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**COUNCIL DECISION ESTABLISHING THE SPECIFIC PROGRAMME  
IMPLEMENTING HORIZON 2020 - THE FRAMEWORK PROGRAMME  
FOR RESEARCH AND INNOVATION (2014-2020)**

**WORK PROGRAMME 2014 – 2015**

*Part III – 4. Smart, green and integrated transport*

**INFORMAL DRAFT DISCUSSION DOCUMENT**

**Important notice:**

The present document is meant to facilitate the discussions towards the preparation of the work programme 2014 – 2015. It does not at this stage cover all relevant aspects and it does not prejudge the outcome of the on-going interinstitutional negotiations on Horizon 2020 or internal work on cross-cutting aspects. Hence, it remains subject to change. Information, such as indicative budgets per call/area, will be provided at later stage.

**(DRAFT TPC 16/09/2013)**

**TABLE OF CONTENTS**

<b>A. CALLS.....</b>	<b>4</b>
<b>A.1. CALL ‘MOBILITY FOR GROWTH’ .....</b>	<b>4</b>
<b>1. AVIATION .....</b>	<b>5</b>
MG.1.1-2014-2015. Innovative aviation technologies and concepts .....	6
MG.1.2-2014. Coordinated research and innovation actions targeting the highest levels of safety for European aviation.....	7
MG.1.3-2014. Improving skills and knowledge base in European Aviation.....	8
MG.1.4-2014. Support to European Aviation Research and Innovation Policy.....	9
MG.1.5-2014-2015. International cooperation in aeronautics .....	10
<b>2. RAIL .....</b>	<b>12</b>
MG.2.1-2014. I <sup>2</sup> I – Intelligent Infrastructure .....	12
MG.2.2-2014. Smart Rail Services.....	13
MG.2.3-2014. New generation of rail vehicles .....	14
<b>3. ROAD .....</b>	<b>16</b>
MG.3.1-2014. Technologies for low “real world” CO <sub>2</sub> and polluting emissions.....	16
MG.3.2-2014. Advanced bus concepts for increased efficiency .....	17
MG.3.3-2014. Automotive supply chain management.....	17
MG.3.4-2014. Traffic safety analysis and integrated approach towards the safety of Vulnerable Road Users .....	18
MG.3.6-2015. Safe and connected automation in road transport .....	20
MG.3.7-2015. The cleanest engine.....	22
<b>4. WATERBORNE.....</b>	<b>23</b>
MG.4.1-2014. Towards the energy efficient and emission free vessel.....	23
MG.4.2-2014. Safer and more efficient waterborne operations through new technologies and smarter traffic management.....	24
MG.4.3-2015. System modelling and life-cycle cost optimisation for waterborne assets.....	26
MG.4.4-2014. Promoting innovation in the Inland Waterways Transport (IWT) sector .....	26
<b>5. URBAN MOBILITY .....</b>	<b>28</b>
MG.5.1-2014. Transforming the use of conventionally fuelled vehicles in urban areas.....	28
MG.5.2-2014. Reducing impacts and costs of freight and service trips in urban areas.....	29
MG.5.3-2014. Tackling urban road congestion.....	30
MG.5.4-2015. Strengthening the knowledge and capacities of local authorities .....	31
MG.5.5-2015. Demonstrating and testing innovative solutions for cleaner and better urban transport and mobility .....	32
<b>6. LOGISTICS.....</b>	<b>34</b>
MG.6.1-2014. Fostering synergies alongside the supply chain (including e.commerce).....	34
MG.6.2-2014. De-stressing the supply chain .....	35
MG.6.3-2015. Common communication and navigation platforms for pan-European logistics applications .....	36
<b>7. INTELLIGENT TRANSPORT SYSTEMS.....</b>	<b>38</b>
MG.7.1-2015. Connectivity and information sharing for intelligent mobility. ....	38

## HORIZON 2020 – WORK PROGRAMME 2014-2015

### Part III – 4. Smart, green and integrated transport

MG.7.2-2014.	Towards seamless mobility addressing fragmentation in ITS deployment in Europe .....	39
<b>8. INFRASTRUCTURE.....</b>		<b>41</b>
MG.8.1-2014.	Smarter design, construction and maintenance.....	41
MG.8.2-2014.	Next generation transport infrastructure: resource efficient, smarter and safer .....	42
MG 8.3-2015	Facilitating market take up of innovative transport infrastructure solutions.....	43
MG.8.4-2015.	Smart governance, network resilience and streamlined delivery of infrastructure innovation.....	44
<b>9. SOCIO-ECONOMIC AND BEHAVIOURAL RESEARCH AND FORWARD LOOKING ACTIVITIES FOR POLICY MAKING .....</b>		<b>46</b>
MG.9.1-2015.	Transport societal drivers .....	46
MG.9.2-2015.	Fostering transnational cooperation in European transport research and innovation – NCP network.....	47
MG.9.3-2014.	Strengthening the research and innovation strategies of the transport industries in Europe .....	48
MG.9.4-2014.	Innovation awards for students and researchers in the context of the Transport Research Arena conference - TRA 2016.....	48
<b>A.2. CALL ‘GREEN VEHICLES’ .....</b>		<b>50</b>
GV.1-2014.	Next generation of competitive Li-ion batteries to meet customer expectations .....	50
GV.2-2014.	Optimized and systematic energy management in electric vehicles .....	51
GV.3-2014.	Future natural gas powertrains and components for cars and vans.....	51
GV.4-2014.	Hybrid light and heavy duty vehicles .....	52
GV.5-2014.	Electric two-wheelers and new ultra-light vehicle concepts.....	52
GV.6-2015.	Powertrain control for heavy-duty vehicles with optimised emissions.....	53
GV.7-2014.	Future alternative fuel powertrains and components for heavy duty vehicles .....	54
GV.8-2015.	Electric vehicles’ enhanced performance and integration into the transport system and the grid.....	54
<b>A.3. CALL ‘SMALL BUSINESS AND FAST TRACK INNOVATION FOR TRANSPORT’ .....</b>		<b>56</b>
IT.1-2014-2015.	Small business innovation research for Transport .....	56
IT.2-2015.	Fast Track to Innovation .....	57
<b>TRANSPORT CHALLENGE CONTRIBUTIONS TO OTHER CALLS .....</b>		<b>59</b>
<b>CALL ‘BLUE GROWTH’ .....</b>		<b>59</b>
BG.1-2014.	The offshore challenge - Preparing the future maritime economy.....	60
BG.2-2014.	Delivering the Sub-sea technologies for new services at sea.....	61
BG.3-2015.	Response capacities to oil spills and marine pollutions.....	61

## **A. CALLS**

### **A.1. CALL ‘MOBILITY FOR GROWTH’**

*H2020-MG-2014/2015*

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”. The Specific Programme is structured in four broad lines of activities aiming at:

- a) Resource efficient transport that respects the environment and public health
- b) Better mobility and accessibility, less congestion, more safety and security
- c) Global leadership for the European transport industry
- d) Socio-economic and behavioural research and forward looking activities for policy making

As indicated in the Specific Programme, these “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 organised as follows:

#### Areas addressing mode-specific challenges

1. Aviation
2. Rail
3. Road
4. Waterborne

#### Areas addressing transport integration specific challenges

5. Urban
6. Logistics
7. Intelligent Transport Systems
8. Infrastructures

#### Areas addressing cross-cutting issues

9. Socio-economic and behavioural research and forward looking activities for policy making
10. Small business innovation research
11. Inducement prize

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.

A thorough and mature research and innovation agenda for this call has been defined taking into account the other calls and initiatives where the Transport Challenge is concerned, i.e. the calls on ‘Green Vehicles’, ‘Small Business and Fast Track Innovation for Transport’, ‘Blue Growth’, and ‘Smart Cities and Communities’, and the ‘Clean Sky 2’, ‘SESAR 2’, ‘Shift2Rail’ and ‘Fuel Cells and Hydrogen 2’ joint undertakings (in different degrees of preparation). 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), Energy and Space. Special attention is dedicated to innovation aspects not covered in the other parts of the Transport Challenge, as well as to SMEs.

## **1. AVIATION**

Aviation, which comprises aeronautics and air transport, is vital for our society and economy. It provides mobility to passengers and freight, establishing links between citizens and regions of Europe and beyond. Aviation generates around 2% of EU GDP and accounts for 3.7 million direct and indirect jobs. European aeronautics is a high-tech sector, which employs highly qualified people. It has made considerable progress over the last decades providing Europe with a leadership position world-wide. However, in the current context of globalisation, this position is challenged. Aviation has also an impact on the environment due to its emissions and the noise to which part of the population is exposed. In the coming years, air transport is expected to continue growing by 4 to 5% every year. We should therefore seize all opportunities associated with this growth while mitigating the negative impacts.

For all these reasons, it is important and urgent to act at EU level on all these aspects through research and innovation actions. The Clean Sky Joint Undertaking and its successor programme, targets primarily the reduction of the impact on the environment through demonstration actions of existing technologies in a range of Technology Readiness Level that is typically between 4 and 6. The SESAR Joint Undertaking develops solutions for a seamless, efficient and cost effective management of air traffic, including services of European GNSS. It covers the full range of TRL from 1 to 6.

This Work Programme addresses therefore medium to long term research and innovation actions with a bottom-up approach for innovative technologies not covered by Clean Sky and outside the scope of SESAR and calls for their maturation in a range of TRL of typically 1-4.

In addition, actions are proposed to improve the skills and knowledge base of European aviation, to support its research and innovation policy and to create durable links with targeted international cooperation partners.

Note that aviation security is addressed in the ‘Secure societies’ challenge and that generic research on materials and manufacturing techniques is encompassed in the Leadership in Enabling and Industrial Technologies part of Horizon 2020 under NMP and Factories of the

Future, respectively. Recycling of materials and replacement of critical raw materials are normally addressed by the Climate action, resource efficiency and raw material' societal challenge. A number of actions related to the production of alternative fuels for aviation will be found under the 'Secure, clean and efficient energy' challenge and novel high-risk research of a more interdisciplinary nature is addressed in the Future and Emerging Technologies (FET) under the Excellent Science part of Horizon 2020.

### **MG.1.1-2014-2015. Innovative aviation technologies and concepts**

Specific challenge: A number of very ambitious goals have been set for the aviation sector at a time horizon of 2050 in the Strategic Research and Innovation Agenda (SRIA) of the Advisory Council for Aviation Research and Innovation in Europe (ACARE). In order to reach these long-term goals new innovative technologies and concepts are needed, which have the potential to bring significant improvements with respect to current approaches and go beyond technologies and concepts currently under development.

Scope: The proposed research and innovation actions could address the vehicles as well as the air transport system.

- Regarding vehicles, actions can target new technologies and concepts that are not currently used in aeronautics or significant improvement in performance of currently used technologies. This could be for example, new approaches to propulsion, improved or new types of vehicles, etc.
- Regarding the air transport system, the proposed actions can address improved or new concepts on the way vehicles and passengers are handled in airports, the type of handling and servicing equipment used, the way airports are organised and connected to other modes, the way information is shared, used, and handled on the landside part of the airport.

Proposers are given full freedom to address parts of the two domains above or a combination of specific parts. The proposals should aim at developing technologies and concepts following a sound technical and scientific approach and demonstrate their validity in a range of Technology Readiness Level (TRL) of typically 1-4. Proposals should also include work to assess, at the end of the project, the potential of the technologies and concepts to be developed at further TRLs and barriers that could prevent such developments and their later deployment.

Proposals should indicate the expected progress along the TRL scale and provide ad-hoc indicators to measure the expected impact when comparing the situation before the start of the project and after its completion (e.g. the proposed improvement has the potential to reduce production time by 30%). In the case of novel products and services, the potential markets should be identified together with the potential corresponding volumes / value. In the case of breakthrough technologies / concepts, the potential impact should be quantified using realistic hypothesis and scenarios.

The proposed actions should not overlap with these carried out in the Clean Sky and SESAR.

#### Expected impact:

Actions will contribute to one or several of the following high level goals by 2050 with reference to 2000:

- Europe retains leading edge design, manufacturing and system integration capabilities and associated jobs thanks to significantly decreased development costs (including a reduction of costs of certification by 50%), European aviation industry delivers the best products and services on the world-wide market with a global share of more than 40%.
- Aircraft CO<sub>2</sub> emissions are reduced by 75%, NO<sub>x</sub> emissions by 90% (both per passenger and per kilometre), perceived noise is reduced by 65%, emissions of other local atmospheric pollutants are significantly reduced, the effect of aviation on the environment and the wider impacts on the climate is better understood and quantified with improved accuracy.
- 90% of the travels involving air transport within Europe can be completed in 4 hours door to door, passengers can make informed decisions, air transport is well connected to other modes.

Type of action: Research and Innovation Actions (100% funding) – Two stage

### **MG.1.2-2014. Coordinated research and innovation actions targeting the highest levels of safety for European aviation**

Specific challenge: Safety is embedded in aircraft design and operations making air transport the safest transport mode. In Europe, accident rates involving passenger fatalities are of the order of 1.6 accidents per million flights (EASA, 2011). Nevertheless, new risks, e.g. arising from the integration of new technologies, new operations or emerging hazards must be proactively monitored and mitigated and continuous efforts are necessary to maintain the excellent records Europe has achieved over the last 60 years. Furthermore, the aviation community pursues a further decrease of accident rates by one order of magnitude and further significant progress will be achieved only if safety is addressed at system level. Therefore actions are needed using an integrated approach to safety.

Scope: Proposals will encompass research and innovation actions in targeted areas of aviation safety. The proposed research and innovation actions should be part of a broader safety roadmap established at system level, identifying and prioritising practical actions to be undertaken in the next seven years. It should be consistent with other roadmaps (e.g. European Aviation Research Partnership Group thematic programme, ACARE SRIA). Coordination with key European organisations which have a mandate in aviation safety (e.g. EASA, EUROCONTROL) and key European Initiatives (e.g. ACARE WG4, OPTICS Coordination Action on safety research) should be ensured.

Proposals should also demonstrate that the research and innovation actions for which EU-funding is requested will be complemented by other research and innovation actions on safety carried out by the proposal partners with at least an equivalent magnitude in terms of estimated resources (e.g. cumulated effort in person-months). A methodology should be put forward to evaluate this leverage effect during the project and at its end. The proposal should describe how links will be established with the other research and innovation actions from the partners and how the project will contribute to coordinate these.

The composition of the consortium should reflect openness and the fact that the partners have been selected in the light of the nature of the proposed actions. The overall management of the initiative could be designed for a longer term than the duration of the project with a

potential to be extended to other activities after a first review of the concept. The proposed actions should not overlap with those carried out in the SESAR and Clean Sky programmes. Where relevant, actions could include networking with projects from leading entities from third countries, to leverage resources and global impact (e.g. with US and Canada).

Proposals should also provide ad-hoc indicators to measure the expected progress in terms of reduction of the number of accidents when comparing the situation before the start of the project and after its completion. Also an indicator assessing the magnitude of the leverage effect resulting from the coordination of the research based on both the EU-funded part and the part of the work relying on partners in-house resources should be provided.

Expected impact: Actions will demonstrate in a quantified manner their potential to mature the Technology Readiness Level (TRL) in the range 1-6 of technologies and concepts that can contribute to reach by 2050 less than one accident per 10 million commercial aircraft flight departures and an 80% reduction of the accident rate compared to 2000 for specific operations, where weather hazards are evaluated and mitigated, in a system which includes all types of air vehicles, manned and unmanned, while preserving cost and time efficiency. It is also expected that the proposal will gather critical mass on a pan-European scale, overcoming gaps, duplication and fragmentation, create a leverage effect, enhance coherence and efficiency of aviation safety research in Europe and underpin the development of future safety regulations, operations and technology.

