing and diagnosis of new e-drive concepts at higher frequencies and voltages.

- Development of systems and methods to assess reliability, energy content and commercial certainty for battery systems at all levels of technology, from cell via packs, vehicles to recycling.
- Investigation on reliable and automated methods and procedures for parameter identification of physical and/or empiric models of batteries (state of charge and health, lifetime, etc.). Potential for international cooperation in establishing standard procedures should be explored.
- New tools and methods integrated with control development for improving safety analysis and reducing costs.

The Commission considers that proposals requesting a contribution from the EU of between EUR 7 and 10 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 on new testing and simulation tools and methods will lead (depending on the chosen scope) to a:

- Reduction of development and testing efforts for e-drivetrains by 40%
- Improved efficiency of e-drivetrains under real driving conditions by 20%
- Improved xEV powertrain safety by a factor of 10 with no additional expenses in safety studies.
- Increased collaboration between firms and academia and other projects with similar research activities and further leverage the EV-development ecosystem in Europe.

Type of Action: Research and Innovation Actions

GV-08-2017. Electrified heavy duty vehicles integration with fast charging infrastructure

Specific challenge: Electrification of different types of transportation and delivery typically in urban and suburban areas (including buses, vans, medium-duty goods vehicles, and specialist vehicles such as trucks for refuse collection) is a privileged path to reduce their energy consumption and emissions particularly in a urban environment. At the same time, achieving the same capabilities only by having larger batteries would undermine their payload capacity. It is therefore necessary to integrate either a range extender or solution for the fast transfer of significant energy volumes, be it at terminals, loading/de-loading stops or en-route. However, large magnitude power transfer directly from the grid can be costly and introduce disturbances into the grid. Furthermore, large power flows in relation to the total energy capacity of the involved energy storage systems may be harmful to the energy storage systems. Therefore, the different options of super-fast charging need to be assessed and compared with respect to cost and their impact on the power grid before the launch of

demonstration activities at a later stage. The overall challenge is to design integrated, energy efficient vehicles taking into account the powertrain and the charging infrastructure needed to cover the intended missions, without compromising on performance or comfort of the vehicle driver and occupants or increasing the final costs to the users/customers.

Scope: Actions shall address the development of vehicle and drive train concepts which are able to operate in a pure electric mode with high energy recovery capacity to ensure zero emissions and low noise pollution either on the whole mission or in designated low-emission zones, while permitting in the second case highly efficient, low environmental impact internal combustion engine operation without range restrictions in other areas. Such technologies can be applied to one or both of the following vehicle types:

- Electrified medium duty trucks for urban applications (freight delivery, refuse collection, etc.).
- Electrified high capacity buses (at least 12 m) for urban use, capable of time efficient operation including effective charging and driving at bus stops with multiple bus lines.

For both above applications, where appropriate, development and integration in the vehicles, of power transfer solutions for ultrafast (< 30 seconds), superfast (< 5 minutes) and/or fast (< 30-50 minutes) wireless and contact-based electric energy transfer technologies, demonstrating how the system level efficiency and economic impacts can be achieved, including amortisation of infrastructure.

To ensure the acceptability of such systems into the market, negative effects on battery life and the grid, and measures to mitigate them should also be developed and integrated in the global system, as well as standardisation and health and safety implications. Extension of these concepts to lighter vehicles should be taken into account wherever appropriate to enhance the exploitation opportunities.

An interaction with interested European cities to provide input on needs and implementation plans will be performed targeting market readiness by 2023.

The Commission considers that proposals requesting a contribution from the EU of between EUR 5 and 15 million each depending on the number of developed vehicles and charging technologies 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 electrified medium duty trucks for urban use:

- Energy efficiency improvements up to 70% in comparison with equivalent category conventional vehicles are targeted, with full electric driving ranges of at least 50 km (including energy recuperation and superfast charging at delivery stops).
- Low noise operation (<72 dB) allowing e.g. off peak delivery.

- Polluting emissions below Euro VI with a Conformity Factor of 1.2 in real driving when in range extended mode.

