

#### **4. SMART, GREEN AND INTEGRATED TRANSPORT**

##### **4.1. Resource efficient transport that respects the environment**

Europe has set a policy target of achieving a 60 % reduction of CO<sub>2</sub> by 2050. It aims at halving the use of 'conventionally-fuelled' cars in cities and achieving virtually CO<sub>2</sub>-free city logistics in major urban centres by 2030. Low-carbon fuels in aviation should reach 40 % by 2050, and CO<sub>2</sub> emissions from maritime bunker fuels should be reduced by 40 % by 2050.

Research and innovation will substantially contribute to the development and take up of the necessary solutions for all transport modes, which will drastically reduce transport's emissions that are harmful to the environment (such as CO<sub>2</sub>, NO<sub>x</sub>, and SO<sub>x</sub>), lower its dependence on fossil fuels, and hence reduce transport impact on biodiversity and preserve natural resources.

This will be done through work on the following specific activities:

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#### *4.1.1. Making aircraft, vehicles and vessels cleaner and quieter will improve environmental performance and reduce perceived noise and vibration*

The activities in this domain will focus on the end products, but will also address lean and ecological design and manufacturing processes, with recyclability integrated in the design phase.

- (a) Developing and accelerating the take-up of cleaner propulsion technologies is important for reducing or eliminating CO<sub>2</sub> and pollution from transport. New and innovative solutions are necessary, based on electric engines and batteries, fuel cells, or hybrid propulsion. Technological breakthroughs will also help improve the environmental performance of traditional propulsion systems.
- (b) Exploring options for the use of low emission alternative energies will help reduce the consumption of fossil fuels. This includes using sustainable fuels and electricity from renewable energy sources in all modes of transport including aviation, reducing fuel consumption through energy harvesting or diversified energy supply and other innovative solutions. New holistic approaches will be pursued encompassing vehicles, energy storage and energy supply infrastructure, including vehicle-to-grid interfaces and innovative solutions for the use of alternative fuels.
- (c) Reducing the weight of aircraft, vessels and vehicles and lowering their aerodynamic, hydrodynamic or rolling resistance by using lighter materials, leaner structures and innovative design, will contribute to lower fuel consumption.

#### *4.1.2. Developing smart equipment, infrastructures and services*

This will help optimise transport operations and reduce resource consumption. The focus will be on the efficient use and management of airports, ports, logistic platforms and surface transport infrastructures, as well as on autonomous and efficient maintenance and inspection systems. Particular attention will be given to the climate resilience of infrastructures, cost-efficient solutions based on a life-cycle approach, and the wider take-up of new materials allowing for more efficient and lower cost maintenance. Attention will also be paid to accessibility and social inclusiveness.

#### *4.1.3. Improving transport and mobility in urban areas*

This will benefit a large and increasing share of the population which lives and works in cities or uses them for services and leisure. New mobility concepts, transport organisation, logistics and planning solutions need to be developed and tested, which will contribute to reduce air pollution and noise, and improve efficiency. Public and non-motorised transport as well as other resource-efficient transport options should be developed as a real alternative to the use of private motor vehicles, supported by greater use of intelligent transport systems as well as by innovative demand management.

### **4.2. Better mobility, less congestion, more safety and security**

Relevant European transport policy goals aim to optimise performance and efficiency in the face of growing demands for mobility, to make Europe the safest region for aviation and to move towards the target of zero fatalities in road transport by 2050. By 2030, 30 % of road freight transport over 300 kilometres should shift to rail and waterborne transport. A continuous and efficient pan-European transport of people and goods, also internalising

external costs, requires a new European multimodal transport management, information and payment system.

Research and innovation will make important contributions to these ambitious policy goals through activities in the following specific activities:

#### *4.2.1. A substantial reduction of traffic congestion*

This can be achieved by implementing a fully intermodal ‘door-to-door’ transport system and by avoiding unnecessary use of transport. This means promoting greater integration between transport modes, the optimisation of transportation chains and better integrated transport services. Such innovative solutions will also facilitate accessibility, including for the ageing population and vulnerable users.

#### *4.2.2. Substantial improvements in the mobility of people and freight*

This can be achieved through the development and widespread use of intelligent transport applications and management systems. This entails: planning, demand management, information and payment systems that are interoperable Europe-wide; and the full integration of information flows, management systems, infrastructure networks and mobility services into a new common multi-modal framework based on open platforms. This will also ensure flexibility and rapid responses to crisis events and extreme weather conditions by reconfiguring travel across modes. New positioning, navigation and timing applications, made possible through the Galileo and EGNOS satellite navigation systems, will be instrumental in achieving this objective.