Type of action: Research and Innovation Actions (100% funding) – Two stage

### **MG.1.3-2014. Improving skills and knowledge base in European Aviation**

Specific challenge: The European aviation sector should have access to a highly skilled workforce which can rely on a strong scientific knowledge base to be able to properly address the environmental and competitiveness challenges facing both the aeronautics and the air transport sectors. Two specific challenges have to be addressed:

1. To analyse and define the evolving skill needs of the sector and propose changes to the education of aviation engineers accordingly, and to attract more young people to aviation careers.
2. To reduce the fragmentation in the dissemination of scientific and technical knowledge in Europe and enhance its global impact.

Scope: Proposals should address one of the two following domains:

1. Regarding the education of aviation engineers in Europe, the scope of the action is to identify the skill needs in the sector, propose improvements and further contribute to the harmonisation of the content of the curricula for aviation engineers towards the creation of a Europe wide system. The action should also develop and share outreach material and organise events to attract young people to studies leading to aviation careers. The initiative should build on existing mechanisms and associations. The consortium should include representatives from the aviation industry, research establishments and education institutions so that the proposed solutions can acquire recognition and support from these different stakeholders.
2. Regarding the dissemination of scientific and technical knowledge, the scope of the action is to create a Europe wide coordination mechanism gathering a representative

group of associations active in the field of aviation to harmonise and rationalise conferences, events and publications. The action will contribute to enhance the impact and accessibility of publications relevant to European aviation, in particular those issued from EU funded projects. The actions should aim at being self-supportable after the end of the project.

Expected impact:

Regarding area 1, the proposed actions should demonstrate their capacity to contribute to increase the attractiveness, quality, coherence and relevance of the curricula, enhance teaching methods and the profile of engineers matching the evolving and growing needs of the sector. The potential impact should be expressed in the light of the number of engineers which could benefit from the improvements and time / manpower savings when compared to the extra time young engineers need to adapt / train under the current situation before they can be operational.

Regarding area 2, the proposed actions should contribute to raise the impact and visibility of European conferences and events, to optimise the number and the yearly calendar of events and enhance the impact factor of scientific publications, their availability and access, in particular for those created in EU funded projects. The impact should be expressed in terms of: the time that could be saved for scientists / researchers when participating to conferences resulting from an optimised calendar of events, the time that could be saved in the search of information resulting from a centralised and structured approach to publications repository and the potential gain in impact factor resulting from an organised approach to EU-based journals. The gain of attractiveness of the European scientific dissemination system (compared to the US or other regions of the world) should be assessed qualitatively.

Type of action: Coordination and Support Actions – Single stage

## **MG.1.4-2014. Support to European Aviation Research and Innovation Policy**

Specific challenge: The Strategic Research and Innovation Agenda (SRIA) of the Advisory Council for Aviation Research and Innovation in Europe (ACARE) identified a number of domains where policy support is needed. The following two domains call for urgent actions; Proposals should address fully one of the two domains:

1. Door-to-door travel involving air transport is currently far from being seamless and therefore, based on the analysis of the current system, conceptual foundations of a novel system should be studied and proposed.
2. Certification, which is a key element to guarantee the safety of the air transport system, can be time consuming and costly; in addition, new approaches to certification have to be found to cope with novel technologies never used before. Therefore, innovative approaches to this process should be envisaged and studied.

Scope: Proposals should address one of the following areas:

1. Regarding seamless door to door travel involving air transport, the proposed actions should investigate the profile of customers and better understand their expectations by having a look at the air transport system and its connections from a user's perspective. The current effectiveness of traffic flows should be assessed and metrics developed in

order to identify the main areas to be improved (information to passengers, luggage handling, predictability, etc.). On this basis, the action should then develop a concept for a system that is capable of providing a door-to-door service to the customers, establish the broad lines of the architecture of this system and assess the feasibility and economic viability of the concept (cost-benefit analysis).

2. Regarding certification, the proposed actions should aim to review the current existing approaches (i.e. including outside of Europe) and identify which new tools and new methods could be used to accelerate the certification process (e.g. alternative means of compliance), lower its costs while ensuring the requested level of safety. The action requires the involvement of the key stakeholders who have authority and the capacity to act on the certification process, notably EASA (this does not necessarily require that these stakeholders are participants to the Proposal).

Expected impact: The proposed actions should pave the way for future research and innovation actions contributing to the following high level goals for the 2050 time horizon:

1. 90% of the travellers within Europe are able to complete their journey within 4 hours door to door. In order to guarantee its impact, the proposal should give indication on the methods and sources of data that are planned to be used to study customer profiles and traffic flows and assess the statistical representativeness. It should also present a sound dissemination plan, demonstrate that the results will be communicated to the appropriate stakeholders and, in particular to the potential partners that would be needed to initiate the first research and innovation actions.
2. The certification process is time efficient, its costs have been reduced by 50% (with reference to year 2000) while ensuring the required levels of safety and gaining global acceptance. In order to guarantee its impact, the proposal should demonstrate that the results will be communicated to the appropriate stakeholders and that the dissemination mechanism is capable of gaining endorsement and commitment at high level.

Type of action: Coordination and Support Actions – Single stage

### **MG.1.5-2014-2015. International cooperation in aeronautics**

Specific challenge: In order to leverage resources, mitigate risks and establish long term relationships, the European aeronautics sector should identify topics of common interest and mutual benefit with other regions of the world, in particular where these address societal challenges such as a worldwide safe air transport system, common standards (including for environmental aspects) and win-win situations for technological development. Aeronautics has inherently and increasingly an international dimension because almost all current aircraft programmes involve stakeholders from many different countries. Relations with a number of countries have already been initiated<sup>1</sup> with different levels of maturity and experience, calling for ad-hoc approaches which respect the different situations. For the coming years, actions are called in the two following domains:

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<sup>1</sup> FP7 Support actions with Canada(CANNAPE), Brazil - Latin America (Coopair-LA), Japan (SUNJET), China (Aerochina, GRAIN), South Africa (AeroAfrica-EU), Ukraine (AeroUkraine) and United States of America (CooperateUS) plus EU-US Memorandum of Cooperation on civil aviation research.

1. To establish or deepen links with countries, building on previously established cooperation where relevant, with the aim to identify subjects of common interest and mutual benefit.
2. To perform jointly research and innovation actions on topics of common interest, involving the appropriate funding from both sides.

Scope: Proposals should address entirely one domain, the first is opened in 2014 and the second domain is opened in 2015:

1. Set up platform of communication between EU and Japan including research and innovation stakeholders (industry, research establishments, academia) and aviation research and innovation funding authorities to maintain a common research and innovation roadmap. This could include organization of workshops and short term studies to identify preferred areas of common interest and win-win situations, barriers and solutions for improved cooperation in research and technology development, and recommendations for future actions. Proposals should demonstrate good knowledge of research mechanisms in the EU and Japan and take into account past and on-going cooperation initiatives.
2. The proposed research and innovation actions should address topics of common interest between Europe and the international partners<sup>2</sup>. This may include joint development of technologies which can enhance safety, reduce the impact of aviation on the environment (e.g. innovative aircraft configuration, drag reduction, environmentally friendly aero engines, understanding the mutual impact of aviation on the environment and the climate), mature new materials and manufacturing processes for aeronautics components and structures (e.g. composite materials) and develop numerical and experimental tools for aircraft design (e.g. advanced measurement techniques, use of supercomputing for large scale multidisciplinary applications, modelling of flow physics).

Expected impact:

Regarding domain 1, the action should contribute to deepen and widen cooperation with Japan and maintain a common research and innovation roadmap. Proposals could assess their impact by estimating the volume / funding of research and innovation actions which could be undertaken in cooperation between EU and Japan.

Regarding domain 2, actions should demonstrate their potential to mature the level of readiness of technologies and concepts, identify how the project results will be of mutual benefit and evaluate the leverage effect resulting from the coordinating research and innovation funding of EU and international partner (Russia, Japan, Canada or China).

Type of action: 1) 2014: Coordination and Support Actions – Single stage; 2) 2015: Research and Innovation Actions (100% funding) – Two stage

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<sup>2</sup> Discussion have been initiated with Russia, Japan, Canada and China; these actions are pending agreements between the EU and international partners and the content of the actions will be further specified in the light of the arrangements currently being defined with them.

## 2. RAIL

In order to fulfil its potential of playing a significant role in meeting future transport needs, while at the same time adapting to increasingly constrained public finances, the rail industry will need to radically progress in terms of service, costs, interoperability, capacity, noise reduction and competitiveness, and further develop its advantages in terms of carbon footprint. Set against such uphill challenge, crafting the right innovation strategy will require a step well beyond just technology. Novel business, organisational and logistic solutions as well as new partnerships with service and technology providers from more advanced sectors are deemed essential to support new economies of scale and the much needed search-for-excellence by rail. The goal will be to rapidly address the weaknesses that hamper rail services and operations and to engage in a number of game-changers in rail services and operations.

Proposals submitted under the topics below can be designed as a preparation for a fast and smooth start-up of large-scale initiatives as announced in the Commission Communication on 'Public-private partnerships in Horizon 2020: a powerful tool to deliver on innovation and growth in Europe'. In this context, the scope of the projects could include the assessment of feasibility of specific solutions or applications, proof-of-concepts, fast-prototyping or any relevant work conducive to a prototyping of a product or process in an operational environment – cf. the elaboration of a business case, the definition of technical, operational or service requirements, enabling planning or standardisation activities, critical technologies development or the set-up of validation/certification strategies. The selected projects will contribute to the objectives of the initiative to be implemented under a public-private partnership.

### MG.2.1-2014. I<sup>2</sup>I – Intelligent Infrastructure

Specific challenge: Taking into account the expected growth in transport demand and the ever-increasing customer expectations in quality of service, there is a need for a step change in the productivity of the infrastructure assets. These assets will need to be managed in a more holistic and intelligent way, using lean operational practices and smart technologies that can ultimately contribute to improving the reliability and responsiveness of customer service and the whole economics of rail transportation.

Scope: The research and innovation activities will evolve within the following three complementary work streams to be addressed separately:

- *Smart, cost-efficient, high-capacity rail infrastructure:* proposals should aim at identifying relevant infrastructure-related challenges and develop solutions that result in reduced investment and recurring operational costs and improve the reliability and availability of rail operations. Infrastructure requirements stemming from new solutions for smart rail services (see MG.2.2) should be properly taken into account.
- *I2M – Intelligent mobility management:* proposals should focus on the development of intelligent and automated rail traffic dispatching systems supporting an integrated approach to the optimisation of rail operations at network, route and individual train level. These should reconcile business and operational requirements (namely customer service, capacity, speed, timekeeping, energy, asset management) with real-time field and asset condition monitoring to deliver normal or near-normal services during all but the most exceptional circumstances. Particular emphasis should be given to real-

time data collection and analytics from trains and infrastructure for the purposes of goal-oriented predictive and adaptive control of the traffic and to minimise disturbances with a view to ensuring a minimum impact on services delivered. The interfaces and compatibility with information services from other transport modes shall be guaranteed. Full compatibility with European Rail Traffic Management System (ERTMS) must be ensured.

- *Energy management*: the work should address innovative approaches to improve the efficiency of energy usage in rail systems, embracing vehicles, infrastructure and operation within a whole-system perspective. This will imply notably the development of smart concepts in intelligent design and management of energy systems for rail applications which should be pursued from a whole-of-life perspective - from concept to implementation through the design, procurement, manufacturing, construction, operations and maintenance phases.

Expected impact: Research and innovation activities are expected to result in an indicative surge in the utilisation of capacity within a range 70-90% as well as a reduction in the recurrent costs of rail operations within a range of 25-45%. Part of the lower operating costs will evolve from reductions in the power supply operational and maintenance costs (~25%), reductions in transmission and distribution losses (~20%) and increases in reliability of operation (~20%). This is to be considered, in parallel, with potential savings in investment costs for the delivery of major infrastructure projects and related systems through the adoption of lean design and implementation strategies (that may amount up to 30% of total costs).

Type of action: Research and Innovation Actions (100% funding) – Two stage

## **MG.2.2-2014. Smart Rail Services**

Specific challenge: There are two main specific challenges concerning seamless travel and logistic services.

1. *Seamless multimodal travel*: The challenge is to enhance the rail traveller experience centred on solutions that respond to customer needs to support anytime, anywhere door-to-door intermodal journeys encompassing distinct modes of transportation, including factors as travel planning, one-stop-shop ticketing and booking transactions, en-route travel companion, real-time re-accommodation.
2. *Logistic services*: The challenge is two-fold:
  - To acquire a new service-oriented profile for rail freight services based on excellence in on-time delivery at competitive prices, interweaving its operations with other transport modes, addressing the real needs of the clientele while incorporating innovative value-added services.
  - To increase productivity, by addressing current operational and system weaknesses and limitations and finding cost-effective solutions to these problems. Fostering technology transfer from other sectors into rail freight will be crucial for these innovation strategies to be put in place.

Scope:

Regarding *Seamless multimodal travel*, research and innovation activities should aim at conceiving and prototyping an on-line, mobile, suite of integrated facilities providing a whole new traveller experience throughout the journey (namely planning and reservation of user-friendly multimodal trips and services, including the specific needs of persons with reduced mobility), easily accessible entitlements, validation and control for all transport modes, en-route assistance including re-accommodation. The whole process should be further supported by the necessary business analytics providing relevant feedback of traveller data with the aim of ensuring more robust and responsive transport operations. Developments should evolve on the basis of robust business models capable of guaranteeing the economics of these e-services in the long-term.

Regarding *Logistic Services*, proposals should aim at addressing the key challenges of freight through a systematic "top-down" approach that backtracks from the performance indicators to be achieved – either in a geographical reach perspective (i.e. applicability of the solutions on a European scale) or in market segmentation (e.g. trainload/intermodal/wagonload or commodity-based segments) - and define the optimal combination of business, operational and technological solutions that are required for their delivery. In view of the significant financial fragility of the sector, priority should be given to those aspects that maximise potential returns in the short-term and require only moderate investment.

Expected impact:

Regarding *Seamless Travel*, projects should aim at increased rail attractiveness through a new service profile for rail focused on customers by providing them with an integrated end-to-end solution for their travel needs – from transaction support to en-route assistance.

Regarding *Logistic Services*, projects should eventually be aimed at reaching 98% level on-time delivery, placing rail amongst the "best-in-class" of logistic operators and guaranteeing multimodal operations. This over-arching goal will imply achieving significant gains from a diversification of the freight business, re-engineering production processes towards a leaner, more service-focused stance capable of delivering significantly higher levels of productivity (e.g. a doubling of both the revenue per employee and the annual load-runs per wagon, reduction of up to 50% in dwell times and a two-fold increase in the load factor for trains/wagons).

Type of action: Research and Innovation Actions (100% funding) – Two stage

### **MG.2.3-2014. New generation of rail vehicles**

Specific challenge: A combination of rail customers' ever-evolving requirements regarding quality of service, mounting energy costs, reduced emissions and increasing stress on the economics of rail operation is generating a new wave of challenges to rail vehicle development – notably imposing the delivery of enhanced functionality, comfort operational performance, interoperability and reduced life cycle costs. Reconciling such requirements will imply a departure from the traditional, incremental approach to vehicle development to a whole new way of thinking on product development.

