TRANSPORT CHALLENGE IN HORIZON 2020

ECTRI SUGGESTIONS FOR THE FIRST WORK PROGRAMMES

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The European Conference of Transport Research Institutes (ECTRI) is an international non-profit association that was officially founded in April 2003. It is the first attempt to unite the forces of the foremost multimodal transport research centres across Europe and to thereby promote the excellence of European transport research. Today, it includes 26 major transport research institutes or universities from 19 European countries. Together, they account for more than 4,000 European scientific and research staff in the field of transport. ECTRI as the leading European research association for sustainable and multimodal mobility is committed to provide the scientifically based competence, knowledge and advice to move towards a green, safe, efficient, and inclusive transport for people and goods.

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1. The Importance of an Integrated Transport System

Building upon previous contributions[1], ECTRI supports the preparation of the 1st Work Programme of Horizon 2020 by putting forward the research needs for transport as perceived by the ECTRI research community. We are well aware of the substantial input being prepared by the European Technology Platforms and other advisory bodies. However, as the leading European association for multimodal mobility and transport research, we are firmly convinced that an integrative, multimodal vision of the research needs has significant added value. In this paper, ECTRI will follow the approach recently presented by the European Commission by defining first the transport challenges, before proposing Horizon 2020 research topics to tackle them.

In earlier contributions, ECTRI has stressed the importance of an integrated transport system in order to cope with the grand economic, environmental, and societal challenges faced by the European Union in the coming decades. Transport is crucial for the short-term economic recovery as well as for the long-term competitive position of Europe. This is especially true for a globalized economy, where all economic activities are dependent on a well-functioning transport system. Beyond that, transport is also a key success factor towards the European vision of an environmentally-friendly, sustainable and inclusive society.

All this calls for an intelligent and adaptive transport and mobility system on the basis of an interconnected and resilient infrastructure. Therefore, ECTRI underlines the importance of "socio-economic research and forward looking activities" as foreseen for Horizon 2020. This perspective is a core driver that needs to be developed throughout the Horizon 2020 programme in a consistent way following a systemic approach. Further, research under this paragraph should both "meet the challenges raised by transport", such as resource efficiency, better mobility, less congestion, greater safety and security, and competitiveness, and address likewise the positive contributions of transport and mobility to other societal challenges. ECTRI therefore presents in the following two chapters elements for a research agenda following an integrated approach.

[1] See ECTRI's following position papers:
- ECTRI Reflections on the Transport Challenge of Horizon 2020 – September 2012
- ECTRI Position on the Horizon 2020 Specific Programme – December 2011
- ECTRI Position on the EC Transport White Paper 2011 – July 2011
- ECTRI Answer to the EC Green Paper Consultation – May 2011
- ECTRI Contribution to the *"Strategic Transport Technology Plan"* – March 2011
- ECTRI Position on FP8 – February 2011
- ECTRI Position on the EC Communication on *"The Future of Transport"* – September 2009

2. Seven Challenges for an Integrated Transport System

ECTRI has identified seven cross-modal challenges for an integrated transport system:

1. Understanding socio-economic and behavioural aspects of mobility

To better understand our dynamic and complex transport system we need much greater knowledge about key factors (socio-economic, cultural, etc.) that lead to travel choices and users' behaviour. We also need further knowledge about cost-effective governance models supporting multimodal and integrated systems. This challenge includes studies and empirical evidence on decision-making processes, actors and organizations as well as the institutional frameworks that shape more sustainable transport systems and travel behaviour. And finally, we need knowledge about the links between technological factors, user behaviour and decision and planning practices among politicians and planners. [cf. chapter 3.1, pp. 6-8]

2. Forecasting socio-economic and technological developments

To address the significant current and future transport-relevant challenges such as global warming, energy supply and the ageing population, long-term systems thinking is required addressing both the social and the technical aspects of future developments. We need to better understand the capability of technology with a long-term (50 year) and very long term (70-80 year) view and to develop visions and scenarios taking full account of different stakeholder perspectives and economic realities. [cf. chapter 3.2, pp. 9-11]