- (a) Innovative air traffic management technologies will contribute to a step-change in safety and efficiency with rapidly increasing demand, to achieve improved punctuality, to reduce time spent in travel-related procedures at airports and to achieve resilience in the air transport system. The implementation and further development of the ‘Single European Sky’ will be supported with solutions for increased automation and autonomy in air traffic management and aircraft control, better integration of air and ground components, and novel solutions for the efficient and seamless handling of passengers and freight throughout the transport system.
- (b) For waterborne transport, improved and integrated planning and management technologies will contribute to the emergence of a ‘Blue Belt’ in the seas around Europe, improving port operations, and to a suitable framework for inland waterways.
- (c) For rail and road, the optimisation of network management will improve efficient use of infrastructure and make cross-border operations easier. Comprehensive cooperative road traffic management and information systems will be developed, relying on vehicle to vehicle and vehicle to infrastructure communication.

#### *4.2.3. Developing and applying new concepts of freight transport and logistics*

This can reduce pressure on the transport system and improve safety and freight capacity. They can, for example, combine high performance and low environmental impact vehicles with smart, secure on-board and infrastructure-based systems (e.g. road trains). Activities will also support the development of the e-Freight vision of a paperless freight transport process,

where electronic information flows, services and payments are linked to physical freight flows across transport modes.

#### *4.2.4. Reducing accident rates and fatal casualties and improving security*

This will be achieved by addressing aspects inherent to the organisation, management and monitoring of performance and risk of transport systems; and by focusing on the design and operations of aircraft, vehicles and vessels, infrastructures and terminals.. The focus will be on passive and active safety, preventive safety, and enhanced automation and training processes to reduce the impact of human errors. To better anticipate, assess and mitigate the impact of weather and other natural hazards, special tools and techniques will be devised. Activities will also focus on the integration of security aspects in the planning and management of passenger and freight flows, on the conception of aircraft, vehicles and vessels, on traffic and system management and on the design of terminals.

### **4.3. Global leadership for the European transport industry**

By staying ahead in new technologies and reducing the costs of existing manufacturing processes, research and innovation will contribute to growth and highly skilled jobs in the European transport industry, in the face of growing competition. At stake is the preservation of the competitiveness of a major economic sector that directly represents 6.3 % of the Union GDP and employs nearly 13 million people in Europe. Specific objectives include the development of the next generation of innovative transport means and to prepare the ground for the following one, by working on novel concepts and designs, smart control systems and efficient production processes. Europe aims at becoming the world-leader in efficiency and safety in all modes of transport.

Research and innovation will focus on the following specific activities:

#### *4.3.1. Developing the next generation of transport means as the way to secure market share in the future*

It will help enhance European leadership in aircraft, high speed trains, (sub)urban rail transport, road vehicles, electromobility, passenger cruise ships, ferries and specialised high technology ships and marine platforms. It will also spur the competitiveness of European industries in upcoming technologies and systems and support their diversification towards new markets, including in sectors other than transport. This includes the development of innovative safe aircraft, vehicles and vessels that incorporate efficient propulsion units, high performance and intelligent control systems.

#### *4.3.2. On board, smart control systems*

These are needed to realise higher levels of performance and system integration in transport. Appropriate interfaces for communications between aircraft, vehicles, vessels and infrastructures in all relevant combinations will be developed, with a view to defining common operational standards.

#### *4.3.3. Advanced production processes*

These will allow customization, lower lifecycle cost and development time and facilitate the standardisation and certification of aircraft, vehicles and vessels, and related infrastructure. Activities in this area will develop fast and cost efficient design and manufacturing

techniques, including assembly, construction, maintenance and recycling, through digital tools and automation, and capacity to integrate complex systems. This will foster competitive supply chains able to deliver with short time-to-market and reduced costs.

#### *4.3.4. Exploring entirely new transport concepts*

This will help enhance Europe's competitive edge in the longer term perspective. Strategic research and proof of concept activities shall address innovative transport systems and services, including fully automated and other new types of aircraft, vehicles and vessels with long term potential.

#### **4.4. Socio-economic research and forward looking activities for policy making**

Actions to support policy analysis and development including on socio-economic aspects of transport are necessary to promote innovation and meet the challenges raised by transport. Activities will target the development and implementation of European research and innovation policies for transport, prospective studies and technology foresight, and strengthening of the European Research Area.

Understanding user behaviour, social acceptance, impact of policy measures, mobility patterns and business models and their implications are of paramount importance for the evolution of the European transport system. Scenario development taking into account societal trends, policy objectives and technology foresight in a 2050 perspective will be carried out. In view of better understanding the links between territorial development and the European transport system, robust models are needed on which sound policy decisions can be taken.

Research will focus on how to prevent social inequalities in access to mobility, and how to improve the position of vulnerable road users. Economic issues must also be addressed, focusing on ways to internalise the externalities from transport across modes, as well as taxation and pricing models. Prospective research is needed to assess future requirements for skills and jobs.

#### **4.5. Specific implementation aspects**

In establishing the priorities in the work programme, in addition to the input of the external independent advice and of the various European Technology Platforms, account will be taken of the work carried out in the framework of the Strategic Transport Technology Plan.