Scope: Research and innovation activities should focus on innovative system approaches leading in the longer-term to the development and demonstration of a new-generation of railway vehicles and passenger trains, characterised by significant improvements in product reliability, cost-effectiveness, user-friendliness, safety and security, environmental impacts, ease of manufacture and interoperability. This will demand not only the development and integration of higher-performance technologies for critical structural traction, command-control and cabin environment applications (e.g. new materials, smart power and wireless technologies) but also the design and production solutions (e.g. modular, "commercial off-the-shelf" or adaptive concepts) that best contribute to the lean manufacturing and lean operation of such vehicles. Proposals should also consider the development of innovative solutions to extend vehicle lifetime, or simplify retrofitting and will ensure interoperability through better Electro-Magnetic Compatibility (EMC) between the railway vehicles and the electrical installations of the network.

Attention should also be paid to the development of innovative, modular and customisable solutions for comfortable and attractive train interiors as an integral part of the whole passenger train concept. In particular, these should focus on delivering a unique traveller experience, facilitating accessibility, notably for persons with reduced mobility, fast boarding for commuters, as well as other on-board value-added services.

Expected impact: The key goal will be to deliver a reduction of up to 40% in life cycle costs of rolling stock products, an increase in passenger train capacity up to 15%, reductions of downtime by increased reliability ( up to 50%), whilst delivering superior performance in terms of overall service quality, safety and customer experience in rail transport.

Type of action: Research and Innovation Actions (100% funding) – Two stage

### 3. ROAD

This important section of the work programme addresses research and innovation for road transport which is complementary to the “Green vehicles” call. It includes activities in the field of Internal Combustion Engines based on conventional fuels (not included in the scope of the Green Vehicle call), in support of the air quality policy, safety of road transport, production technologies (from conceptual design to manufacturing) and new vehicle concepts for road and urban transport. The “Green vehicles” topics address the application of new types of energies to road transport and the improvement of the energy efficiency of road vehicles and their power trains. Whilst “Green vehicles” looks primarily at breakthrough research that will lead to a step change in road transport energy use, topics in this section will also address the necessary incremental improvements in road transport (e.g. advances in conventional internal combustion engines and safety) that will support the attainment of short to medium term EU policy targets.

#### **MG.3.1-2014. Technologies for low “real world” CO<sub>2</sub> and polluting emissions**

Specific challenge: Growing road transport 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. The challenge is therefore to develop a new generation of products and technologies able to reach post Euro 6 limits under real world driving conditions while complying with future CO<sub>2</sub> legislation and noise. At the same time, with the progressive reduction of particle emissions due to the introduction of particle filters, the contribution of brake components wear to air quality deterioration is relatively increasing, and it is important to deepen the understanding of the health risk that this constitutes and find ways of reducing these emissions in parallel to engine ones.

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

- Future spark-ignited engines and their pollution abatement systems for gasoline and bio-based liquid fuels for cars and vans focussing on the optimal combination of innovative engine and after-treatment technology and of modelling, sensing on-board emission monitoring and testing to improve the design and control capability.
- Future diesel engines for cars and vans also focussing on the combination of the most appropriate engine and after-treatment technologies and on modelling, sensing on-board emission monitoring and testing to improve the overall design and control capability.
- Low environmental impact brakes systems to reduce micro and nano particles emissions while improving the measurement and understanding of their effects on health and the environment.

Expected impact: Cleaner and more efficient road transport activities through advances in power trains and brake concepts, strengthening the leading role of European industries in the sector. Technological demonstration vehicles incorporating the new engine technologies must prove, by independent testing, real driving emissions below expected future EU requirements, while providing a 10% improvement in fuel consumption for gasoline and 15% for diesel in

comparison to the best vehicles on the market in 2013. For brakes, where no current legislation is applicable, at least a 50% reduction of particle emissions should be demonstrated.

Type of action: Innovation Actions (70% funding) – Two stage

### **MG.3.2-2014. Advanced bus concepts for increased efficiency**

Specific challenge: The challenge is to increase the modal share of public passenger transport, in particular by bus, and also promote co-modality. In addition, the economic situation today is highlighting the importance to study solutions for all segments of the urban bus market, capable to improve the attractiveness through innovative solutions for increased efficiency of the system. In particular energy consumption of auxiliaries in a bus represents a significant part of the overall consumption, heavily impacting energy efficiency performances.

Scope: Key innovative solutions should be developed and tested in real operational scenarios with the joint collaboration of industries and authorities/operators, adopting a system approach. This will entail research and demonstration activities for the vehicle and its interfaces with the transport system addressing all aspects below:

- Testing of strategies for energy and thermal management of buses, in particular auxiliaries such as climate systems for electrified vehicles lacking engine waste heat while excluding powertrain development.
- Specific drive assistance technologies, to encourage a driving style aiming at improving fuel consumption and passenger comfort.
- New solutions for the exterior and interior design and layout of buses (seating, passenger boarding/alighting, modularity and capacity, etc).
- Interface with the system: intelligent garage/maintenance of bus fleets (e.g. IT standard solutions for predictive maintenance); infrastructure (e.g. bus stops and urban elements to work as an optimised interface with the bus).

A strong involvement of the supply chain, in particular SMEs, is highly suitable.

Expected impact: Improvement of public transport in Europe through more attractive buses that contribute to strengthen the leading role of European industries in the sector, in particular through the development of standard components by the bus manufacturers and by the demonstration of at least a 30% reduction of energy needed for climate control.

Type of action: Innovation Actions (70% funding) – Two stage

### **MG.3.3-2014. Automotive supply chain management**

Specific challenge: The market environment for the European automotive sector is characterised by weak economic growth, limited investments and declining sales of new vehicles in the mature markets. The accelerating introduction of electrified vehicles puts an additional challenge to the European automotive industry, in particular to its related supply chain. As a consequence production strategies need to contemplate a mix of new products combined with innovative services, able to respond to customer needs in a flexible way. In the area of electrified vehicles this requires specific designs and the introduction of new

technologies and service innovation for vehicles (e.g. electric batteries and components) in manufacturing chains which must be matched by innovative production methods and processes in order to make them affordable and competitive compared with conventional cars.

Scope: Research and innovation activities will develop:

- Introduce innovative combinations of organisational and service innovation, advanced design, manufacturing and testing technologies as means of increasing flexibility, near-real time reactivity to changing market demand while allowing for large numbers of different configurations (mass customisation) and reducing costs.
- Concepts for innovative multi-powertrain platforms and flexible methods and processes for their integration into manufacturing and logistic chains.
- Optimise logistics by developing new supply framework structures in a global context.
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Expected impact: Actions should demonstrate their potential to mature the Technology Readiness Level of technologies and processes against sector specific competitiveness goals, in particular:

- Retaining leading edge European automotive product and process capabilities and jobs, boosting industry's share of GDP to 20% by 2020 by transitioning to a low-carbon, zero pollution and resource efficient road transport.
- Developing advanced collaboration schemes on a global scale integrating OEMs and suppliers (all level of tiers, greatly benefiting SMEs) across new worldwide supply chains deriving from the growth of electrified vehicles and their components in newly designed multi-powertrain vehicle models.

Type of action: Research and Innovation Actions (100% funding) – Two stage

### **MG.3.4-2014. Traffic safety analysis and integrated approach towards the safety of Vulnerable Road Users**

Specific challenge: Despite the improvement in road safety in recent years, road accidents and their consequences remain a serious social problem – on average 75 people lose their lives every day on European roads and 750 are seriously injured. Pedestrians, cyclists, motorbike and moped riders represent a particularly serious safety concern, since they account for a disproportionately high percentage of the total number of road fatalities and serious injuries. At the same time, measures aimed at improving safety often imply significant economic cost, and tend to become more incremental over time. The challenge is therefore to assess the societal benefits of such measures, to update existing knowledge of accident causation in the European Union and to improve the safety of Vulnerable Road Users (riders of Powered Two Wheelers, cyclists, pedestrians, the elderly and Persons with Reduced Mobility).

Scope: Research and innovation activities should address one or both of the following:

- Advanced safety measures involving vehicles, infrastructure, protective systems, training and development of behavioural knowledge to reduce the number and severity of accidents involving Vulnerable Road Users. All proposals should include

assessment of the effectiveness, and demonstration of relevant technologies, in real-life conditions.

- Developing an in-depth understanding of road accident causation, covering all aspects of road safety (vehicle, driver and infrastructure) together with appropriate actions for their prevention and mitigation. This shall include methods for conducting a comprehensive assessment of socio-economic costs related to road accidents, taking into consideration secondary costs related to congestion, material damage, vehicle uptime etc. as a basis for robust cost-benefit analysis of safety countermeasures at a transport system level.

Research will fill knowledge gaps at both European and national levels, and take into account regional differences. International cooperation is strongly encouraged. In line with the Union's strategy for international cooperation in research and innovation<sup>3</sup> international cooperation is encouraged.

Expected impact: Research in this area will contribute to delivering essential knowledge for the design and implementation of an efficient strategy to make European road users (particularly Vulnerable Road Users), vehicles and infrastructure safer, and so promote the development of the European Road Safety Observatory. Overall, research will 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.

Type of action: Research and Innovation Actions (100% funding) – Two stage

### **MG.3.5-2014. Cooperative ITS for safe, congestion-free and sustainable mobility**

Specific challenge: Europe would be closer to solving problems related to congestion, traffic safety and environmental challenges if people, vehicles, infrastructure and businesses were connected into one cooperative ecosystem combining integrated traffic and transport management with new elements of ubiquitous data collection and system self-management. Significant technological progress in this area has been made in the past years; however, large scale deployment is in its infancy. Additional research is needed to improve and demonstrate at a European scale the effectiveness and efficiency of integrated smart mobility solutions based on human-vehicle-infrastructure communication. Seamless integration of the benefits offered by the European Global Navigation Satellite System (European GNSS) in ITS applications will play an important role.

Scope: Research and innovation actions should address the development of one or several of the following domains:

- Open in-vehicle platform architecture for provision of real-time ITS services and mechanisms to provide seamless connectivity, interoperability and secure flow of information across stakeholders, including convergence of Dedicated Short-Range Communication (DSRC) and 4th generation mobile communication technologies.

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<sup>3</sup> COM(2012)497

- Improved positioning technology, building on innovative features of European GNSS systems, with standard interfaces to serve different ITS applications and new concepts for flexible charging based on guaranteed positioning.
- Highly accurate, dynamic maps for transport applications, leveraging technologies based on advanced GNSS and cloud computing.
- Innovative solutions for cooperative network management, multimodal transport services, safety applications and hazard warnings.
- Tailor-made solutions for heavy duty vehicles, integrating as much as possible tachograph, tolling, inspection and (dynamic) route guidance functions, etc.

The activities should support development of European Wide Service Platforms (EWSP). Proposed solutions should be demonstrated in real-life conditions, based on which the assessment of their effectiveness and their respective deployment requirements should be carried out. They have to propose robust built-in data privacy and security measures.

The scope of the work should extend towards full-scale early deployment, and should address issues related to suitability for public procurement, identification of (multi-stakeholder) business cases and value-added scenarios, users' acceptance and willingness to pay.

Priority will be given to proposals with strong participation of innovative SMEs and to proposals boosting international cooperation. Robust and convincing commercialization strategy in view of market roll-out of proposed solutions will be an advantage.

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

Expected impact: The establishment of an integrated transport "info-structure", relying on vehicle to vehicle (V2V) and vehicle to infrastructure (V2I) communications, but also on the availability of open and quality transport data, will improve transport system's

- safety level, by reducing the number of crashes
- efficiency, by offering efficient and cost-effective solutions for curbing congestion
- flexibility, by providing alternative options to drivers in case of traffic disruptions
- sustainability, by cutting down GHG and other pollutant emissions.

Type of action: Research and Innovation Actions (100% funding)

### **MG.3.6-2015. Safe and connected automation in road transport**

Specific challenge: Automated and progressively autonomous driving applications in road transport, actively interacting with its intelligent environment could provide an answer to the EU objective of reconciling growing mobility needs with improved transport fluidity while drastically reducing the occurrence of accidents.

Human errors in attention and vigilance are among the most common causes of road accidents and near-crashes. Somnolence and fatigue have severe effects on situational awareness and driving performance. This is why particular effort should be devoted to technologies that improve road safety by pre-empting or compensating for human error, and even taking over the vehicle control in case of imminent collision.

Automation in road transport should make best use of the evolution of Cooperative ITS and the benefits made available by satellite navigation systems, such as the increased accuracy and robustness. Connectivity and cooperative mobility will be the key driving force for integrating automation into novel mobility concepts enabled by the European Wide Service Platforms (EWSP).

Scope: Proposals should develop and demonstrate fault-tolerant, resilient technologies and applications that will allow highly automated driving through smart environments, meeting the requirements of complex real-life situations. Research and innovation activities could address one or more of the following aspects:

- Novel transport services and mobility concepts enabled by automated driving and connectivity.
- Automation specific to road freight sector, including smart, secure on-board and infrastructure based-systems and seamless integration with other modes.
- Advanced Driver Assistance Systems (ADAS) to effectively support drivers in accident avoidance and to mitigate the consequences of collisions, including tools to detect and measure undesirable or unusual driver condition and warn, control and correct that behaviour at different levels.
- Optimised Human Machine Interface (HMI), capable of tailoring and balancing the amount of information the driver is capable of processing in continuously changing conditions to maximise drivers' attention and system acceptance.

All proposals should include an assessment of the effectiveness of the relevant technologies in real life conditions. Aspects related to liability and standardisation will also form an important part of the research work. Policy and regulatory framework recommendations should be formulated as appropriate. In line with the Union's strategy for international cooperation in research and innovation<sup>4</sup> international cooperation is encouraged.

Expected impact: Projects should contribute to:

- Enhanced robustness and performance of sensor and data analysis systems, improving (semi)autonomous driving capabilities.
- Optimised HMI and advice strategies together with unobtrusive methods for measuring workload, distraction and fatigue.
- Improved traffic flow through better exploitation of the existing infrastructure capacity, and reduction of emissions.
- Enhanced traffic safety supporting the Transport White Paper's "Vision Zero" where nobody is killed on European roads by 2050.
- Support authorities and standardisation bodies in solving the main issues related to the regulatory framework.
- Reduction of the systems' development costs and thus increased penetration rate in lower-cost vehicle segments.

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<sup>4</sup> COM(2012)497

- Raising competitiveness of the European industry in developing breakthrough technological solutions.

Type of action: Research and Innovation Actions (100% funding) – Two stage

### **MG.3.7-2015. The cleanest engine**

**Placeholder: subject to the outcome of a study aimed at designing and implementing inducement prizes, recently launched at RTD level.**

Specific challenge: Internal combustion engines have a major role in producing noxious emissions. One of the major targets of EU transport policy – in line with the other EU policy goals in the field of energy efficiency, environmental protection and climate change mitigation – is to achieve compliance with air quality regulations. These complement other policy goals, such as the reduction of CO<sub>2</sub> emissions from transport, which should deliver virtually carbon free cities by 2050. These objectives call for an ambitious mix of innovative policy measures and significant technological breakthroughs, notably for the engines. The transport challenge of the H2020 proposal is designed in a way as to help pursue both.

An inducement prize setting "at the horizon" targets for the lowest attainable real life noxious emissions from internal combustion engines (in particular diesel) would help accelerate the current slow improvements in air quality, and thus substantially enhance the prospect of achieving the ambitious EU policy goals, while at the same time strengthening the competitive advantages of the European automotive industry which will be able to propose these technologies in emerging countries even more affected by air quality problems. This activity would complement effectively the work foreseen under proposed "European Green Vehicle Initiative" which will strongly focus on CO<sub>2</sub> emissions reductions.