3. Providing efficient, safe, and inclusive mobility

Mastering the realization and interplay of efficient, safe, and inclusive mobility solutions for all groups of transport users is a key competitive advantage for urban areas of the future and for mobility more widely. The challenge is to achieve cross-modal solutions which exploit lessons learned at the modal level and, at the same time, make innovative connections between seemingly disparate approaches. A cross-modal approach supports in finding and validating solutions which can cope with diversifying mobility patterns and improve all key elements of future mobility systems.. [cf. chapter 3.3, pp. 12-17]

4. Achieving sustainable mobility

The future will see a strong need for new vehicle concepts, reoriented urban design and a shift in land use for sustainable environment and energy efficiency. However, the decision making in achieving this includes numerous stakeholders, conflicting goals and multi-level political processes and most important - individual mobility decisions. A holistic network-wide approach is necessary to ensure that mobility issues are addressed in a multimodal approach. Effective sustainable mobility needs further research to address all three components: economy, society, and environment. A further challenge is to understand the compatibility between future mobility systems, current and alternative decision processes including individual mobility decisions and the development of sustainable mobility. [cf. chapter 3.4, pp. 18-19]

5. Fostering advanced logistic services

Logistic systems and economics of scale have been a driving force for economic and welfare development over centuries. Current global competition raised a strong demand for developing more advanced logistics services. Logistic services involve shippers, intermediaries, institutional partners and operators and include multimodal freight terminals and supply chains as well as optimized urban logistics. The challenge to foster advanced logistic services has to be met with a system approach to shed light on the diversity of the responses to complex issues such as performance, the sustainability of transport chains and the potential for modal transfer. [cf. chapter 3.5, pp. 20-24]

6. Ensuring resilient and secure transport systems

European cohesion, economic growth and improved quality of life are depending on well-functioning and efficient transport chains, which are affected by a rising number and seriousness of threats and hazards. Moreover, the existing transport infrastructure is frequently under-maintained due to lack of funding or to a lower priority level. Concerning transport infrastructure, a number of measures for protection have been developed. However, the critical combination of measures and their impact has been left out. It is essential to use an integrated approach to protect the EU transport systems from hazards and keep the most important goods and passengers' flows moving. This calls for a detailed analysis of threats and categorization of effects and impacts for supply chains and affected transport modes as well as for further development and trialling of maintenance and upgrading technologies through demonstrators on a European scale. Another important aspect is to develop flexible information and decision systems concerning the current capacities and performances of different transport modes in real-time. [cf. chapter 3.6, pp. 25-29]

7. Developing effective socio-economic policy measures

Moving towards smart, low carbon transport systems in Europe up to 2050 and beyond will require in-depth reforms of institutions and governance practices. Decision-making procedures need to be more collaborative and open to innovation and radical change with support from technical tools assisting dialogue between stakeholders, and integration of potential of technological developments. Of central importance is a better integration of transport externalities in economic models allowing more evidence-led and open policy making as well as more effective evaluation of outcomes. [cf. chapter 3.7, pp. 30-35]

3. Research Topics to Tackle the Seven Challenges

In this Chapter we present the topics that according to ECTRI could effectively addressed the Challenges previously defined. In doing so, we follow a traditional scheme starting by the motivation of such topics followed by specific research needs / subjects, and the expected impacts. Finally we give an indication of the type of projects ECTRI consider appropriate:

- Coordination and Support Action
- Small Scale Research Project
- Large Scale Research Project

An overview of all research topics grouped per challenge is provided hereafter. Many of the topics also affect other challenges. For the sake of clarity, we have chosen to allocate them to the most relevant one.

Overview of the research topics grouped per challenge

3.1 Challenge 1: Understanding socio-economic and behavioural aspects of mobility (4 topics)

3.1.1 Changes and trend breaks in mobility patterns and their contribution to sustainable mobility and design of sustainable policies

Motivation

Passengers travel behavior is changing as a result of changes such as: evolution in vehicle technology, ownership and use, transport means, social mobility and use of ICT (teleworking, multimodal information, ITS, use of smartphones, etc.). It is crucial to increase awareness of policy makers, transport researchers and all related stakeholders in the field of transport and mobility regarding the synergies and obstacles arising from the changes in travel and communication behaviour of people and sustainable mobility and policies.