For electrified high capacity buses for urban use:

- Bus energy efficiency improvements similar to dual mode medium duty trucks, with a practical operational range compatible with normal bus schedules, depending on whether charging take place only at end terminals or at bus stops.
- Reduced operating costs per km by #%
- Polluting emissions below Euro VI with a Conformity Factor of 1.2 in real driving when in range extended mode.

For fast charging infrastructure:

- Power transfer capability above 100kW
- Transfer efficiencies above 90% for contactless systems
- Total system costs competitive with conventional low emissions buses or trucks.

Type of action: Innovation Actions

GV-09-2016. Aerodynamic and flexible trucks

Specific challenge: The energy efficiency of logistics and co-modal transportation needs to be significantly improved, since road haulage represents the dominant share of CO₂ emissions and energy consumption. Adaptable and configurable complete truck concepts and architectures can significantly contribute to improving road haulage energy efficiency, by improving aerodynamics and energy efficiency, while contributing to meet future logistics and co-modality needs for different segments and markets. Industry, authorities and policy-makers should collaborate on standardisation issues in order to allow the use of configurable trucks in road haulage. Present regulatory framework hinders some of the developments suggested above. Revisions of existing regulations are needed and can benefit from results of this project, e.g. the present work with Directive 96/53/EC, which will allow greater flexibility in terms of vehicle length provided improvements in efficiency and safety can be demonstrated.

Scope: Proposals should address the following aspects:

- Map, quantify and predict the type of loads carried on roads in Europe and define potential solutions for configurable trucks.
- Develop new concepts and technologies for trucks with reduced drag, that are safer, comfortable, configurable and cost effective.
- Provide inputs for revising the standardisation and regulatory framework.

The Commission considers that proposals requesting a contribution from the EU of between EUR 7 and 10 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 target overall efficiency gains of at least 18-33% demonstrated on real platforms, broken down as follows:

- 4–5% improvement in energy efficiency by separate platforms for volume and weight freight, respectively.
- 4–6% improvement in energy consumption due to more effective loading space utilisation.
- 5–12% energy efficiency improvement (depending on traffic circumstances) from the integration of more elaborate flexible powertrains.
- 5–10% improvement in energy consumption due to improved truck aerodynamics.
- Standardised interfaces and the resulting sharing of components leading to higher economies of scale.
- The innovative front end design will increase energy absorption by #% for vehicles and #% for pedestrian, ensuring survivability up to 50 km/h.

Type of action: Innovation Actions

GV-10-2017. Demonstration (pilots) for integration in transport system of electrified L-category vehicles

Specific challenge: Growing urbanisation in Europe is generating increased traffic congestion, greenhouse gas emissions, and air pollution. Economic development requires an efficient and sustainable mobility system and European citizens need affordable and adaptable transport options through synergies between different modes. L-category vehicles, for individual passenger transport and for small logistics, are an effective solution to address the growing problems of traffic congestion in towns and cities across the EU. Smaller, lighter and more specialised than other vehicles, their use produces economic savings in terms of time gained, energy consumption and space required for moving and parking. Electrified L-category vehicles (EL-Vs) are a further step towards an even more sustainable urban mobility but they are still a niche market, mainly due to cost, lack of public information and limited direct user experience. However, last generation EL-Vs, and those currently under development, could meet mainstream customer expectations and contribute to urban quality of life.

Scope: Proposals should focus on the demonstration of the potential market penetration of EL-Vs in Europe. It should enable EL-V manufacturers to make vehicles more attractive to the general public, support a mind-shift and encourage the uptake of EL-Vs (in particular two/three wheelers and light quadricycles). The demonstration of EL-Vs as private, shared, or

service vehicles will make the public more familiar with easy to operate EL-Vs and allow overcoming issues such as range anxiety. Enabling users to experience the wide range of EL-Vs as part of their daily personal mobility, will make them more aware of their real mobility needs and allow the integration of EL-Vs with other private and public modes of transport.

The scope also includes the compatibility of EL-Vs with other vehicles' charging stations and with cheaper charging devices, such as home chargers.

Compatibilities and potential incompatibilities between different categories of vehicles (L, M, N) should be identified and documented, suitable to serve as a basis for creating or adapting street rules, type approval regulations, standards and policy measures for the deployment of an effective charging infrastructure.