## **4. WATERBORNE**

A modern, safe, secure and resource efficient waterborne transport system, encompassing deep sea shipping, coastal shipping around Europe and the use of the internal waterways, is an essential requirement for an economy which aims at succeeding on the global scale and supporting a truly integrated internal market.

Today's challenges for the sustainable development of such a system are defined by the optimal use of energy sources and the minimisation of its environmental impacts, in particular with regard to pollutant and greenhouse gas emissions. The waterborne sector is still lagging behind in these respects as compared with other transport modes.

Europe remains a world leader in the design, production and operation of waterborne assets, but its industry is facing ever fiercer global competition. To stay ahead, the entire value chain needs an accelerated creation and deployment of research and innovation solutions whilst at the same time there is a need to explore new frontiers in terms of vessels, operational paradigms and the industrial use of the oceans.

### **MG.4.1-2014. Towards the energy efficient and emission free vessel**

Specific challenge: The challenge is to support developments that make new and existing vessels in maritime transport and inland navigation significantly more efficient and less polluting through solutions addressing four ship sub-systems: engine, pollution abatement systems, propulsion, energy sources and management.

Waterborne transport still offers an enormous potential for pollution reduction and energy efficiency gains. The reduction of pollutant and greenhouse gas emissions is far removed from the progress made in road transport, particularly in the category of older, small to medium-size vessels which make up a large proportion of intra-European waterborne transport, including inland navigation.

Since vessels have a long life expectancy, developing technologies for clean retrofit and fuel conversion solutions is a key aspect of the challenge.

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

- Optimisation of conventional ship engines, including fuel flexibility, new materials, lifetime performance and near zero emissions engines.
- Development of low-maintenance, affordable off-the-shelf retrofit solutions for emission reductions of existing engines used in inland navigation.
- Development of Liquified Natural Gas/dual fuel powered engines for small and mid-size ships, including the specific aspects of retrofitting, fuel storage, safety and classification, and solutions to address the risks of methane slip.
- Design and demonstration of new and improved propulsion means and vessel configurations that include the entire drive train and the propeller and hull optimization for vessels, including applied research in Computational Fluid Dynamics (CFD).

- Use of new energy sources including renewables, alternative fuels, hybrid and electric solutions with the aim to demonstrate the feasibility of the zero or near-zero emissions vessel.
- Solutions that are sufficiently close to market take-up so that ship owners will consider these concepts in their future investment plans should be demonstrated. This applies in particular to the existing fleet and retrofitting solutions which must be cost-effective and present a considerable societal return on investment.
- Research and innovation efforts should enable pilot applications for new engines, new pollution abatement technologies, new propulsion lines and alternative fuels solutions to enter the market by the end of the research period.

Expected impact: It is expected to:

- Achieve efficiency gains and emission reductions that go significantly beyond normal technological progress and the benchmarks of the existing regulatory regimes at lowest costs.
- Achieve fuel efficiency gains of at least 15% for retrofitting per type of solution (engine or propulsion) and at least 30% per type of solution for new concepts.
- Accomplish a 25% decrease in greenhouse gas emissions and a reduction of, on average, 80% in air pollution compared with Best Available Technology (BAT).

Experience acquired in this innovative field should be broadly made available to ship owners requiring improvements in the environmental performance of their vessel.

Type of action: Innovation Actions (70% funding) – Two stage

#### **MG.4.2-2014. Safer and more efficient waterborne operations through new technologies and smarter traffic management**

Specific challenge: Ensuring and enhancing the safety of waterborne operations is of high importance for the EU since past and recent maritime disasters and accidents in inland navigation have shown that accidents come with high costs in terms of loss of life, environmental damage, economic impact, and the overall image and public perception of the waterborne sector. Whilst the safe operations of cargo vessels remain a challenge to be addressed, the significant and continuing growth in the size of cruise ships and the expansion of their operating areas to remote regions (and particularly difficult environments such as the Arctic) has created a new and increasing risk. More research is needed to develop and demonstrate innovative solutions for ship design and waterborne operations in order to avoid and mitigate passenger risks, ensure high levels of safety, whilst at the same time preserving increased passenger expectations of comfort and on-board amenities.

Enhanced or new technologies for maritime traffic management will be key for a safer and more secure operations as well as to lower emissions, whilst supporting a more competitive maritime transport as part of an integrated transport chain. To reduce congestion in ports and port fairways, port traffic guidance systems need to be at the same time cost efficient and easily deployable. Synergies with existing systems should be ensured, with the aim of integrating the use of port traffic guidance tools by all relevant authorities and ensuring the

full interoperability between Information and Communication Technologies (ICT) systems, which monitor vessels, freight and port services.

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

- Safer shipping through innovative conceptual (hull, general arrangement) and detail designs (exterior and interior) of vessels and systems and through a new approach to emergency response.
- New safety devices and their demonstration, including new technologies and operational solutions for the evacuation of large passenger ships, black-out mitigation, fire proofing and making ships more salvage friendly.
- New and improved systems for the surveillance, monitoring and integrated management of waterborne transport and other activities (commercial and non-commercial).
- New and cost effective European Global Navigation Satellite System (European GNSS)-based procedures for port approach, pilotage and guidance, ICT-enabled shipping lanes and maritime services that will reduce the risk of accidents and incidents in port approaches and dense traffic lanes, and minimise both delays and turn-around times.
- For traffic management, solutions that support the extension, integration and optimisation of waterborne transport information and communication systems with the aim of contributing to build a comprehensive "e-maritime" environment (including e-navigation components). They should serve the overall objective of building the European Maritime Transport Space without Barriers allowing waterborne transport (including inland navigation) to be used to the full potential of the integrated intermodal logistic chain. Solutions should also provide the foundation for the deployment of autonomous and actively guided ships as well as the possibility to verify all related safety certificates before the vessel enters the port.

Inputs to EU and international regulatory regimes, standardisation and international research co-operation are expected for the above areas, in particular regarding safety devices.

In line with the Union's strategy for international cooperation in research and innovation<sup>5</sup> international cooperation is encouraged.

Expected impact: It is expected to:

- Achieve significant improvements in terms of navigational safety and efficiency (in particular emission reductions) along the entire waterborne transport logistic chain, and decrease administrative burdens.
- Facilitate the transfer of new safety concepts from passenger shipping to other areas of maritime operations.
- Show a statistically relevant decrease in the number of fatalities caused by maritime accidents, the number of ship losses and specific incidents such as fires or black-outs accompanied, where relevant, by operational empirical evidence.
- Support the upgrading of international maritime safety regimes through relevant inputs.

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<sup>5</sup> COM(2012)497

Type of action: Innovation Actions (70% funding) – Two stage

### **MG.4.3-2015. System modelling and life-cycle cost optimisation for waterborne assets**

Specific challenge: The European maritime technologies industry is facing fierce global competition on price in its traditional markets which forces it to shift its focus to profitable (existing and new) markets where technical excellence and smart custom-made solutions are the key to market success. In order to develop these niche markets and exploit them successfully, research and innovation efforts are required that introduce new design and production processes with the aim of having minimal total costs over the useful economic life of the product which, for waterborne assets (vessels and maritime structures), is particularly long (20-50 years).

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

- New design and mathematical modelling tools and paradigms supporting the full understanding of operational practices and situations covering the entire useful economic life of a vessel or maritime structure ("from cradle to grave").
- A comprehensive and detailed approach to system integration and optimisation for vessels which is multi-objective driven, based on virtual product (digital mock-up) methodologies (with virtual reality capabilities). The resulting model must include all technical systems and sub-systems and must cover all operational conditions of the complete system. Modelling should cover the majority of ship types produced in Europe and should be based on the new tools and paradigms.
- A large scale virtual demonstrator for smart, adaptive and multi-material complex ships and structures, based on the tools and concepts for minimised life-cycle costs and using the complete product model.

Expected impact: It is expected:

- Achieve measurable cost reductions in design, production and lifetime maritime asset management.
- Facilitate a shorter time for assessment and integration of sub-systems on board vessels and a better integration of complex systems, in particular in relation with energy issues and efficient operations. This should lead to efficiency gains of 20% in terms of energy consumption and of 10% in terms of other operational costs.

Type of action: Research and Innovation Actions (100% funding) – Two stage

### **MG.4.4-2014. Promoting innovation in the Inland Waterways Transport (IWT) sector**

Specific challenge: The maritime and inland waterways sectors have different dynamics as regards policy developments and policy-making cycles. The Inland Waterways Transport (IWT) sector cannot benefit from the same economies of scale as the maritime sector, also because it is largely dominated by SMEs. The global dimension is practically absent; the

sector has a stronger regional focus, is more driven by EU legislation and is more integrated into the internal market.

New priorities for inland navigation policy have emerged, including those coming from the NAIADES II action programme, which require RDI support as a key building block for exploiting synergies and bringing about an integrated, comprehensive, and sustainable waterborne transport system. This will improve the competitive position of IWT and give it a better environmental performance.

Scope: In order to drive an innovation agenda for the sector particular attention proposals should address the following three issues together:

- Support a massive introduction of a range of alternative energy concepts in IWT. New technological solutions are to be developed, which aim at achieving emission levels in IWT that reflect the state of the art and are at least similar to those of road transport. research and innovation efforts should focus on new concepts that are tested through real-life pilot deployments which are accompanied by a thorough assessment of operational and environmental performance, including cost-efficiency. The certification of solutions should be addressed in order to stimulate widespread take-up.
- Establishment of a testing and monitoring regime for the application of strict emission limits to various categories of existing vessels/engines, including certification, implementation and type approval of retrofit solutions, appropriate test cycles and procedures for compliance monitoring.
- Develop simulator-based tools for education/training and cost-efficient navigation based on the assessment of manning and training/qualification requirements with regard to vessel operation and cargo handling.

Expected impact: Major progress should be made regarding the environmental performance and the energy efficiency of the IWT sector, improving its competitiveness as part of the Single European Transport Area.

New qualifications should allow for a more mobile and up-skilled work force.

As inland navigation in Europe also affects non-EU and non-EEA countries, international co-operation aspects in research and deployment of results should be addressed. Inputs to standardisation efforts should be made in terms of technical requirements for navigation and qualifications.

Type of action: Research and Innovation Actions (100% funding) – Two stage

## **5. URBAN MOBILITY**

The start of Horizon 2020 means the launch of CIVITAS 2020: innovation in resource-efficient and competitive urban mobility and transport. Improving the efficiency of urban transport and mitigating the negative effects of transport effectively is crucial for the performance and attractiveness of Europe's urban centres. Urban mobility figures prominently in the 2011 Transport White Paper which calls for achieving essentially CO<sub>2</sub>-free city logistics in major urban centres by 2030, and for phasing out the use of conventionally-fuelled cars in cities by 2050. This requires a transformation in the use of vehicles, more efficient and lower impact city logistics, and a significant reduction in urban road congestion, combined with a broad introduction of cleaner vehicles powered by alternative fuels and drive trains.

CIVITAS 2020 seeks to drive the innovative policies and technologies needed for the transformation towards cleaner and better urban mobility and transport. CIVITAS 2020 is structured around five complementary challenge-topics. It will put in place a framework for coordinated evaluation, dissemination and information exchange, as outlined at the end of this section. CIVITAS will continue to support local partnerships in implementing and testing new approaches under real-life conditions. Participating cities work together and exchange experiences while they undertake a process evaluation and impact evaluation and investigate the transferability of the tested solutions. This results in a developing knowledge-base, technical capacity and support for up-scaling and transfer which are available to all cities.

### **MG.5.1-2014. Transforming the use of conventionally fuelled vehicles in urban areas**

Specific challenge: Significantly reducing the use of fossil fuels in urban mobility whilst increasing the accessibility and attractiveness of urban areas will, in addition to advances in vehicle technology, require new, cost effective policy measures and tools. In particular the increased use of non-conventionally fuelled vehicles in urban areas is a key challenge.

Scope: Proposals should address one of the following domains:

- Comparing innovative policies, measures and tools that will, inter alia, halve the use of conventionally fuelled vehicles in cities, while increasing accessibility of urban areas and improve air quality and road safety. This could include:
  - Assessing the role of regulatory measures, demand side measures and the promotion of alternative modes as part of wider package of technologies, policy-based and soft measures with a strong potential for replication. The related consensus building, information and communication activities should be fully integrated in the work. Attention should be paid to issues related to vulnerable groups of citizens and gender issues.
  - Exploring how changes in mobility behaviour, individual choices, and social norms can be catalysed, accelerated and guided towards modal shift, changing vehicle use or ownership, reducing the need for travel, or other options and/or their combination. Relevant drivers and barriers could be identified. The research should gather, evaluate and disseminate techniques that can be employed, including approaches that use social media.

- Exploring policy frameworks and measures to ensure the uptake of alternative fuelled vehicle fleets in urban areas. This could include:
  - Assessing the opportunities for large scale deployment of alternative fuel distribution infrastructure, including for electric vehicle recharging. This could include a comparative assessment of deployment approaches combined with the adequate vehicles. Partnerships, business models and planning/rollout approaches could be addressed. Standardisation aspects could form part of the work. Pre-commercial procurement initiatives could be facilitated.
  - Analysing the potentials for upgrading and/or regenerating electric public transport systems (i.e. trolleybus, tram and metro), in line with the trend towards electromobility in urban areas. This could include the evaluation of costs and benefits of development schemes as well as knowledge transfer, exchange of experience and preparing policy recommendations. Research and innovation activities to improve the operational potential and energy performance of electric public transport may be included.

Expected impact: The project(s) should lead to increased knowledge and awareness of cost effective strategies, policies and approaches contributing to halving the use of conventionally fuelled vehicles in different types of cities through a variety of approaches. This should result, through increased acceptance by users, operators and policy makers, in their accelerated rollout. Clear commitments from participants, and leadership for an ambitious Europe-wide take up and rollout of results during and following the project(s) are expected.

Type of action: Research and Innovation Actions (100% funding) – Two stage

### **MG.5.2-2014. Reducing impacts and costs of freight and service trips in urban areas**

Specific challenge: In addition to advances in vehicle technology, achieving essentially CO<sub>2</sub>-free city logistics will require significant improvements in the efficiency of goods, waste and service trips to reduce negative impacts and costs. This will require, among others, an improved knowledge and understanding of freight distribution and service trips and the development of best practice guidance on innovative approaches and how to replicate them.

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

- Improving basic knowledge and understanding on freight distribution and service trips in urban areas. This could address research on indicators and data collection (e.g. delivery characteristics, operators, movements, and impacts); economic and behavioural modelling; effects of logistics sprawl (e.g. impact of decentralisation of logistics facilities on transport movements); freight mitigation strategies; effectiveness of partnerships and stakeholder engagement; and comparative analyses and evaluation of policies and experiments
- Assessing innovative policies and solutions to ensure a better use of infrastructure (e.g. delivery spaces, off peak deliveries, non-road modes) and vehicles (types, load factors); improve network management; address demand side measures, new ways of stakeholder collaboration; and provide policy frameworks that allow sustainable business models for urban logistics solutions.

- Assessing innovative policies and solutions on consolidation and distribution centres in urban areas, including design (e.g. cross-docking); business models for consolidation schemes (including fleet and freight sharing and pooling and adequate collaboration frameworks); integration of direct and reverse logistics; tools to identify and measure consolidation opportunities; and governance models.

This topic complements the work under topic MG.6.1 of this work programme.

In line with the Union's strategy for international cooperation in research and innovation<sup>6</sup> international cooperation is encouraged, in particular with the United States.