Research needs/aspects to consider

- Identification of changes and trend breaks and comparison with other European and non European countries
  - Which characteristics of travel behaviour (car use, trip frequency, short distance, long distance, work-related travel, car ownership, etc.) are changing the most?
  - Are all European countries subject to similar changes? Are changes in mobility behaviour similar or different in North-America and in Asia and what can Europe learn from such comparison?
  - Are there differences between urban, peri-urban and rural areas?
- Assessment of possible solutions for compatibility with sustainable development (integrated land use and transport, cost-efficiency issues, etc.)
- Identification of the main determinants of behavioural changes
  - Internal preferences/habits and external factors
  - How can preferences and habits be influenced (which motivators for which groups)?
  - Specific impacts of ITS and Communications (home working, teleshopping, etc.)
  - Impact on future transport demand - policy scenarios for the future, at the European scale and for region types (urban, peri-urban, rural)

Expected impacts

Insights for policy makers, decision makers, transportation planners and the research community regarding the impacts of behavioral changes and their influences on sustainable transportation policies.

Type of project

Coordination/Support Action or Small Scale Research Project

3.1.2 Co-modal and multimodal information: trip planners integration, improvement and acceptability

Motivation

A large number of trip planners exist, using traffic and traveler data coming from various and different sources. Data sets are analyzed and processed by dedicated systems, aiming to provide travelers with several options in order to reach their destinations. This information is multimodal and co-modal, since it involves different transport means, their connections, timetables and expected travel time. This topic focuses on the analysis of service characteristics, on the use and acceptability of such services by travelers and on the possibilities for a pan-European perspective.

Research needs/aspects to consider

- Value of information
- Types of information
- Easiness to access to this information
- How this information conditions people's behaviour
- Acceptance of advices given by devices
- Quantity of advices provided to users
- Proven cost (in the sense of generalized costs, incl. time, money etc) savings when following recommendations
- Improvements, technology trends, new devices, new data
- Data quality issues and standardization, taking into account the several data sources
- Real-time multimodal trip planning algorithms
- Contribution to pan-European multimodal trip planners envisioned by DG MOVE

Expected impacts

Development of multimodal journey planners with sustainable business models. Demonstration of their effectiveness and acceptability. Evaluation of their impacts at urban as well as at peri-urban, national and pan-European levels.

Type of project

Large Scale Research Project

3.1.3 Planning for the ageing society

Motivation

A lot of heterogeneity exists in the older population, related to health and cognitive state, and also experiences, behaviour and expectations. It is particularly crucial to study how factors as gender, socioeconomic status, educational level, social support, and personality influence older people's habits concerning mobility and accessibility. These factors should be analyzed to identify potential new subgroups with regards to self-estimations of ability and modal choice. The number of older car drivers is increasing, and the extent to which older people manage to drive and to handle new vehicle technology is an important question. However, it is as pedestrians (and increasingly as bicyclists) that older people are most at risk in road traffic. Also, their knowledge about public transport services is often lacking, which may result in them travelling less than they might have done or shying away completely from using public transport. Sometimes the problem is not lack of information but too much of it or the wrong kind. More research, trials and evaluations are needed here to meet the needs and expectations from the growing populations of older people in Europe and other developed countries. Accessibility of the transport system is also a function of urban planning, land use, perceptions of security, facility provision and location.

Research needs/aspects to consider

- How do factors such as gender, socio-economic status, educational level, social support, and personality influence subgroups of older people's habits concerning mobility and accessibility?
- Development of models providing a better understanding of 'the whole journey' from end to end, and of the public environment
- Countermeasures to allow for continued driving in safety (including Advanced Driver Assistance Systems)
- How can a new generation of public transport systems and ways of providing information using the latest technology be found to meet the needs of older people?