The Commission considers that proposals requesting a contribution from the EU of between EUR 7 to 10 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 demonstration will contribute to assess the potential market penetration of EL-Vs and consumers' needs and expectations. It will also contribute to speed up the penetration of EL-Vs into the market and will supply the manufacturer with crucial information for the development and the engineering work of the next generation of EL-Vs, as well as it will give the vehicle manufacturers and mobility service providers the necessary information to develop successful business models. Additionally it will assess the impact on quality of life in urban environments (including commuting), and provide recommendations for effective policy measures supporting the deployment of EVs. It will also provide recommendations for an optimised grid and charging infrastructure, able to guarantee compatibility among different type of EVs.

In addition, demonstration will provide data on real driving conditions useful to design policy measures (i.e. optimal amount and distribution of public charging points, identification and possible areas accessible only to electrical L vehicles, interaction with other means of transport and vulnerable road users).

The demonstration will also enhance the competitive position of the European industry in this field.

Type of action: Innovation Actions

GV-11-2016. Stimulating European research and development for the implementation of future road transport technologies

Specific challenge: The objective of this topic is to define and promote research priorities for sustainable road transport in Europe. It calls for a Coordination and Support Action to assist ERTRAC, the European Technology Platform for road transport, the European Green Vehicle Initiative PPP, the European Commission and Member States in defining the research needs for their strategies and programmes in order to achieve the objectives of the Energy Union

and other European policies and further on the vision of the White Paper 2011 for a competitive and resource-efficient future transport system.

Scope: Proposals should consider a comprehensive approach ranging from components to system integration and including enabling technologies and other transport modes, where relevant. They should address the following aspects:

- Updating of research agendas and roadmaps as developed by the European Technology Platform ERTRAC (European Road Transport Research Advisory Council) and the European Green Vehicle Initiative (EGVI).
- Monitoring of road transport research projects and their impacts from relevant European programmes (Horizon2020, ENT, JU, etc.) and organisation of workshops to present and discuss results, trends, exchange experience and foster innovation aspects.
- Definition of multi-annual and more precise annual implementation plans as input for the programmes of the EU and MS.
- Identification of actions to support education, training, standardisation and business models.
- Identification of barriers for the deployment of research results and improvement of framework conditions.
- Fostering of the links between ERTRAC and the national technology platforms for road transport existing at national level in Europe.
- Organisation of dissemination activities for ERTRAC and EGVI. These activities should also target emerging economies in particular China and Brazil.
- Initiate pilot actions and develop pre-feasibility studies for at least 3 cities in emerging economies and twin EU and international projects on urban electric mobility.
- Track global progress on urban electric mobility and support UN activities, such as the Urban Electric Mobility Initiative (UEMI).

The implementation requires close collaboration with the leading stakeholders in transport RTD in Europe. This includes Original Equipment Manufacturers, supply industry, research and engineering organisations, as well as other multipliers such as ETPs dealing with transport research and innovation, EGVI, the ENT, the EU, and Member States.

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 to 3.5 million each would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: This action will bring together the leading European stakeholders in road transport research to monitor projects, develop roadmaps, and support their implementation. It will contribute to a further harmonisation of research and innovation, and therefore contribute

to the European Research Area, in particular also in the view of innovation, as well as to the European strategies for a future transport system. The action will also accelerate time to market of new mobility solutions.

Type of action: Coordination and Support Actions.

GV-12-2016. ERA-NET Co-fund on electromobility

Specific Challenge: At present, the first generation of electric vehicles have proven their potential although there is still scope for future improvement. So while research and the development of electric vehicle technology has progressed well, the integration of new technologies in the existing transport system still requires substantial effort, mainly in urban areas. The sound deployment of electric mobility in European cities and the realisation of a certain degree of alignment require the involvement of stakeholders at national, regional and even local authority level, who are in charge of the legislative and regulatory framework. Integrated with, but not overlapping, the European Green Vehicles Initiative, the ERA-Net Cofund represents a new dimension of Public Private Partnership. It ensures that the complementary approaches and means of national and regional authorities are appropriately included and receptive to research achievement from the industrial sector.

A European approach is essential to realise the ambition of effectively bringing electric mobility to the market: it allows key players to come together on a transnational scale; it helps to identify and to tackle the barriers holding back the introduction of innovative urban electrification products and services in the single market. Implementation of electrification needs to be increasingly based on partnerships that build the necessary scale and scope, and achieve greater impact from scarce public and private resources.