Expected impact: The project(s) should result in a clear understanding of cost effective (non-vehicle technology based) strategies, measures and tools to achieve essentially zero emission city logistics in urban centres by 2030. Particular attention should be paid to significantly increased load factors and reduced vehicle movements/kilometres resulting in cost and emission benefits. Practical guidance will result in a better integration of city logistics in urban policies. Clear commitments from participants, and leadership for an ambitious Europe-wide take up and rollout of results during and following the project(s) are expected.

Type of action: Research and Innovation Actions (100% funding) – Two stage

### **MG.5.3-2014. Tackling urban road congestion**

Specific challenge: Significantly reducing urban road congestion and improving the financial sustainability of urban transport will bring major benefits for the economy, the attractiveness of cities and citizens' wellbeing. This requires an improved understanding of measures to reduce urban road congestion whilst increasing urban accessibility for passengers and freight and contribute to the achievement of broader sustainable urban transport policy objectives. It also requires new thinking and innovative business models and service concepts for public transport, adapted to increasingly limited public budgets.

Scope: Proposals should address one of the following domains:

- Analysing measures and tools to understand and secure a long term reduction in urban road congestion. In particular the links with other aspects of urban mobility e.g. public transport services, mobility management, parking policy and road user charging schemes could be addressed.
- Exploring how a favourable environment can be created for a significant growth in public transport at limited extra costs. The research should provide an overview and analysis of innovative approaches in areas such as fares, taxes and levies; infrastructure investment; rolling-stock renewal; customer orientation; operations and service concepts; demand management; and regulatory frameworks. Recommendations, tools and guidance material could be developed and tested at the local level to support operators and authorities in developing business models that match their needs and circumstances. The work could be accompanied by a platform with stakeholders from different organisational, economic and social contexts.

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<sup>6</sup> COM(2012)497

- Developing, testing and evaluating solutions for smart connected mobility services based on Cooperative Intelligent Transport Systems addressing the specific needs of the urban environment and interoperability with interurban transport. In particular, the work should explore how to smartly integrate existing network management tools that collect data through cooperative systems, mobile phones, and other data sources. This would provide citizens with integrated mobility information by analysing available real time data feeds, and customizing this information according to individual's mobility requirements and assess how innovative services provided on this basis can lead to behavioural change, resulting in better traffic conditions, reduced congestion and lower environmental impacts of transport.

Expected impact: The projects should result in improved understanding of proven policy measures and tools and technology options that can contribute to a significant reduction of congestion whilst increasing accessibility in urban areas. They should also produce insights on the feasibility of new public transport business models with long term financial sustainability. Projects on smart connected mobility services should produce new insights on impacts on behaviour, leading to better traffic conditions and environmental benefits. Clear commitments from participants, and leadership for an ambitious Europe-wide take up and rollout of results during and following the projects are expected.

Type of action: Research and Innovation Actions (100% funding) – Two stage

### **MG.5.4-2015. Strengthening the knowledge and capacities of local authorities**

Specific challenge: Achieving sustainable urban mobility requires the adoption of new strategic planning approaches at the local level. However, very few authorities undertake a sound analysis of trends, develop scenarios and provide the necessary long term policies and focus. Without strengthening of authorities' knowledge and capacities, a transformation of urban mobility planning will not be achieved.

Scope: Proposals should address one of the following domains:

- Promoting take up of the innovative concept of Sustainable Urban Mobility Plans (SUMP). Proposals from large networked groups of local authorities should include instruments and mechanisms for information exchange to assist them in preparing and implementing SUMP. The plans follow the Commission's guidance<sup>7</sup> and include quantified targets. Proposals should ensure that the plans comprise a long-term vision, build on local consultation and interdepartmental coordination, include monitoring and evaluation, address financing options, and consider a wide range of measures, including newly-emerging technologies, policy-based, and soft measures.
- Developing simple, harmonised tools for scenario development and trend analysis by local authorities, in support of the development of SUMP. The development of simple, harmonised tools for the collection and interpretation of harmonised 'open' data could also be included. The work should cover the economic, environmental and social dimensions of sustainability. Gender issues and the needs of vulnerable groups

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<sup>7</sup> To be specified later in 2013, when EC guidance will be provided as part of the Urban Mobility Package.

should be incorporated. To allow for an understanding of trends at European level, opportunities for 'up-scaling' the local results should be explored. Data collected in the framework of CIVITAS should be fully exploited.

Expected impact: The projects on Sustainable Urban Mobility Plans will generate a high leverage factor, especially in regions where take up is so far low. They show strong commitment on the preparation and implementation of the plans. The projects on scenario development and analysis will produce practical tools and methods to obtain data and provide a comprehensive picture of current and future urban mobility and transport. These will be tested and fit-for-use by local authorities and other relevant actors.

Type of action: Research and Innovation Actions (100% funding) – Two stage

### **MG.5.5-2015. Demonstrating and testing innovative solutions for cleaner and better urban transport and mobility**

Specific challenge: Many of Europe's urban areas are struggling to meet the transport-related challenges they are facing. New technologies and innovative measures are emerging which offer great potential for increasing the quality and efficiency of urban mobility and transport, and for reducing transport's negative impacts. However, they are not taken up at a scale that is necessary to meet the targets of the Transport White Paper. Cities are hesitating to implement innovative solutions because little information is available on their effectiveness and on how the barriers to their successful implementation can be overcome.

Scope: The first part of the topic addresses city-led consortia, composed of four to five cities and led by at least two advanced cities, which are committed to establish living laboratories where innovative solutions can be demonstrated and tested. The participating cities should prove their common interests and have a clear vision on how they will ensure a meaningful and close cooperation between them. The proposals should outline how the work will support cities' efforts to follow a viable path towards sustainable mobility.

Each of the cities should follow an integrated approach by implementing, in a laboratory-area, a set of complementary and mutually supporting solutions and subsequently investigating their individual impact and the impact on the laboratory-area as a whole. The solutions should be newly-emerging technologies, policy-based, and soft measures with a strong replication potential. They should cover the eight 'CIVITAS measure categories': clean fuels and vehicles; collective passenger transport; demand management strategies; mobility management; safety and security; car-independent lifestyles; urban freight logistics; and transport telematics

Proposals may include suggestions for relevant preparatory actions, research activities, take up and replication actions, and for tools to support policy making, planning, management and operation of urban transport systems. They may also include activities to support local planning and policy making processes and that contribute to the development or updating of a Sustainable Urban Mobility Plans.

In line with the Union's strategy for international cooperation in research and innovation, projects will contribute to implementing the EU-China High Level Dialogue on Transport

agreement of 24 September 2012 and enhance the objectives of the 'Joint Declaration on EU-China Urbanisation Partnership'<sup>8</sup>.

By demonstrating and testing the innovative solutions under real-life conditions, combined with a thorough impact and process evaluation on the basis of a common framework using a clear baseline in each city, projects will provide qualitative and quantitative information on the results of the local solutions implemented; evaluate the effectiveness of these solutions in achieving local policy objectives; assess the barriers to implementation and broad deployment of these solutions and provide recommendations on how to overcome them; set up an effective internal platform for cooperation and exchange to allow each project participant to benefit from the other participants' experiences and know-how; and actively support the dissemination of results and experiences.

The second part of the topic covers a support action which will facilitate common activities across the projects, cities and stakeholders involved in the projects under this topic, and from across CIVITAS 2020. To ensure a high visibility and to maximise impact of project results, a communication and dissemination plan should be developed and implemented. The action should further elaborate the common 'CIVITAS Process and Impact Evaluation Framework' and support its implementation. Local knowledge for improved policy making could be extended through information exchange, training, staff exchange, etc. Initiatives to promote the uptake of innovative solutions could be launched. The support action should also ensure continuity of the 'CIVITAS Secretariat'.

Expected impact: The demonstration projects should produce new insights on impacts and barriers, which can act as inputs to the developing European knowledge base on the effectiveness of innovative solutions and how to overcome the barriers to their successful implementation. Clear commitments from participants, and leadership for an ambitious Europe-wide take up and rollout of results during and following the projects are expected.

The support action will help to promote take up of innovation by strengthening the mechanisms for urban transport policy making and planning and well as the technical capacity of the relevant actors in the participating cities.

Type of action: 1) Innovation Actions (70% funding) – Two stage; 2) Coordination and Support Actions – Single stage

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<sup>8</sup> Subject to the finalisation of the appropriate arrangements.

## **6. 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 2010, EU-27 freight transport was close to 3.9 trillion tonne-kilometres (tkm), of which about 45% was on the road and 40% by sea. Currently, only 5% of internal EU freight traffic flows through intermodal routes. Eurostat surveys estimate that 24% of good vehicles in the EU are running empty and that the average loading of the rest is 57% giving an overall efficiency of 43%. Flow imbalance can only explain half of this loss.

The total volume of logistics expenditures in the EU was estimated at €30 billion in 2010. A 10% to 30% improvement in efficiency in the EU logistics sector has been estimated to give savings of between €100 billion and €300 billion per year. The aim of these topics is to increase efficiency and hence sustainability in the logistics supply chain, removing 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.

### **MG.6.1-2014. Fostering synergies alongside the supply chain (including e.commerce)**

Specific challenge: The global challenge is to find the right business models for a number of separate activities that when brought together can foster synergies that satisfy the seemingly mutually exclusive objectives of decoupling the growth of urban and inter-urban freight transport demand from its consequences on traffic and the environment. This can be done by horizontal collaboration between retail, distribution, logistics, traffic management and users in a more intelligent chain, taking into account the following trends:

- Redesigned global logistics processes, including the last mile component of the logistics chain. The redesign requires a sound information infrastructure for retailers, consumers and utility service providers and collaboration of authorities, shippers and logistics service providers along delivery chains.
- E.commerce developments with the subsequent need for personalised, secure and efficient order fulfilment and delivery, by establishing collaborative and mutualized business cases.
- The transition from the current independent supply networks to open global networks where resources are compatible, accessible and easily interconnected.

Scope: The work should establish and demonstrate mechanisms to foster synergies through:

- Improved collaboration and concerted actions between all authorities, shippers, retailers and logistics service providers for door-to-door transport.
- Co-operative Intelligent Transport Systems (C-ITS) and cloud based services, integrated into an on-line planning platform that offers new means of communication amongst vehicles, between delivery vehicles & traffic management and to end users.

- The design and delivery of a proof of concept model for e-commerce logistics execution.
- Develop tools and test cases for the mutualisation of truck use. An example would be to provide a mechanism for the public internet auction of logistics services (e-bay type) centres on the trading of back-loading opportunities.

Participation of SMEs with proven experience in these areas will be considered an asset.

Ethical aspects referring to the transport of livestock should be duly considered where appropriate. The work should assess social implications, especially the effect on employment and the economic effects of the solutions envisaged.

Expected impact: Projects should contribute to:

- Reduce the number of delivery vehicles by at least 10% and hence limit congestion, pollution and GHG emissions.
- Improve truck and container load factors (+ 50% in test cases and overall stabilise load factors) and provide new 'back-load' possibilities.
- Serve as an inspirational example for future market collaboration.

Type of action: Research and Innovation Actions (100% funding) – Two stage

## **MG.6.2-2014. De-stressing the supply chain**

Specific challenge: The challenge for industry is to overcome the stress caused through dealing with the increasing length, complexity and vulnerability of supply chains while enhancing the performance, quality and knowledge needed to plan seamless transports of goods. To this end, a better understanding is needed of the technological and operational opportunities that 'slow steaming' and synchro-modal operations provide.

Scope: The work should assess the added value of, and the technical, economic, political, social (including the effect on employment and safety) and organisational aspects of the whole transport and logistics supply chain (both inland and overseas, long and short haul) regarding:

- The impact of slow steaming on supply chains, production processes and trade lanes including opportunities that exist to de-stress other transport modes and make slow steaming and de-stressing a positive economic as well as environmental success.
- Information systems including e-Freight tools, infrastructures, smart coordination mechanisms, policies, and legal possibilities to be able to use different transportation modes flexibly to deliver maximum value to the shipper or end customer. This should demonstrate through implementation the added value of synchro-modality in networks and services.
- The work should focus on technology specifications, business models and governance structures for both 'slow steaming' and synchro-modal vehicles/vessels and technologies to fulfil logistics paradigms and new business models, including collaboration regimes. A profound benefit to sustainability is expected.

Expected impact: Slow steaming offers a strong potential to reduce operating costs of a liner shipping company. A limited reduction in speed may lead to almost halving the costs of

bunker fuel and environmental impacts. Both synchro-modality and 'slow steaming' will enable logistics to operate more sustainably, at lower costs and at higher quality. This will bring benefit to freight intermodal transport by significantly improving freight transfer efficiency and hence help replace road only transport by incorporating other modes with less external negative effects, as well as improving the utilisation of existing infrastructures in order to meet expected increased demand.

Type of action: Research and Innovation Actions (100% funding) – Two stage

### **MG.6.3-2015. Common communication and navigation platforms for pan-European logistics applications**

Specific challenge: Today, new international and intermodal repositories and data pipelines are being created, management systems are deployed and new data mining capabilities are being developed to deal with the data flood needed for logistics decision making . Unfortunately, these data uses involve different information systems, different user requirements, different business models and different deployment trajectories. This constitutes an obstacle for the deployment of pan-European logistics solutions.

The challenge is to develop architectures and open systems for information sharing and valorisation, connecting key stakeholders with information and expertise enabling exploitation on the basis of trusted business agreements and with the relevant authorities (transport authorities and customs being the most eloquent player, but there are also other authorities in relation to health, safety, etc.).

Scope: The work should focus on solutions to enable actors to take fast and well-informed decisions inside and cross-companies. This implies that information with the right quality, reliability and content is made available to concerned actors and shared between them. The work will develop an open system and architecture that facilitates real time information exchange and co-operation between agents in the network. It will facilitate collaboration and give good confidence that a significant number of cases of horizontal shipper collaboration can be established within the horizon of the project and have a high expectation of continuance after the project ends.

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

- Mobile communications for secured information exchange among actors (users, service providers, operators, communities).
- Secure, resilient and trusted communications and information storage and processing including adequate information delivery infrastructures for future customs, other controlling authorities and international transport & trade.
- Provision of position and spatial information regarding goods on the move through European GNSS applications, RFID and 3G/4G services.
- Web-based open platforms to enable information exchange across suppliers, manufacturers, logistics providers and retailers without necessitating costly interfaces.
- Technical and organizational guidelines for data and information system governance, technical aspects of IT solutions, business models and processes

- Deployment roadmaps for the application of collaborative systems and services—the legal and business outstanding aspects of such collaborations will be fully assessed and recommendations made as to how to split the costs of collaboration and make it attractive for users to buy into the proposed collaborative system.
- Operational and business models that include the participation of SMEs in the voluntary sharing of data and participation in collaborative business services.

Expected impact: Cloud-based data and services infrastructure, underpinned by common information models, will give all logistic stakeholders opportunities to collaborate on both an operational and strategic level. The creation of an architecture for logistics information sharing and valorisation will speed up the formation of a single logistics information space in Europe, that is accessible for the transport sector, its users and, in addition, public authorities.

Once deployed, the platform for pan-European logistics application is expected to reduce energy consumption and thus greenhouse gas emissions of the supported supply chains by at least 30% compared to the current situation.