- How can technical solutions in combination with information campaigns and training activities help develop bicycling and walking?

Expected impacts
Better understanding of the characteristics of the older population will increase the older people's mobility through appropriate and supported modes. This will include advanced assistance system designed according to their needs & expectations and public transport systems. The work will also facilitate modal shift of older people from the private car, and the participation and inclusion of older people in Europe's society. Another related and important impact will be the reduction of the number of injuries and severity experienced by older road users.

Type of project
Large Scale Research Project, Small Scale Research Project, Coordination/Support Action

3.1.4 Modelling and analysis of mobility systems

Motivation
Mobility patterns are changing both as a result of new technology (e.g. cooperative vehicles and electric vehicles) and social changes. Although a wide range of modeling tools exist improvements in scale, detail and scope are required. In parallel, new ICT techniques and facilities can be exploited. There is therefore a need to both improve and extend existing modeling approaches to reflect these developments.

Research needs/aspects to consider
- Improving modelling and analysis of mobility systems
  - Activity based modelling and agent based modelling
  - Big data analysis methodologies
  - Open source software, data and models
- Modelling and simulation of new modes, services and systems
  - Real time modelling and simulation of large mobility systems
  - Multimodal mobility systems optimization
  - New modes modelling (e.g. electromobility)
  - Cooperative systems modelling and simulation
  - Multiple info-mobility services modelling
  - Modelling of automated and autonomous mobility systems
  - Modelling of interfaces and interactions/implications between private passenger transport systems and commercial transport activities (e.g. urban logistics, ports activities etc.)
  - Travellers' groups analyses, including behavioural studies to feed modelling activities with accurate input data/parameters (e.g. value of time, mode choice parameters, route choice parameters etc.)
- Facilitating the use of models by the different stakeholders
  - Development of models with facilitated implementation (in particular facilitated calibration) so that they can be more easily used by local governments
  - Integration of modelling tools into decision support systems
- Facilitating the use of models by different stakeholders
- Integration of modelling tools into decision support systems
- Modelling future trends and elaborating/evaluating scenarios

Expected impacts
Methodological improvements and development of holistic, and potentially open source, mobility analysis tools, covering all modes of transport that will be useable by all interested stakeholders for planning and operational applications.

Type of project
Small Scale Research Project

3.2 Challenge 2: Forecasting socio-economic and technological developments (5 topics)

3.2.1 Visions and transport policy scenarios towards smart, low carbon transport systems up to 2050 and beyond

Motivation
The grand challenges such as global warming, global markets, energy supply, ageing population, security, scarcity of financial resources and also new technologies necessitate more efficient and effective policy measures, but in addition, new ways of system-level thinking, working and decision making within transport systems. Potential measures and innovations to tackle the above challenges are often systemic, resulting in system innovation or transition, in other words a shift from one socio-technical system to another. Such co-evolution processes involve not only technological changes but also changes in e.g. social, cultural, economic or legal dimensions. Uptake of new e.g. low-carbon technologies or services may be difficult, delayed or even fail completely if the societal impacts of new technologies or services are not known properly and/or information on their future potential and challenges is not available for supporting individual, private and public sector decisions.

Research needs/aspects to consider
- Visions, scenarios and related strategies and measures towards future goals of smart, low carbon cities and corridors in the long-term (50 years) and very long term (70-80 years) together with public and private actors of the transport systems
- Continuous research and monitoring on the constantly changing societal environment - political, economic, social, technological, environmental, cultural – as well as unexpected developments, as the basis for policy interventions towards EC Transport White Paper goals
- Exchange of best practices between the different cities and member states

Expected Impacts
Foresight and impact assessment is particularly important for making effective decisions in relation to transport system due to their typical features requiring long-term investments and strong role of regulation. Visioning work is intended to support decision making and ultimately deliver improvements to the competitiveness of the European economy.