Scope: The proposed scope of the ERA-Net Cofund on Electric Urban Mobility reflects the progress that was made in previous years and consequently sets a specific focus on urban areas, where the next important steps in the innovation cycle will take place. Proposals will aim at the innovation and deployment needs for 2020 and the years after. Activities should focus on demonstrating and validating solutions that have already reached TRL 5-6. These should be complementary to, and not duplicate the scope of, the projects of the European Green Car and European Green Vehicle Initiatives. Appropriate user and general public acceptance, regulatory, market up-take, social, environmental and resource efficiency aspects should be included. In principle all modes of surface transport are relevant. Urban freight and logistics is in scope (e.g. smart urban delivery fleets), but the focus will rather be on passenger transport (e.g. car sharing with EVs).

The proposals should pool the necessary financial resources from the participating national and regional research programmes with a view to implementing a joint call for proposals resulting in grants to third parties with EU co-funding in this area. Proposers are encouraged to include other joint activities including additional joint calls without EU co-funding. Call content should be agreed with the European Commission and the European Green Vehicles Initiative to ensure no duplication of funding.

Expected impact:

- Acceleration of the time to market of affordable, cost-effective and socially acceptable solutions to integrate electric mobility in Europe's urban transport systems.
- Reduction of the environmental footprint and the energy payback time.
- Strengthening the industrial technology base, thereby creating growth and jobs in Europe.
- Tangible and practical guidance to the decision makers in the relevant authorities and support industry as well as the service sector to provide suitable and feasible solutions for electric mobility in European urban areas.

Type of action: ERA-Net Cofund

To appropriately address this specific challenge and generate a substantial impact, a minimum call volume of EUR 30 million is considered to be necessary (including a contribution from the EU of EUR 10 million).

Nota bene: Budgets should be determined in consultation with the respective initiatives to balance ambition in achieving critical mass and absorption capacity as well as aligning financial planning between MS and the EU.

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OTHER ACTIONS^{21,22}

OA-01-2016. An inducement prize for the cleanest engine

Inducement prizes stimulate innovative solutions to address the existing and emerging societal challenges that are otherwise rarely pursued via normal grants and business processes in enterprises.

Objective: European citizens in many urban areas suffer from serious health impacts due to air quality issues²³. These are in part due to the fact that current engines, while certified on test stands according to the Euro standards in force, exhibit higher emissions while driving on the road, for example for NO_x in cars powered by diesel engines²⁴ or for particles in direct injections gasoline engines²⁵. The prize aims at spurring the development of engine and powertrain technologies using conventional fuels emitting the lowest attainable level of pollutants in real life driving conditions, to such low levels to improve air quality (and therefore health and environmental) issues in European cities.

To tackle the air quality issue at all levels it is important to address the problem on two different fronts: on the one hand the pollution produced by the huge existing fleet, on the other hand future vehicles introduced in the market. As a consequence the prize will be subdivided into two awards:

- 1) The retrofit prize, addressing the existing fleet.
- 2) The grand prize, aiming at new vehicles.

This should be obtained without compromising, or by even reducing CO₂ emissions, while providing sufficient dynamic performance for normal vehicle driving. Powertrains/cars in which the improvements are achieved by using fuels or stored energy other than the main fuel (i.e. plug-in electricity, hybrids with large batteries, stored compressed gases, etc.) are excluded.

The specific rules of the contest will be published in 2016 by the European Commission²⁶, which will directly launch and manage the contest and award the prize based on the judgement of independent experts.

²¹ The budget amounts for 2016 are subject to the availability of the appropriations provided for in the draft budget for 2016 after the adoption of the budget for 2016 by the budgetary authority or if the budget is not adopted as provided for in the system of provisional twelfths.

²² The budget amounts for 2017 are indicative and will be subject to a separate financing decision to cover the amounts to be allocated for 2017.

²³ http://www.eea.europa.eu/publications/air-quality-in-europe-2014/at_download/file

²⁴ http://ec.europa.eu/clima/policies/transport/vehicles/docs/2011_pems_jrc_62639_en.pdf

²⁵ <http://www.aecc.be/content/pdf/2014-01-1581.pdf>

²⁶ On the Participant Portal but also actively publicised elsewhere to maximise participation.