Type of action: Research and Innovation Actions (100% funding) – Two stage

## 7. INTELLIGENT TRANSPORT SYSTEMS

Mobility and safety challenges continue to be a serious problem for the European transport system. Congestion is expected to substantially increase in the years as a result of rising demand for transport services. Intelligent Transport Systems (ITS) and rapidly evolving ICT technologies provide a proven set of strategies for addressing the challenges of assuring safety and reducing congestion and are expected to play a key role in delivering safe, efficient, sustainable and seamless transport options across Europe, while accommodating the growth in passenger and freight traffic. At the same time they will be central to safeguarding the competitiveness of the European industry. It is expected that the progress in the ITS area under Horizon 2020 shall substantially contribute to decarbonizing the European transport sector and materializing the "Zero" vision of road safety where no one is killed on European roads by 2050, as envisaged by the Transport White Paper.

High-speed communication networks, crowdsourcing, cloud storage, social networks, "internet of things/vehicles", advanced data analytics, multiplication of mobile applications and massive amounts of data made available by proliferation of sensors are the connectivity components that will provide many new opportunities for personal mobility and for transport of goods. Congestion cannot be solved by making cars cleaner, but the establishment of an integrated transport "info-structure", relying notably on vehicle to vehicle (V2V) and vehicle to infrastructure (V2I) communications, and also on the availability of open and quality transport data, can provide substantial improvements for the performance of transport networks and raise their efficiency.

### **MG.7.1-2015. Connectivity and information sharing for intelligent mobility.**

Specific challenge: The complexity of the travel experience for individuals, including the difficulties associated with analysing and negotiating multiple available options/services, accessing the right information at the right time, and tackling the different needs of logistics services and operations, has increased significantly over the past years becoming ever more challenging and stressful.

The challenge is to come up with new, efficient, affordable and accessible solutions taking advantage of the ever growing connectivity of people and objects, the availability of European GNSS based location, the advances in cloud computing, big, linked and open data and the propagation of Internet and social media, that will help solve the mobility problems European citizens and businesses are facing today.

Scope: The work could focus on:

- Measures to improve and maximize the availability and (cross-border/cross-system) interoperability of transport data, fostering open data policy, definition and monitoring of data quality, while considering data security and integrity related challenges.
- Real-time information exchange; new generation forecasting models to deliver high-quality traffic and travel information.
- Green driving support systems; active traffic management based on European GNSS location data; solutions for integrated, customized and accessible mobility services for various end-users with robust built-in predictive analytics capabilities and ways to

utilize these solutions to induce positive behavioural changes in citizens to opt for more eco-friendly choices etc.

The work should extend well beyond a purely technology-driven perspective and needs to include a comprehensive understanding of the relevant market structures and business segmentation, including the identification of the key drivers and barriers that shape technology development. The integration of social media for data crowd sourcing and increasing user acceptance is core for success. Stakeholders from all sectors along the value chain have to be involved. The proposed solutions should be tested in real life conditions to prove the concepts' validity and business case.

Establishment of the right regulatory/legal framework as well as standardisation issues should build on what has been developed and is operational in the various transport modes used in the logistical chain and be addressed as (interoperable) appropriate.

In line with the Union's strategy for international cooperation in research and innovation<sup>9</sup> international cooperation is encouraged.

Expected impact:

- Unlocking the potential of vast amounts of transport data and solving problems related to interoperability, storage, processing and security.
- Provision of new environmentally-friendly mobility solutions for European citizens, reducing the commuting times and improving transport system's quality and accessibility and utilisation.
- Alleviating congestion, reducing pollution levels and emergency-response times.

Type of action: Research and Innovation Actions (100% funding)

### **MG.7.2-2014. Towards seamless mobility addressing fragmentation in ITS deployment in Europe**

Specific challenge: Although the application of technology has been the primary means of reducing the environmental impacts of transport in the last two decades, technical solutions alone cannot solve all the economic, environmental and societal problems Europe is currently facing.

Multimodal integrated travel information, planning and ticketing services could play a significant role in improving modal integration, thus increasing the attractiveness of collective mobility and transport modes alternative to road. However, the current fragmentation of the landscape in this field, including dispersed knowledge and lack of cooperation between various stakeholders involved in service provision, does not allow the user to easily organise a door-to-door pan-European intermodal trip.

It also constitutes a major barrier in developing and enacting a truly comprehensive and cohesive strategy for ITS deployment in Europe.

Scope: Research and innovation actions should focus on one or several of the following domains:

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<sup>9</sup> COM(2012)497

- Interoperability and linking of the existing services, including necessary interfaces, in order to achieve the widest possible geographical and modal coverage. The scope of the work should extend towards full-scale early deployment and the developed solutions should be tested on large scale. This domain could be addressed by either Research and Innovation Actions or Coordination and Support Actions.
- Exploring more effective and more efficient cooperation and decision making mechanisms between stakeholders, including coordination of the existing European, national and regional initiatives. This could encompass setting up a cooperation platform to foster EU-wide consolidation and deployment of high-quality integrated multimodal travel information, planning and especially ticketing services.
- Exploring ways to overcome the fragmentation of knowledge with regard to ITS deployment across the EU, for example by setting up a dedicated observatory monitoring all major developments in ITS deployment across Europe, to facilitate fact-based policy making at all levels and to engage a large number of local authorities and industrial stakeholders. Special attention should be paid to broad coverage both in geographical and thematic terms.

Expected Impact: The work should contribute to:

- Better modal integration by providing travellers with information about various options to travel from A to B according to their needs, thus improving European citizens' mobility in general.
- Increased travel time reliability.
- More efficient use of the existing transport infrastructure.
- More inclusive transport services across Europe by better responding to the special needs of population groups such as the elderly and disabled travellers.
- Better informed and more efficient policies for ITS deployment based on consolidated knowledge on the state of play across Europe and thus accelerated roll-out of the related services and technologies.

Type of action: 1) Research and Innovation Actions (100% funding) – Two stage; 2) Coordination and Support Actions – Single stage

## **8. 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. Although transport infrastructure as such is well-developed within the European Union, it is still fragmented, both geographically and between transport modes. Besides missing links, in particular at cross-border sections, a considerable disparity in the quality and availability of infrastructure persists within the EU.

The whole of Europe is also faced with a growing need to make infrastructure more resilient, 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, health and noise). At the same time 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.

In view of the expected growth in traffic between Member States, the investment required to complete and modernise the transport network is substantial. However, infrastructure investment will face a number of important challenges in the coming years, including constrained public budgets, shortages in lending capacity and more stringent regulation in the banking system.

Set against these multifaceted challenges, key in the future will be to find innovative solutions to increase the performance, robustness and efficiency of infrastructure.

### **MG.8.1-2014. Smarter design, construction and maintenance**

Specific challenge: Increasing the performance of transport infrastructure can be achieved through improving the productivity of the assets. In this context, key in the future will be to reduce drastically traffic disruptions of transport flows from inspection, construction and maintenance activities to accommodate increasing/changing traffic demand. This means fewer, faster, more sustainable and better planned interventions with maximum safety for the workers and other traffic participants.

Scope: Proposals could address:

- Advanced, quick, cost-effective and flexible (modular) design, manufacturing, construction, maintenance, rehabilitation and retrofitting systems/techniques and materials.
- Self-monitoring, self-reporting, non-intrusive inspection and testing methods, including advanced predictive modelling.
- Reuse and recycling methods for low energy construction.

Research in this domain should aim at validation of innovative solutions, targeting specific European geographical areas where either new construction for the completion of an efficient transport network is needed, or advanced maintenance systems are necessary to improve and extend the capacity of the existing network.

International cooperation with third countries is encouraged, both with international partners willing to share advanced know-how, and with third parties (in particular neighbouring countries) needing technology transfer.

SME active participation is strongly encouraged with the aim of fostering open innovation.

Proposals can either focus on technological progress and further advancement in knowledge (Collaborative projects 100%) or on reinforcing networking among operators with a view to enhance the effectiveness of the sector (Coordination and Support Actions).

Expected impact: Proposals are expected to deliver the following results:

- Monitoring and management systems increasing infrastructure capacity.
- New construction techniques that enhance the performance and reliability of infrastructure.
- Extending the life span of ageing transport infrastructure.
- Development and application of effective and efficient materials, technologies and tools to meet cost-effectiveness and sustainability goals.
- Reduction of infrastructure construction energy intensity and subsequent CO<sub>2</sub> emissions.

The work in this area should support the transition towards zero traffic disruption from inspection, construction and maintenance by 2030 and boost the overall performance of European transport infrastructure.

Type of action: 1) Research and Innovation Actions (100% funding) – Two stage; 2) Coordination and Support Actions – Single stage

### **MG.8.2-2014. Next generation transport infrastructure: resource efficient, smarter and safer**

Specific challenge: In order to increase the performance of infrastructure to accommodate increasing transport demand, the 21<sup>st</sup> century transport infrastructure needs to be more resource efficient, smarter and safer. This requires a range of innovative solutions, including for intelligent traffic management, low-carbon construction and energy-harvesting. In order to implement effective infrastructure management, advanced methods for data collection (including automatic sensing) and analysis have to be developed. In addition, a better integration of infrastructure in its natural habitat with a reduced intrusion of noise, air pollution and vibration should be achieved. Another challenge consists in developing solutions for infrastructure to actively contribute to enhancing the safety level of the European roads.

Scope: Research and innovation actions could address any of the following domains:

- Infrastructure specific solutions for enhanced cross-modal inter-connectivity and active traffic management, leveraging European GNSS enabled real-time location data, capable of providing optimal responses to changes in conditions of the network (e.g. weather, works, incidents) by all actors in the value chain (infrastructure operators, owners and users).
- Innovative concepts and methods for alternative fuels infrastructure (in particular for roads and ports) to facilitate its deployment in Europe.
- Energy harvesting infrastructure.

- Infrastructure-based pro-active safety systems, including advanced predictive models and simulations.
- Methods for preventing disruption of critical infrastructure from malicious acts.

Proposals can either focus on technological progress and further advancement in knowledge (Collaborative Projects - 100%) or on reinforcing networking among operators with a view to enhance the effectiveness of the sector (Coordination and Support Actions).

In line with the Union's strategy for international cooperation in research and innovation<sup>10</sup> international cooperation is encouraged.

Effective integration of SMEs in the value chain is strongly recommended.

Expected impact: The work is expected to contribute to:

- Improvement of infrastructure capacity and incident management by means of added-value mobility services across different modes.
- Deployment of alternative fuels infrastructure in Europe according to the Clean Power for Transport Package objectives.
- Reduction of infrastructure operation energy intensity and subsequent CO<sub>2</sub> emissions.

Type of action: 1) Research and Innovation Actions (100% funding) – Two stage; 2) Coordination and Support Actions – Single stage

### **MG 8.3-2015 Facilitating market take up of innovative transport infrastructure solutions**

Specific challenge: The White Paper ‘Towards a Single European Transport Area’ aims at the completion of efficient, interoperable and integrated transport infrastructure network by 2050. These long term goals can only be achieved when infrastructure innovation, supported by targeted up-stream research activities, is deployed at integrated system level. However, testing and implementing solutions at system level is much more challenging than at component level in view of the number of technological and organisational parameters involved, their interdependency, the scale of investment and the potential impact on stakeholders.

Although many technological solutions relative to transport infrastructure are already available, the challenge consists in overcoming highly fragmented demand. Decision-makers (mainly from the public sector) are often unaware of the availability and efficiency of highly innovative solutions and are not familiar with the use of public procurement for innovation.

Scope: Actions leading to improvement and capacity building in the field of public purchasing of innovative solutions in transport infrastructure leading to implementation of best available solutions on cross-border TEN-T network business cases representative of typical European situations. Proposals should be driven by clearly identified procurement needs of infrastructure owners (the procurers), including life-cycle and cost-benefit assessments and should effectively control budget across various European regions. Proposals should demonstrate strong industry involvement as supplier of innovative solutions. The work

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<sup>10</sup> COM(2012)497

should contribute to the revision /development of relevant standards and regulatory framework . Good practises should be made available for replication.

Expected impact: The selected actions are expected to:

- Serve as pilot projects to demonstrate the effectiveness of advanced technological solutions in reducing the total cost of ownership of transport and the effectiveness of new supply chain models and contractual arrangements.
- Allow for a better coordinated dialogue between procurers and suppliers contributing to long-lasting stakeholder partnerships with clearly defined roles and responsibilities.
- Contribute to competence building in the sector by enabling public procurers to improve their knowledge about available innovative solutions and leveraging the benefits of European cooperation in exchanging experience in procurement practices.
- Build a coherent basis for progressive step changes to regulation, standardisation and public procurement practices fostering innovation and sustainability in transport infrastructure.

Type of action: Public Procurement of Innovative Solutions

### **MG.8.4-2015. Smart governance, network resilience and streamlined delivery of infrastructure innovation**

Specific challenge: Infrastructure owners and operators need to ensure the best possible return from increasingly limited transport infrastructure investment funds. The main challenge is to overcome the lack of a common framework for governance, management and finance of transport infrastructure projects (including methodologies and modelling) with the aim to enable transparent, risk-based optimisation of investments within and across the modes. This includes issues such as resilience against climate change and other disturbances. Additionally, it is necessary to enhance the industry's practices and capacities in order to raise the productivity, quality and timeliness of infrastructure projects.

Scope: Proposals could address one or several of the following aspects:

- Development of whole system planning environments (based e.g. on virtual design concepts) to support the streamlined delivery of infrastructure projects from concept to deployment. In this respect, the rail sector deserves particular attention.
- Innovative, harmonized and lean procurement processes, accompanied by adequate monitoring systems, contracting and tendering methods; management tools to provide help in innovation delivery.
- Solutions for advanced infrastructure capacity planning and modelling.
- Solutions for optimal cost-effectiveness, including network resilience, mapping of climate risk hot-spots together with appropriate adaptation/mitigation measures and cross-modal implementation strategies.
- Solutions for advanced asset management, advanced investment strategies and innovation governance.

SME active participation is strongly encouraged.

The work will focus either on further advancements in knowledge where technological progress is still needed (Collaborative Projects - 100%), or on implementing innovative technologies in real life conditions via large scale demonstration actions (Collaborative Projects - 70%). The need for strengthening the network between infrastructure owners and operators in view of enhancing the effectiveness of the sector could be approached through appropriate coordination schemes (Coordination and Support Actions).

Expected impact:

- Accelerated delivery of transport infrastructure through improved, transparent and harmonised investment decision making at a European level, balancing performance with cost (in terms of Total Cost of Ownership) and risk.
- Improved predictive capacity and maintenance planning of the European transport infrastructure network, including determination of the optimal balance between long-term renewal and short-term maintenance.
- Faster adoption of innovation as a result of reinforced coordinated public-private partnerships, for example through (pre-competitive) innovation procurement procedures.
- Competence building in the area of transport infrastructure management, resulting in strong (public-sector) capabilities across the value chain of planning, delivery and operations.

Type of action: 1) Research and Innovation Actions (100% funding) – Two stage; 2) Innovation Actions (70% funding) – Two stage; 3) Coordination and Support Actions – Single stage.

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

### MG.9.1-2015. Transport societal drivers

Specific challenge: A sound understanding of behavioural and societal factors that influence transport demand and supply is needed to ensure that, in shaping transport policies and research and innovation activities, the values, needs and expectations of the society are met.

Scope: A platform for communication, collaboration, relationship-building should develop multi-stakeholder interactions and produce an action plan for innovative solution/options for transport and mobility to advance the agenda of the transport sector and society at large. The work should be inclusive of the state of the art of ideas, trials and business endeavours on new mobility concepts.