Type of project
Coordination/Support Action

3.2.2 Foresight on societal and environmental aspects of mobility combined with business and technology foresight

Motivation

The Transport White Paper, and subsequent Directives are setting the agenda for development and deployment of transport systems in Europe over the coming decades. In order to facilitate smooth implementation, the roles of various stakeholders have to be coordinated even if they have different perspectives, motivations and timescales. Member States often have distinctive characteristics and priorities for their citizens; the business community, which often plays a vital role in delivering systems and services supporting European policy goals, may have a shorter time-horizon than the transport policy objectives. Nevertheless, these stakeholders, and many others, have to be accommodated within the overall deployment road map.

Research needs/aspects to consider

- Research on the measures in operation and planned by Member States that are aligned with the EC Transport White Paper goals; impact analysis and development of cost-effectiveness indicators based on existing and best available evidence
- Governance models and operational concepts integrating transport, land use, energy and smart services
- Research on integrating the long term perspective and business-related short term perspective in strategic transport planning in reaching EC Transport White Paper goals

Expected Impacts

More efficient and effective translation of European transport policy objectives into deployment with support of the main stakeholders and a more vibrant and engaged business community.

Type of project

Small Scale Research Project or Coordination/Support Action

3.2.3 Cost-benefit analysis and cost-effectiveness analysis (e.g. for reducing carbon emissions) of future ICT and vehicle technologies

Motivation

Although the EC Transport White Paper goals are clear, there are many possible pathways for achieving the objectives. Research is needed on the capabilities and costs of different technology support options to obtain a clearer picture of the relative roles and opportunities in future deployment and where further R&D is required. Although much is known, current knowledge of costs and benefits has to be developed in an integrated assessment such that a wider systems picture is obtained to support evidence-led policy making.

Research needs/aspects to consider

- Research on the (social) costs and benefits of future technologies (vehicle technologies, ICT, etc.) using prospective scenarios, and integrated assessment of transport and energy scenarios as well as cost-effectiveness analysis of future technologies (example: related to their contribution to reduce Greenhouse Gas Emissions –GGE-)
- Integrated assessment of transport and energy scenarios (production energy mix scenarios with incorporation of renewable energy, etc.), including the analysis of the entire cycle of production and usage of vehicles (Well-to-Wheel analysis)
- Cost-effectiveness analysis of future technologies (example: related to their contribution to reduce GGE)
- Market analysis (pilot studies)

- Financial models for future ICT and vehicle technologies

Expected impacts
This research is vital for understanding the market for future technologies and its potential to reduce GGE. The economic viability of each technology is assessed ex ante, with will allow the EC to be able to draw in advance a list of measures for the earlier diffusion of cost-efficient technologies.

Type of project
Coordination/Support Action or Small Scale Research Project

3.2.4 Socio-technical change and multi-level perspective for analysing transition towards smart low carbon transport systems in cities and corridors

Motivation
To move towards smart and low carbon transport systems in urban areas and in corridors a range of developments and deployment of technology and new systems will be required. In effect change is needed between the systems we have now and the future transport system and this transition involves a socio-technical interaction which is only poorly understood. In particular, a multi-level perspective on the technical sub-system is required that integrates land use, transport systems, technologies & services.

Research needs/aspects to consider
- Research on changes, actions and innovations towards smart low carbon transport in three analytical levels are necessary: the niche-level that accounts for the emergence of new innovations, the socio-technical regime level that accounts for the stability of existing systems, and the socio-technical landscape that accounts for exogenous macro-developments
- Research on deep structural changes needed to realise the development towards smart low carbon transport in cities and in transport corridors; Transition entails co-evolution and multi-dimensional interactions between industry, technology, markets, policy, culture and civil society and research on these is of great importance
- Research on the measures in operation and being planned by Member States that are aligned with the EC Transport White Paper goals; impact analysis and development of cost-effectiveness indicators based on existing and best available evidence

Expected impacts
The research will develop a better appreciation and alignment of stakeholder perspectives supporting smoother deployment of new low carbon technologies. It will also develop tools to assist prioritization of policy actions and to help mitigate potential barriers to implementation. These developments will facilitate a faster transition to low carbon transport in urban areas and corridors.