Expected results: Performance will have to be demonstrated by providing a complete vehicle incorporating the innovation for real drive testing.

Eligibility criteria: The contest will be open to any legal entity (including single persons) or groups of legal entities from Member States and countries associated to Horizon 2020.

Exclusion criteria foreseen in the provisions of articles 106(1), 107, 108 and 109 of the Financial Regulation (regulation 966/2012) will apply.

Award criteria: The prize will be awarded, after closure of the contest, to the contestants who in the opinion of the jury demonstrate a solution (which is at least a system prototype demonstrated in an operational environment) that best addresses the following cumulative criteria²⁷:

Demonstrate the reduction of emissions of NO_x, PN, CO, hydrocarbons in real driving emissions down to the limits that will be defined in the prize regulation, while ensuring low levels of undesired non-regulated pollutants. The specific limits and the procedures to test the engine/powertrain/car will be detailed in the prize regulation detail specifications.

Indicative timetable:

1) Retrofit prize

Stages	Date and time or indicative period
Publication of the contest	1 st quarter of 2016
Deadline for submission of proposals	1 st quarter of 2019
Solutions demonstration	2 nd quarter of 2019
Award decision	3 rd quarter of 2019

2) Grand prize

Stages	Date and time or indicative period
Publication of the contest	1 st quarter of 2016
Deadline for submission of proposals	1 st quarter of 2021

²⁷ Further clarification of these criteria will be published in the Rules of Contest.

Solutions demonstration	2 nd quarter of 2021
Award decision	3 rd quarter of 2021

Type of action: Inducement prize

The common Rules of Contest for Prizes are provided in part F of the General Annexes.

Rules for exploitation and dissemination of results additional to those laid down in the Rules for Participation, if any: IPR will remain with the contestants with an obligation of exploiting the technology or the Commission might exploit them after 3/5 years respectively for the two sub prizes.

The following additional information will be laid down in the rules of contest(s) to be published:

- Arrangements and final date for the submission of entries: ... i.e. required entry forms and the deadline for submissions.
- Arrangements for the payment of prize(s) to the winner(s) after their award: ... normally paid in one instalment.
- The conditions for cancelling the contest(s): If the targets are achieved by an entity not participating in the prize.
- Hearings: in order to support the contestants, the periodic events will also host workshops to clarify any issues with the measurement procedures and the regulation in general (to be performed by JRC acting as the referee of the competition).

Indicative budget: EUR 5.00 million including running expenses (EUR 3.50 million and EUR 1.00 million for the grand and retrofit prizes, respectively).

OA-02-2016/2017. External expertise for evaluation and monitoring

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

Type of action: Expert contracts

Indicative budget: EUR ### million from the 2016 budget and EUR ### million from the 2017 budget.

OA-03-2016/2017. External expertise to advise on EU research and innovation policy

This action will support the provision of independent expertise in support of the design and implementation of EU research policy. Experts with contract will work in the following domains:

- Analysis, design and implementation of strategic transport technology options and actions.
- International cooperation in Transport research and innovation.

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 individual expert's tasks will include attending meetings and remote drafting 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 will be paid to the experts appointed in their personal capacity who act independently and in the public interest.

Type of action: Expert contracts

Indicative timetable: Along 2016 and 2017.

Indicative budget: **EUR ### million from the 2016 budget and EUR ### million from the 2017 budget.**

OA-04-2016. Sustainable infrastructure charging

A number of studies have looked at negative external effects of transport, attempting to estimate costs to society that are not paid for by the transport user. Nevertheless, gaps exist in the information that has been collected so far, while differences in methodologies lead to significantly different results.

In order to be able to compare revenues from existing instruments like transport taxes, charges and tolls in Europe to total external cost, EU-wide information on infrastructure costs would be necessary. Rough estimates exist for road infrastructure costs, however not even such indicative overview is available in the case of other modes. Estimates exist only in certain countries. An in-depth study on transport infrastructure accounts of Member States could provide the missing information. Also data on revenues and their use is not complete and should be further developed, e.g. on the total revenues from fees and tolls in road transport. The study should also look at subsidies.