Stakeholders from within and outside the sector should be involved, in particular: policy makers, civil society organisations, end-users, industry including suppliers (vehicles and components – all modes) and transport service providers, academia and research organisations. These actors, by being engaged in this collaborative and knowledge-mobilisation process, will learn to explore together the most appropriate and viable solutions. Links and synergies with transport-related European Technology Platforms (ETPs) and the on-going TRANSFORuM<sup>11</sup> project would add significant value.

The action plan should focus on:

- Understanding mobility choices, aspirations and behaviours.
- Assessing how new mobility concepts would contribute to the overall transport efficiency.
- Exploring implications for policies, regulations, standards, forms of governance.
- Analysing societal resistance to acceptance of emerging transport technologies and services.
- Exploring market opportunities alongside the innovation chain, including services.
- Foster consensus-building and public-engagement, thus facilitating the dissemination of good practices and the deployment of innovative transport and mobility solutions.

Dedicated outreach activities to foster awareness and engagement of transport users and of the young generations in particular should be undertaken, in order to enable the development of responsible and innovative attitudes as regards their mobility behaviour.

In view of an appropriate potential impact, the Commission will positively evaluate projects having a minimum duration of three years, partners coming from at least 10 different countries and from all the above-mentioned types of organisations.

Expected impact: The setting up of this participatory framework is expected to:

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<sup>11</sup><http://www.transforum-project.eu/>

- Ensure an inclusive approach in providing a comprehensive overview of new forms of mobility and transport, and their implications for users, society as a whole and policy makers.
- Enhance and better target transport policies and research and innovation priority setting.
- Address the mobility needs of specific groups and communities (accessibility; affordability, inclusiveness, safety, ageing population, etc.).
- Promote innovative/alternative business models and social innovation.
- Enhance corporate social responsibility.

Type of action: Coordination and Support Actions – Single stage

### **MG.9.2-2015. Fostering transnational cooperation in European transport research and innovation – NCP network**

Specific challenge: Facilitate trans-national co-operation between NCPs within the Transport challenge with a view to identifying and sharing good practices and raising the general standard of support to programme applicants, taking into account the diversity of actors that make up the constituency of the Transport challenge.

Scope: Support will be given to a network of formally nominated NCPs in the area of Transport. The activities will be tailored according to the nature of the area, and the priorities of the NCPs concerned. Various mechanisms may be included, such as benchmarking, joint workshops, specific training linked to the Transport challenge as well as gender dimension, twinning schemes and cross-border brokerage events, particularly those aimed at enhancing the application of research outcomes. Special attention will be given to enhance the competence of NCPs, including helping less experienced NCPs rapidly acquire the know-how accumulated in other countries.

The focus throughout should be on issues specific to the Transport challenge. Improved NCP awareness of other sources of funding for Transport research and innovation and complementary support schemes would represent a valuable asset.

Proposals can only include NCP from EU Member States, and Associated Countries, who have been officially appointed by the relevant national authorities.

The consortium should have a good representation of experienced and less experienced NCPs.

If certain NCPs wish to abstain from participating, this fact should be explicitly documented in the proposal. These NCPs are nevertheless invited and encouraged to participate in the project activities, and are eligible for reimbursement of their participation.

Participation of NCPs from third countries is welcome, but these NCPs are not eligible for reimbursement of their participation.

The Commission expects to receive and fund a single proposal under this heading.

Expected impact:

- An improved and professionalised NCP service across Europe, thereby helping simplify access to Horizon 2020 calls, lowering the entry barriers for newcomers, and raising the average quality of proposals submitted.

- A more consistent level of NCP support services across Europe.

Type of action: Coordination and Support Actions – Single stage

### **MG.9.3-2014. Strengthening the research and innovation strategies of the transport industries in Europe**

Specific challenge: The specific challenge is to strengthen the willingness and capability of European transport industries and other transport stakeholders to collaborate at European level in identifying their common research and innovation needs and defining the corresponding objectives, agendas and roadmaps.

Scope: Proposals could address activities such as:

- Updating of research agendas and roadmaps at modal and multi-modal level.
- Defining implementation plans, based on the research agendas and roadmaps.
- Monitoring the status of progress of transport research and innovation activities towards the commonly identified needs and agreed objectives.
- Developing links and coordination strategies between the transport-related ETPs and technology platforms existing at national level in Member States and Associated Countries, in order to ensure synergies and convergence.
- Increasing visibility of research and innovation activities, and contributing to the dissemination of results, through large conferences, thematic events, showcases, databases, website support, newsletters and other publications, including coordination with large transport events, such as Transport Research Arena conference, and cooperation with the Transport Research and Innovation Portal (TRIP) and relevant ERA-NETs.

The action will assist the transport-related European Technology Platforms (ETP), the European Commission (EC) and Member States and Associated Countries in defining research needs for their strategies and programmes in order to realise the objectives of the Europe-2020 strategy, especially the Innovation Union and Horizon 2020, as well as the vision of the White Paper 2011 ‘Roadmap to a single European transport area’.

Consortia must be made-up of leading European transport research experts from both industry and research providers. The implementation of this action requires close collaboration with the ETPs dealing with transport research and innovation, as well as with other related initiatives and entities. Cooperation with EU services will be an essential element.

Expected impact: This action is expected to optimise the research and innovation capacities of Europe in the Transport sector, to improve communication, dissemination and use of results, and to help defining relevant transport policies.

Type of action: Coordination and Support Actions – Single stage

### **MG.9.4-2014. Innovation awards for students and researchers in the context of the Transport Research Arena conference - TRA 2016**

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

Scope: The objective of this action is to organise two competitions for transport research and innovation awards to be announced at the TRA conference in 2016:

- A competition for students and young researchers with the goal of stimulating the interest among young researchers/students in the field of sustainable surface transport.
- A competition for senior researchers in the field of innovative surface transport concepts based on results from EU-funded projects only.
- Both competitions will cover all surface transport modes (rail, road, urban mobility and waterborne) 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.

Expected impact: This action is expected to increase the attractiveness of transport related studies and reinforce the pursuit of excellence in European surface 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 sustainable surface transport and thus improve the development and deployment of innovative solutions for surface transport in Europe.

Type of action: Coordination and Support Actions – Single stage

## **A.2. CALL ‘GREEN VEHICLES’**

***H2020-GV-2014/2015***

This call of the Transport Challenge 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 into road transport such as electricity, CNG and LNG, bio-based tailored fuels.

The scope of the 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. In this respect, innovation activities linked with other EU funding mechanisms such as cohesion and regional funds should be considered.

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-sectoral 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.

### **GV.1-2014. Next generation of competitive Li-ion batteries to meet customer expectations**

Specific challenge: It is important that next generations of electric and plug-in hybrid vehicles incorporate basic electric components, such as electric batteries, that are manufactured in Europe. This is not the case for the first generation of these vehicles that incorporate non-European battery technologies. The challenge to be addressed is the development of new materials, facilities and technologies for advanced Li-ion batteries to support the development of a strong European industrial base in this field. This challenge is complementary to a battery electrochemistry topic pursuing longer terms solutions in the Advanced Materials Work Programme of 2015.

Scope: The activities should be based on a multidisciplinary approach to pursue the optimisation of the electrochemistry to hone parameters critical to customer acceptance: cost, safety aspects, resistance to high-power charging, durability, recyclability and hybridisation with other types of storage systems (e.g. ultracapacitors), as well as consideration of scale-up for bulk manufacturing.

In addition, better knowledge on the ageing mechanism and its modelling are needed in order to support test procedures and the development of standards. In line with the Union's strategy

for international cooperation in research and innovation<sup>12</sup> international cooperation is encouraged

Expected impact: Research and innovation activities will bring European industry to a stronger position on the world market making it possible to launch new production in Europe while at the same time addressing the shortcomings of electric cars as compared to conventional cars (e.g. cost and weight reduction, safety, reliability, longevity and fitness for charging under real world conditions). The proposed solutions should demonstrate industrial scale prototypes improving cell-level energy densities by at least 30% and costs by 20% with respect to the best LiFe PO cells currently on the market.

Type of action: Research and Innovation Actions (100% funding) – Single stage

### **GV.2-2014. Optimized and systematic energy management in electric vehicles**

Specific challenge: Range limitation, due to the limited storage capacity of electric batteries, is one of the major drawbacks of electric vehicles. The main challenge will be to achieve a systematic energy management of the vehicle based on the integration of components and sub-systems. The problem is worsened by the need to use part of the storage capacity in order to feed auxiliary equipment such as climate control. In extreme conditions up to 50% of the batteries' capacity is absorbed by these systems. The systematic management of energy in electric vehicles is a means to gain extended range without sacrificing comfort. The challenge is therefore to extend the range of electric vehicles in all weather conditions.

Scope: Proposals should address the combination of the following developments: comprehensive thermal management system (including thermal installation and cooling), battery life duration enhancing as a side effect of thermal management, energy efficiency of electrified accessories, energy harvesting functions and automated and eco-driving strategies.

Expected impact: Research and innovation activities will contribute to a faster introduction of electric cars. Cars autonomy will be increased thanks to a reduction of at least 90% of energy used for passenger comfort and at least 30% for component cooling in extreme conditions with reference to electric vehicles currently on the market.

Type of action: Research and Innovation Actions (100% funding) – Single stage

### **GV.3-2014. Future natural gas powertrains and components for cars and vans**

Specific challenge: The challenge is to reach the fleet level of 95g CO<sub>2</sub>/km and 147g CO<sub>2</sub>/km emissions targets for passenger cars and light duty commercial vehicles respectively (according to the new Worldwide harmonised Light Vehicle Test Procedure), through the development of advanced powertrain concepts adapted and optimised to use of natural gas. Significant improvements in terms of real world NO<sub>x</sub> emissions are also expected.

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<sup>12</sup> COM(2012)497

The technology needs to be competitive with respect to current vehicles using conventional fuels. Therefore the challenge can only be reached if vehicles demonstrate a range of at least 600 km. with no space penalty in comparison to gasoline vehicles.

Scope: Activities should focus on any combination of combustion process optimisation, variable compression, control systems, dual fuel operation, optimised fuel injection, adoptive system and sensors to cope with different types of qualities and hydrogen-blends, after-treatment systems, advanced fuel tanks and overall powertrain optimisation.

Expected impact: The research will contribute to demonstrate the achievement of 2020 polluting emission limits in real driving conditions as validated by independent bodies. One or more demonstrators shall confirm the achievement of a reduction of at least 20% in CO<sub>2</sub> emission levels (including unburned methane and N<sub>2</sub>O) compared with the best vehicles on the market in 2013.

Type of action: Innovation Actions (70% funding) – Single stage

#### **GV.4-2014. Hybrid light and heavy duty vehicles**

Specific challenge: The competitiveness of European road transport vehicle manufacturers is based on technological leadership particularly on system optimisation and affordability, particularly with respect to powertrains. The challenge is to recover a leading position in hybrid technology. The technology will also have positive effect on the reduction of CO<sub>2</sub> emissions from road transport and air quality.

Scope: The research should develop new knowledge on components and system engineering, simulation and technology integration with the aim of achieving powertrain weight and cost reduction, increased functionality, simplification of complex systems, efficiency and affordability while decreasing emissions and improving performance, comfort and functional safety. The research will be validated through at least one demonstrator for both light and heavy duty vehicles.

Expected impact: The research will achieve a 20% reduction in CO<sub>2</sub> equivalent emissions and a 20% powertrain weight and volume reduction with respect to the best in-class vehicle on the market in 2013, while having a maximum 10% cost premium. To meet air quality targets, the research will achieve emission levels below the 2020 limits in real driving conditions. Also, zero emission ranges of at least 20 km will be achieved for light duty vehicles. One or more demonstrators shall confirm the achievement of the above targets.

Type of action: Innovation Action (70% funding) – Single stage

#### **GV.5-2014. Electric two-wheelers and new ultra-light vehicle concepts**

Specific challenge: Europe has to face tough challenges in the field of air quality, noise and environmental protection, traffic congestion, competitiveness and jobs preservation. This calls for new and more efficient mobility concepts. Light category vehicles are well placed to answer the demands for less energy consumption, space and affordability. They represent an attractive solution in congested cities with scarce parking space. At present internal combustion engines for L category vehicles present problems in terms of pollution and noise. The challenge is to develop a new generation of electric powertrains for L category vehicles

that are quiet, clean, energy efficient and safe and to investigate radically new ultra-light vehicle concepts (not only electric) for personal mobility in urban areas.

Scope: The research should focus on energy efficiency improvements for a wide range of vehicle types (from mopeds to quads). Research will address cost efficiency, integration and modularity of battery packs, electric and hybrid power trains, system integration and innovative vehicle architecture. The scope also includes the development and proof of concept of new ultra-light vehicles for passengers taking into account their integration with infrastructure; for non-electric concepts, a major target will be real life pollution and noise reduction levels complying with 2020 legislation. The project results will be validated through demonstrators.

Expected impact: The research will contribute to a significantly easing of air quality and noise problems, congestion, energy consumption and the environmental burden of transport. The research will also enhance the competitive position of the European industry. Research in this area will also support the implementation of the Clean Power for Transport strategy by developing the next generation of alternatively powered light urban (e-)vehicles.

Type of action: Innovation Actions (70% funding) – Single stage

### **GV.6-2015. Powertrain control for heavy-duty vehicles with optimised emissions**

Specific challenge: Reducing real world life emissions and consumption of heavy duty road haulage is one of the main societal challenges for the sector. Fuel efficiency and emissions reduction are sometimes dependent on how they interact with each other and with the specific vehicle application and operating conditions. The challenge is therefore to develop new means of flexible and global engine and emissions control in an optimal way for each application in order to maximise the potential utilisation of the individual systems.

Scope: Research should be performed on methods how to optimise the control of powertrains taking into account specific transportation tasks. This can be achieved by using the information provided by new generation navigation systems and emission sensors linked to the On Board Diagnosis/On Board Measuring system. The strategy will use data such as transport assignment (total weight, vehicle configuration, etc), traffic and weather conditions, topography and road network on the chosen route, driving patterns of the surrounding vehicles, the state of the combustion engine, after treatment and transmission, monitored emissions emitted, etc.. The resulting technology should deliver a global optimum for consumption (for both fuel, electric energy and other consumables related to emission control such as urea or ammonia) and noxious emissions on each mission, to be validated through demonstrators.

Expected impact: A reduction of fuel consumption of at least 20% on the same vehicle with conventional control should be obtained, while not exceeding Real Driving Emissions limits set by the established procedures for the expected post-Euro 6 regulation.

Type of action: Innovation Actions (70% funding) – Single stage

## **GV.7-2014. Future alternative fuel powertrains and components for heavy duty vehicles**

Specific challenge: The challenge is the development of advanced powertrain concepts for heavy duty vehicle (either dual-fuel or optimised for pure natural gas operation), meeting the post Euro 6 standards and CO<sub>2</sub>/km emissions targets currently under definition.

At the same time, significant air quality improvements, particularly in terms of emitted particle numbers (and also NO<sub>x</sub> in the case of lean-burn or dual fuel concepts), must be targeted by greatly reducing real driving emissions in all conditions.

In order to achieve a real impact on the societal challenges, vehicles using the developed technology need to be competitive with current vehicles using conventional fuels. Therefore an additional technological challenge is to develop specific components (for instance better fuel tanks for liquefied natural gas, thermal insulation, optimised pressure handling systems and methane catalysers) for these types of fuels with lower cost, volume and weight while keeping high safety standards.

Scope: The research should include adequate combinations of combustion process optimisation, variable compression ratios, engine control, dual fuel operation, optimised fuel injection systems, adaptive systems and sensors to take into account different fuel qualities and hydrogen blends, new generation after-treatment systems (in particular for NO<sub>x</sub> and methane slip especially during transients and at low temperatures) and overall powertrain optimisation, advanced fuel tanks (high pressure gaseous, liquid or solid state) and any other innovative concepts and components for the different vehicle categories.