Type of project
Small Scale Research Project or Coordination/Support Action

3.2.5 Stakeholder & actor analysis and management of stakeholder networks in transition towards low carbon transport systems

Motivation
The management of change (between the transport system that we have now and the future systems of 2050) is a complex dynamic endeavour involving a very large range of stakeholders.

Research is needed to better understand the motivations and scope for action of a wide range of stakeholder groups that can support (or inhibit) the necessary changes and support positive communication with them. Decisions by the public sector, individuals and also companies need to be based on long-term, multi-level knowledge and processes. For instance, when new technology deployment and/or modal shift options and impacts have been considered sufficiently on multiple levels, conflicts between the effectiveness, feasibility and acceptability objectives of the options can be identified and responded to in time.

Research needs/aspects to consider

- Research on the structural dimensions of transport systems, such as actors and their changing roles, institutions, infrastructures and their interactions in transition towards low carbon transport systems
- Research on the measures in operation and being planned by Member States that are aligned with the EC Transport White Paper goals; impact analysis and development of cost-effectiveness indicators based on existing and best available evidence

Expected impacts

By avoiding or mitigating conflicts, sustainability and competitiveness gains can be reached in a cooperative manner. This is of interest for both the public sector and transport sector companies and may consequently give rise to new value networks and business models.

Type of project

Small Scale Research Project or Coordination/Support Action

3.3 Challenge 3: Providing efficient, safe, and inclusive mobility (7 topics)

3.3.1 Intelligent Mobility Systems

Motivation

The use of information and communication technologies in the transport sector is undergoing a transition from Intelligent Transport Systems (ITS) to Intelligent Mobility Systems (IMS). The overall aim is to adopt existing ITS and extend their capabilities, in order to accommodate in an integrated way the mobility needs of travellers and to assist them in their individual daily activity-to-activity planning and help to realize efficient, safe and environmentally-friendly mobility.

Research needs/aspects to consider

- Transition of ITS to IMS
- Cooperative mobility systems
- Integration and interoperable framework of mode-specific ITS services and applications
- Seamless integration of ITS / IMS to user personal devices (e.g. smartphones)
- Internet of things and future internet options for mobility
- Transport user needs, benefits provided by high-quality mobility and acceptance studies
- Cooperation between existing mobility related applications
- Technology assessment and foresight studies

Expected impacts

Research activities under this topic will include technology assessment and social-economic foresight studies related to the transition of ITS to IMS, covering both technological aspects as well as transport policy-making and end users.

Type of project
Coordination/Support Action or Small Scale Research Project

3.3.2 Integrated urban passenger and freight mobility

Motivation
Until today, research activities have focused independently either on passenger mobility in cities or on urban logistics and freight transport. However it is well-known that there are effects of both passenger transport and mobility on urban logistics operations and vice versa, such as the congestion due to peak-hour passenger transportation affecting the distribution of goods in cities. It is a worthwhile and rewarding challenge for transport to bring these two isolated "worlds" under a mutually beneficial cooperation scheme, in order to establish a common framework, analyse and assess the possibilities for improving the mobility of both people and goods in private and commercial transport.

Research needs/aspects to consider
- Organizational and policy related aspects as well actual options for cooperation (e.g. through the shared use of information)
- New measures and incentives systems for addressing negative effects and externalities
- Possibilities for novel integrated urban mobility schemes (passengers and freight – private and commercial), by assuring the general applicability of proposed mobility solutions to various types of European cities

Expected impacts
Deeper understanding of the interfaces, interdependencies and effects of private mobility together with urban logistics and freight transport within urban environments. Demonstrations of the proposed solutions in focused areas will enable the real-world uptake of the results at the pan-European level.

Type of project
Large Scale Research Project

3.3.3 Behavioural adaptation to transport safety measures

Motivation
Although the term "behavioural adaptation" is typically used to denote road user tendency to compensate for road safety measures ("risk compensation"), it is in fact a general mechanism and also used to describe the tendency for drivers to adapt behaviour in response to changes in the driving environment. Moreover the underlying mechanisms are identified in all transport modes: in aviation transport as "lack of situation awareness" or "complacency", in rail transport as "ATC-behaviour" and in sea transport as "radar-assisted accidents". There is an urgent and clear need to understand the mechanisms by which critical forms of behavioural adaption occur and how one may deal with the problem in a cross-modal setting.