With regard to methodology, a recent study using new evidence and a different approach has arrived to considerably greater impact in the case of air pollution than previously reported. For road transport, estimates vary between EUR 50 and 300 billion yearly. A project looking at real-life emissions and the differences in possible methodologies could establish the state-

of-the-art regarding the external costs of transport. The results could lead to the revision of unit values (marginal/average external costs) that could be used to set external cost charges.

Type of action: Public procurement

Indicative number of direct service contracts to be signed: one or two service contracts.

Indicative timetable:

- Launch of call: 3rd quarter of 2016
- Expected start of contract: 2nd quarter of 2017

Indicative budget: EUR 1.00 million

OA-05-2016. ELTIS: supporting exchange of knowledge, information and experiences in the field of urban mobility

The ELTIS urban mobility observatory is the Europe's leading information portal on urban mobility and transport. With its large database with details on innovative and best practice solutions/approaches, it facilitates the exchange of knowledge, information and experiences. ELTIS aims to bridge the gap between scientific knowledge and research and innovation on one side and the needs of European practitioners and policy-makers working in the urban mobility and transport field as well as in related disciplines, including urban and regional development, health, energy and the environment [procurement – tender].

Type of action: Public procurement

Indicative number of direct service contracts to be signed: one service contract.

Indicative timetable:

- Launch of call: 4th quarter of 2016
- Expected start of contract: 2nd quarter of 2017

Indicative budget: EUR 2.00 million

OA-06-2016. The role of urban mobility in supporting the 2011 White Paper objectives - data collection

Urban transport requires particular attention in view of achieving the general objectives of the 2011 White Paper, while limited information is available at urban level. An EU level survey on passenger mobility and urban logistics patterns would help closing such information gap. The use of innovative technology for the survey should also be investigated.

In addition, proper cost-benefit analysis of various means of transport in the urban environment should be better explored. New technologies allow for different solutions that

might complement or replace existing transport solutions e.g. car sharing versus public transport. In order to foster the future developments and affect the behaviour of the European cities' inhabitants there is a need for reliable information on opportunity costs/ externalities of all means of urban mobility e.g. the total costs of public transport or parking fee revenues are aspects to be carefully taken into account when promoting one mode over the other.

Type of action: Public procurement; provision of technical services by EUROSTAT

Indicative number of direct service contracts to be signed: one service contract and one administrative arrangement.

Indicative timetable:

- Launch of call: 3rd quarter of 2016
- Expected start of contract: 2nd quarter of 2017

Indicative budget: A) EUR 2.00 million (public procurement); B) EUR 0.40 million (provision of technical services by EUROSTAT).

OA-07-2017. Establishment of Transport Research and Innovation Monitoring and Information System

Specific challenge: Regular and reliable information provision to policy-makers and private-sector stakeholders is necessary for evidence-based policy and decision making. In addition, the provision of comprehensive information on transport research and innovation can facilitate the monitoring and steering of the development and deployment of innovative solutions, as well as the assessment of the effects of the research funds and projects in the field of transport. Certain steps towards collecting valuable information (such as initiatives like ERA-WATCH or projects like TRIP) have already been taken, but they only provide partial information, while a general source of information and data on transport research and innovation is still missing.

Scope: In order to meet these challenges, the Commission intends to establish a Transport Research and Innovation Monitoring and Information System (TRIMIS). TRIMIS will become the Commission's instrument for mapping technology trends and research and innovation capacities. TRIMIS should cover the following aspects:

- Set up a transport innovation database and assess policy implications.
- Monitor EU supported R&I projects, assess and consolidate findings.
- Map R&I capacities of the European transport sector.
- Support the development, updating and monitoring of strategic roadmaps.
- Prepare and maintain a transport R&I scoreboard.

- Set up and maintain a document repository.
- Develop a public TRIMIS website, gradually incorporating functionalities of the Commission Transport Research and Innovation Portal (TRIP).

Expected impact: By serving as a single point, which will gather and systematise all relevant information about transport research and innovation activities at the EU and Member States level, TRIMIS is expected to: contribute to the provision of up to date, reliable information in support of the research community, transport stakeholders and policy makers, facilitate information exchange between partners, and act as a monitoring system of progress against agreed roadmaps.