Ranges should be demonstrated of at least 800 km on natural gas while keeping weight, volume and cost penalties to a similar level to current best in class vehicles.

All developed technology should be integrated on vehicles that should be tested by independent bodies on the World Heavy Duty Cycle (WHDC) test procedures, including the relevant Portable Emission Measurement System (PEMS) approaches.

Expected impact: Real driving emission levels respecting post-2020 emission limits and procedures shall be achieved in order to address the air quality challenge. The capability to maintain this performance during the engine life should be also demonstrated through accelerated ageing procedures.

As far as the climate change challenge is concerned, the research target is to achieve at least 10% lower CO<sub>2</sub>-equivalent emissions (i.e. including unburned methane and N<sub>2</sub>O) than the best vehicles on the market in 2013.

Type of action: Innovation Actions (70% funding) – Single stage

## **GV.8-2015. Electric vehicles' enhanced performance and integration into the transport system and the grid**

Specific challenge: The limited driving range of electric vehicles is one of the biggest deployment challenges for electromobility. A ground-up re-design is needed to fully take advantage of the design freedoms and the opportunities in defining and developing the electric and electronic architecture and components. This should result in increased efficiency

and range and make a major contribution towards the transition to fully electric vehicles (FEV's).

A particularly important element that needs to be addressed is the battery management system (BMS), which is fundamental for many aspects of electrified vehicle performance, from energy efficiency (and therefore range) to safety, battery life and reliability.

Information and communication technologies (ICT) significantly contribute to enhancing the energy efficiency and thus the range of the vehicle by providing accurate prediction of the range and offering personalised options and services to the driver. Furthermore ICT supports recharging that is coordinated with the local electric grid capabilities. Such coordination must accommodate not only passenger EVs, but also meet the requirements of electric buses, vans or trucks, which are expected to require high-powered fast recharging.

Scope: Proposals should address one of the following domains:

- EV concepts featuring a complete revision of the electric and electronic architecture to reduce complexity and the number of components and interconnections, whilst improving energy efficiency, functionality and modularity. This may be supported by drive-by-wire or wireless communication. Challenges in safety, security, reliability and robustness, including electro-magnetic compatibility, are to be addressed. Work shall pursue a high degree of standardisation and cover the entire electric vehicle value chain.
- Concerning BMS research work will focus on a combination of the following aspects:
  - Novel BMS designs with improved thermal management, power density and life time, safety and reliability.
  - Improved modelling and simulation tools for BMS improvement.
  - Contribution to standardisation of BMS components and interfaces.
  - Test methodologies and procedures to evaluate the functional safety, reliability and lifetime of battery systems.
- In-vehicle integration of the overall cycle of EV energy management into a comprehensive EV battery and ICT-based re-charging system management, providing ergonomic and seamless user support. Such integration should build upon existing technology standards.
- Digital support services for EV such as interaction with nomadic devices, complementing use of wireless / power line communication interfaces, roaming management, or the accommodation of on road charging are in the scope.
- End-to-end integration into the grid by locally deployed smart-grid and smart-metering systems while investigating arising operational issues. Specific requirements of various EV types and various battery types should be addressed.

Expected impact:

- Improvements in the cost-performance ratio of EV contributing to quicker market take-up.
- Enhancements to vehicle range and/or weight, battery life and reliability without compromising on safety - delivering a more robust and well managed battery system.

- Standardised BMS components and interfaces
- Progress on ICT-based technologies for coordinated EV recharging.
- Improved attractiveness of EVs, achieved through a seamless and ergonomic energy management cycle (spanning the entire cycle from re-charging spot selection/reservation to plug-out after re-charging).
- Contributions to standardisation strengthening the competitiveness of the European industry.

Type of action: Research and Innovation Actions (100% funding) – Single stage

### **A.3. CALL ‘SMALL BUSINESS AND FAST TRACK INNOVATION FOR TRANSPORT’**

*H2020-IT-2014/2015*

#### **IT.1-2014-2015. Small business innovation research for Transport**

Specific challenge: The European transport sector must have the capacity to deliver the best products and services, in a time and cost efficient manner, in order to preserve its leadership and create new jobs, as well as to tackle the environmental and mobility defies. The role of SMEs to meet these challenges is critical as they are key players in the supply chains. Enhancing the involvement of weaker players in innovation activities as well as facilitating the start-up and emergence of new high-tech SMEs is of paramount importance.

Scope: The SME instrument consists of three separate phases and a coaching and mentoring service for beneficiaries. Participants can apply to phase 1 with a view to applying to phase 2 at a later date, or directly to phase 2.

**In phase 1**, a feasibility study shall be developed verifying the technological/practical as well as economic viability of an innovation idea with considerable novelty to the industry sector in which it is presented (new products, processes, services and technologies or new market applications of existing technologies). The activities could, for example, comprise risk assessment, market study, user involvement, Intellectual Property management, innovation strategy development, partner search, feasibility of concept and the like to establish a solid high-potential innovation project aligned to the enterprise strategy and with a European dimension. Bottlenecks in the ability to increase profitability of the enterprise through innovation shall be detected and analysed during phase 1 and addressed during phase 2 to increase the return in investment in innovation activities.

**In phase 2**, innovation projects will be supported that address any area of the Transport Specific Programme (H2020 Specific Programme: Part III – 4. Smart, green and integrated transport), and that demonstrate high potential in terms of company competitiveness and growth underpinned by a strategic business plan. Activities should focus on innovation activities such as demonstration, testing, prototyping, piloting, scaling-up, miniaturisation, design, market replication and the like aiming to bring an innovation idea (product, process, service etc) close to deployment and market introduction, but may also include some research.

For technological innovation a Technology Readiness Levels of 6 or above (or similar for non-technological innovations) are envisaged.

In addition, in phase 3, SMEs can benefit from indirect support measures and services as well as access to the financial facilities supported under Access to Risk Finance of this work programme. [[Link to the Access to Risk Finance Part](#)]

Successful beneficiaries will be offered coaching and mentoring support during phase 1 and phase 2. This service will be accessible via the Enterprise Europe Network and delivered by a dedicated coach through consultation and signposting to the beneficiaries. The coaches will be recruited from a central database managed by the European Commission and have all fulfilled stringent criteria with regards to business experience and competencies. Throughout the three phases of the instrument, the Network will complement the coaching support by providing access to its innovation and internationalisation service offering. This could include, for example, depending on the need of the SME, support in identifying growth potential, developing a growth plan and maximising it through internationalisation; strengthening the leadership and management skills of individuals in the senior management team and developing in-house coaching capacity; developing a marketing strategy or raising external finance.

Expected impact:

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

Type of action: SME Instrument (70% funding)

## **IT.2-2015. Fast Track to Innovation**

Under this Fast Track to Innovation (FTI) pilot, proposals for innovation actions linked to any technology field will be invited, on the basis of a continuously open call (with its first cut-off date in 2015) and a bottom-up-driven logic.

Any legal entity may participate and proposals may be submitted at any time. The Commission shall initiate three cut-off dates per year to evaluate proposals. Time between a cut-off date and signature of the grant agreement or notification of the grant decision shall not exceed six months. No more than 5 legal entities shall participate in an action. The amount of the grant shall not exceed EUR 3 million.

Proposals shall be ranked according to the impact, quality and efficiency of implementation and excellence, with the criterion of impact given a higher weighting. Factors such as time sensitivity and the international competitive situation shall be taken into sufficient account

when evaluating the impact of a proposal, to allow for flexibility according to the various specificities within different fields of applied research.

## **TRANSPORT CHALLENGE CONTRIBUTIONS TO OTHER CALLS**

### **CALL ‘BLUE GROWTH’**

***H2020-BG-2014/2015***

Scene setter: Rapid technological progress in working offshore in ever-deeper waters, the need to deliver food and energy from oceans in a sustainable way and the need to reduce greenhouse gas emissions have opened up an opportunity for “blue growth” with the aim of harnessing the untapped potential of Europe's oceans, seas and coasts for jobs and growth. At present oceans’ bio-resources provide 15% of the animal protein consumed globally, blue biotechnology has an expected yearly growth rate of 5 to 10%, deep-sea minerals extraction could gradually represent up to 10% of the world's minerals and marine renewable energy will rapidly extend to 40 GW of offshore wind capacity by 2020 and 3.6 GW of ocean energy by 2030. The Blue Growth economy could grow to employ 7 million people by 2020.

This focus area addresses the challenge of unlocking blue growth potential through 4 cross-cutting priority domains supporting the Blue Growth Agenda:

- promoting the diversity of marine life;
- sustainably harvesting deep-sea resources;
- the new offshore challenge;
- ocean observation technologies;
- as well as horizontal support actions.

Actions in this area will support the EU Blue Growth Strategy and relevant EU policies as well as provide the opportunity for, in particular, transatlantic cooperation.

To maximise the impacts of activities undertaken under this Focus Area, WP 2014-2015 focusses its effort on key priorities for the EU, ensuring the appropriate critical mass to tackle sub-challenges with scale and scope on the main policy needs.

Promoting the diversity of marine life" will put emphasis on marine biodiversity either by increasing knowledge on ecosystems (with priority given to the continuously changing nature of Atlantic marine ecosystems) in 2014 or by valuing their services (marine biotechnology) in 2015. "New offshore challenges" tackles a range of inter-linked challenges (technological bricks) that will make it possible to build offshore platforms for new-large scale- marine activities. In 2014 a preparatory action is foreseen for further large scale initiatives with two initiatives focused on sub-sea technologies and sustainable dredging, while in 2015 a large scale initiative is planned on capacity response to oil spill and maritime pollution. A preparatory action for further potential large scale initiatives on "seabed mining" and one on improving "ocean observation technologies" will both be supported in 2014. Finally, a range of support actions will promote support to SMEs and innovation, social innovation and engagement with society and international cooperation.

Activities under this Focus Area will contribute significantly to the Transatlantic Research Alliance to reinforce cooperation between the EU, Canada and the US on issues concerning the Atlantic Ocean.

### **BG.1-2014. The offshore challenge - Preparing the future maritime economy**

Specific challenge: Human based activities in Europe's seas and on Europe's coasts are expected to intensify, diversify and expand further offshore driven by the increasing lack of space available in coastal areas and the exploitation of marine energy, and deep sea biological and mineral resources.

One way to make use of our seas in a smarter, more sustainable and less disruptive manner is to combine different activities at sea at the same location (e.g. energy production and storage, fisheries and aquaculture, transport & logistics hubs, observation and monitoring). Some EU funded research projects have already looked at such options using multi-use offshore platforms.

However the development of large scale offshore activities in deep sea areas necessitates a series of technological challenges need to be overcome, those relating to surface support facilities, control systems, the transport of fluids and solids and remotely operated robots/vehicles. There is a need to:

- assess both the most likely developments in the maritime economy; and
- the corresponding technological challenges that should be addressed to allow these developments to happen.

Scope: Proposals should analyse and identify the potential socioeconomic developments in the new maritime economy and the most plausible business models corresponding to them. This will include issues of competing access to marine space between different activities and, more broadly, all social and environmental impacts including impacts on coastal areas.

Proposals should review the existing multi-use offshore platforms and their business models, as well as other possibilities. They will seek to identify the technological challenges to be overcome to make these business models operational.

Proposals should also set-up a mechanism associating key scientific and industrial stakeholders interested in the development of the Blue Economy, with a view to define a shared research and technology agenda which would address the offshore challenge and support the advent of the future maritime economy.

Expected impact: The activities will lead to:

- Scenarios and research agenda to unlock the potential of the European maritime economy;
- Mobilisation of key European level maritime (industrial and scientific) stakeholders to support the Blue Growth agenda;
- Support to the EU Blue Growth and marine spatial planning policy objectives.

Type of action: Coordination and Support Actions – Single stage

## **BG.2-2014. Delivering the Sub-sea technologies for new services at sea**

Specific challenge: The development of a new maritime economy necessitates a range of technological challenges to be tackled. One such challenge is the ability to remotely execute unmanned underwater operations remotely, ranging from simple observation / data collection and transmission of information to more complex industrial operations. Existing technologies derived from marine research (Remotely Operated Vehicles - ROVs, Autonomous Underwater Vehicles – AUVs) must be industrialised, i.e. made more robust, reliable and sophisticated (in terms of operating capabilities) and with increased autonomy. Another challenge is the ability to operate at even greater depths (down to 6,000m), and in extreme conditions (e.g. Arctic regions), with corrosive products, heavy / viscous liquids, high pressure - high temperature systems, etc. The control of the potential impact on the environment of these activities is also important.

Scope: Proposals should address the design of new underwater vehicles and robots and/or their main components, required to work undersea. If relevant, proposals demonstrators or prototypes could be developed. Areas of interest are:

- Remotely Operated Vehicles and Subsea Construction systems;
- Specialised Robots and Autonomous Underwater Vehicles, deployment, recovery and docking systems;
- Subsea factory machinery.

Where relevant, activities could cover the development of European standards.

Expected impact: The research and innovation activities will:

- Enable the achievement of sustainable exploitation of deep sea resources by European industries and provide support to EU Blue Growth agenda.
- Increase safety of the existing and new offshore maritime economy.
- Improve the scientific capacity to observe and understand the deep sea environment and resources.

Type of action: Research and Innovation Actions (100% funding) – Two stage

## **BG.3-2015. Response capacities to oil spills and marine pollutions**

Specific challenge: The development of the exploitation of deep sea resources (in particular offshore oil and gas) is moving maritime operations to work under conditions of extreme pressure and low temperature, with many unknown factors and limited response capacity.

Deepwater Horizon accident in 2010 in the Gulf of Mexico, proved that besides the lack of appropriate means to deal with a large scale pollution event at great depth / high pressure, it is particularly challenging:

- to predict the development of the pollution (e.g. oil spill).
- to design an appropriate response combining the right mix of interventions (e.g. mechanical collection, burning surface oil, use of dispersants, bio-remediation, natural dispersion or transformation of spilled oil...).

Recently the Galway event on transatlantic marine research partnership highlighted the need to *"Develop and maintain the capacity for rapid response to unanticipated and episodic events that require immediate scientific investigation to advance knowledge"*. Research in this area will contribute to this objective.

Scope: Activities should aim at developing the capacity to provide an integrated response to major pollution events (particularly oil & gas) in extreme oceanic conditions. The integrated approach should combine oceanographic prediction of the pollution behaviour, understanding the impact of the pollution, physical intervention and bio-remediation and their impact on ecosystems, including the use of specialised vessels and underwater (autonomous) vehicles.

Proposals should improve the capacity to predict the evolution of the pollution and its impact on the marine environment as well as the response capacity, using integrated models and tools that can support decision making in the management of such events. It can also cover, as appropriate, recommendations for infrastructure works to help protect sensitive ecosystems in high risk areas.

The research and innovation activities should foster transatlantic cooperation.

Expected impact: The research will lead to:

- An improvement in the safety of the new/offshore maritime economy and the creation of a better environment for blue growth investments.
- Preservation of the marine environment and marine ecosystems and protection of coastal economies and communities.
- A contribution to the implementation of the EU regulation on the safety of offshore oil and gas prospecting, exploration and production activities.
- A contribution to the effectiveness of the European Maritime Safety Agency's operational capacity to respond to pollution from oil and gas installations.
- An improvement of the societal acceptance of offshore activities.

Type of action: Research and Innovation Actions (100% funding) – One stage