Research needs/aspects to consider
- Identify mechanisms and examples of behavioural adaptation in all transport modes and map exploitable common characters
- Understand differences in relation to fitness-to-drive and between subgroups
- Behavioural adaptation of vulnerable road users (VRUs) in relation to infrastructure changes, including a better understanding of real-life safety situations of all VRUs and new safety technologies, originally developed to improve occupant safety

- Behavioural adaptation in relation to new technologies and Advanced Driver Assistance Systems, such as intelligent speed adaptation (ISA), automatic train control, adaptive cruise control, adaptive front light systems, navigation systems, or smartphones
- Naturalistic driving/riding observation studies, with the aim to increase knowledge about behavioural adaptation in situations where vehicles have multiple support systems bearing the risk of information overload compared to a situation-related process of information
- Behavioural adaptation in relation to training and education in different transport modes
- Promotion of beneficial behavioural change measures e.g. insight-based education, incentive-based reward systems, or technical solutions

Expected impacts
Better understanding of behavioural adaptation will provide the authorities, the motor vehicle industry and other stakeholders with vital knowledge about the effectiveness and way that instruments and safety measures work as intended (correct prediction of human responses), in order to invest efforts and resources where the safety benefit is the highest.

Type of project
Large Scale Research Project or Small Scale Research Project

3.3.4 Safety culture and work-related safety

Motivation
Safety climate/culture are concepts adopted within organizational settings to denote the level of awareness for safety issues within organizations. It has been a key issue in order to maintain safety as a top priority in particular within complex and dangerous production activities, such as oil drilling and nuclear power plants. It has also been a focus in aviation and rail transport, whereas in road transport it is largely absent. There is ample opportunity to improve safety issues in road transport by learning, adopting and implementing standards and principles from other transport modes. Such opportunities seem obvious for professional drivers, often being within an organizational setting, but less so for the vast majority of private drivers. Nevertheless it would be fruitful to investigate the possibilities of adopting safety climate/culture principles to private actors in transport.

Research needs/aspects to consider
- Investigation of the relationship between safety climate/culture and accidents (although increasingly focused on safety management in the transport industry, the relationship with accidents is not satisfyingly documented)
- Defining methods for implementing lessons-learned and better Corporate Social Responsibility in transport companies, including safety culture
- Research about effects of the new international standard for road safety, ISO39001, which specifies requirements for a road traffic safety management system to enable an organization that interacts with the road traffic system to reduce death and serious injuries related to road traffic crashes
- Research on the possibilities of adopting safety climate/culture principles from aviation and rail to professional drivers on the road, like bus companies or haulage companies
- Research of applying the principles of safety climate/culture to private actors in transport, such as private car drivers (e.g. within the Green Car Initiative)

Expected impacts
A growing number of publications document a positive association between safety climate/culture and actual safety in the transport sector. Still safety culture/climate has so far received little

attention in road transport, where the vast majority of transport accidents happen. Consequently there is a significant safety potential for the application of safety climate/culture principles to road transport.