Type of action: Public procurement

Indicative number of direct service contracts to be signed: one service contract.

Indicative timetable:

- Launch of call: # quarter of 201#
- Expected start of contract: # quarter of 201#

Indicative budget: EUR 4.00 million

OA-08-2016/2017. Contribution to the EIB-ELENA Facility for the project development assistance: Deployment of transport innovations that lead to greater energy efficiency in urban areas

The ELENA (European Local Energy Assistance) Facility was established in 2009 under the Intelligent Energy-Europe Programme II. The EIB-ELENA facility, so far providing support to public entities, will be expanded to provide support to both public and private project promoters such as municipalities, regions, public/private infrastructure or transport operators (including public transport authorities and operators), energy service companies (ESCOs), retail chains, estate managers and SMEs/industry to develop and launch investible (bankable) investment projects and programmes which will contribute to achieving and going beyond the objectives of the EU energy policy. In the public sector, the EIB-ELENA Facility should continue helping cities (such as local authorities) to mobilise investments and implement their sustainable energy action plans.

The implementation of the EIB ELENA Facility will be subject to dedicated agreement between European Investment Bank and the European Commission. The EIB will ensure that Project Development Services are being awarded to eligible entities in accordance with the principles of transparency, proportionality, sound financial management, equal treatment and non-discrimination, lack of conflict of interests and compliance with internationally accepted standards.

Eligible projects will be selected by the EIB and submitted to the European Commission for approval. The technical assistance grants will be provided to the Final Beneficiary in relation to feasibility and market studies, project structuring, business plans, justified energy audits, preparation of tendering procedures and contractual arrangements and include any other assistance necessary to develop Investment Programmes, excluding subsidies to investment (hardware) costs. Request for Project Development Services shall be addressed to the EIB according to the standard procedure for the submission of projects to the EIB. Applications are open to all participating countries following the CSA eligibility conditions and are not restricted by the availability of local financial institutions of the EIB in a specific country.

In 2016 and 2017, the EIB-ELENA facility will aim at supporting investment projects and programmes in one or both of the following two pillars:

1) Energy efficiency and distributed renewable energy. Projects could cover one or more of the following areas:

- Public and private buildings, including social housing, commercial and logistic properties and sites, and street and traffic lighting, to support increased energy efficiency – e.g. refurbishment of buildings aimed at significantly decreasing energy consumption (both heat and electricity), such as thermal insulation, efficient air conditioning and ventilation, efficient lighting.
- Integration of renewable energy sources (RES) into the built environment – e.g. solar photovoltaic (PV), solar thermal collectors and biomass.
- Investments into renovating, extending or building new district heating/cooling networks, including networks based on combined heat and power (CHP); decentralised CHP systems (building or neighbourhood level).
- Local infrastructure including smart grids, information and communication technology infrastructure for energy efficiency, energy-efficient urban equipment and link with transport.

2) Urban transport and mobility in urban/suburban agglomerations and other densely populated areas:

A part of the EIB-ELENA budget will be ring-fenced for the development of investment programmes in the field of urban transport that will contribute to the EU urban transport policy goals of halving the use of 'conventionally-fuelled' cars in cities by 2030, achieving essentially CO₂ free logistics in major urban centres by 2030 and attaining the 2020 objectives for urban areas presented in the Directive on the deployment of alternative fuels infrastructure²⁸.

Projects could cover one or more of the following areas:

²⁸ Directive 2014/94/EU

- Investments to support the use and the integration of alternative fuels in urban mobility, e.g. in vehicles and in refuelling infrastructure for alternative fuel²⁹ vehicles and other actions to support the wide-scale use of 'alternative fuels' in urban areas.
- Investments to introduce at a wide scale new, more energy-efficient transport and mobility measures in any modes in urban areas.

Type of action: Delegation agreement / FAFA

Indicative budget: EUR 25.00 million from the 2016 budget including EUR 10.00 million for PDA in the field of urban transport; EUR 30.00 million from the 2017 budget including EUR 10.00 million for PDA in the field of urban transport.

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²⁹ See the Communication on 'Clean Power for Transport: A European alternative fuels strategy' (COM/2013/017)