Type of project
Large Scale Research Project or Small Scale Research Project

3.3.5 Fitness-to-drive, distraction, and human-machine interfaces

Motivation
Fitness-to-drive (F2D) can be viewed in short- and long-term perspectives. In the latter perspective, it is a result of driver training and driving tests giving the driver the necessary qualifications to drive safely. It is a natural concern in all transport modes with specific requirements of the type and amount of training necessary and the content of the driving tests. In the former perspective, F2D is concerned with daily fitness, which may be impaired by lack of sleep, sickness, stress, ageing, disabilities, fatigue or intoxication. Despite a lot of research on driver training and licensing, the effects on accident involvement are unclear. For private car training results vary and often no significant safety effect can be found; in other transport modes accidents are rare and the effect of training is difficult to measure. In the short-term perspective lack of F2D is a major concern in all transport modes – and the problem seems to be increasing. For instance, accidents due to professional (pilots, train, bus and truck) drivers falling asleep are an important risk factor. Research shows that drivers often lack the knowledge of when their reduced vigilance state becomes dangerous, with many different causes related to how work hours and schedules are organised and to free time, or amount and quality of their sleep. In addition sleepiness and fatigue may result from cognitive underload, resulting from the increasing automatization of the driver task. Fatigue management programmes have been adopted in order to help solve the problems. The contents and effects of these programmes vary, as are the ways such problems are met between different transport modes. In line with a holistic approach it is important to improve the detection and informing/warning on an operational, tactical and strategic level, by exploiting lessons learned across transport modes.

Research needs/aspects to consider
- Investigate the mutual learning need between transport modes about fatigue management
- Research on similarities and differences in driver education between transport modes, and the possibility to adopting 'best practice' models from one mode to another
- Research about the user of the transport system as an active participant, e.g., motivation and conscious choices based on the user expertise, experience, attitudes and risk awareness in conjunction with societal standards and norms
- Research about how driver vigilance is affected in autonomous driving, e.g. how to make sure that the driver has the ability to take back control when required (Vienna convention)
- Further research is needed to estimate the risk conferred by different distracting activities and the circumstances during which activities pose greatest risk
- Further research is needed to estimate how best to optimize human-machine interfaces so as to have a positive impact on driver behaviour and safety

Expected impacts
The research will improve technical knowledge based on sensor development and human monitoring and will lead to advanced technical solutions to detect, warn and help drivers to avoid critical situations due to distracting activities while driving. Concepts building upon fatigue management combine new technology with education and control, hold the potential to increase safety. Taking into account learning between transport modes will contribute to a better situation

especially for professional drivers. Future mobility systems that support automated driving will contribute to a safer journey, and fewer accidents and less working-hours lost due to accidents.

Type of project
Large Scale Research Project or Small Scale Research Project

3.3.6 Injury data, injury modeling and cost of treatment

Motivation
Traditionally accident data and information on the consequences (fatalities, slight/severe injuries, property damage only) are collected separately for different transport modes by country and year and published by Eurostat. In safety research there have been only a few studies investigating the safety effects of transferring traffic between road user groups. The potential to use hospital data to acquire reliable injury data regardless of where an accident occurred has for many years been looked upon as a promising possibility. In recent years, several European countries have established accident databases for collecting precisely such hospital data. These databases provide a more detailed picture and allow insight into, e.g., the number of pedestrian and bicycle accidents, which are largely underreported in official road accident statistics. Additional accident and injury data also provides an opportunity to study the risks involved in transport chains, including accidents on board a transport carrier as well as accidents and injuries between carriers at bus stops, pavements and so on.

Research needs/aspects to consider
- Insurance/hospital/police data: Research on methods for merging different data sources to obtain an improved source of information on the EU level (e.g. different agencies often collect the same data with different definitions for the same accident). Establishing a common methodology for accident investigation and data collection is of major interest (SafetyNet and DaCoTA project), however this methodology is under development and most importantly needs real-life testing on a sufficiently large scale before a EU-wide application
- If MAIS3+ is adopted as a common definition of serious injuries within the EU, research about these injuries is required to identify areas with large potential to reduce the number of the seriously injured to reach the EU-goal for 2020 – in a cross-modal setting it is important to compare the distribution of the seriously injured across transport modes
- Research on single-pedestrian accidents and relevant exposure data is necessary to obtain a high safety level from a door-to-door perspective
- Develop better approaches to explore accident and exposure data through statistical methods that enhance in-depth accident investigation results (e.g. in-depth data should complement macroscopic data by means of thematic focus such as pedestrian and bicycle accidents)
- Develop improved accident prediction models for enhanced quantitative predictive safety analysis
- Assess cost-benefits and combined effects of traffic safety improvement measures with regard to the objective of reducing fatalities and severe injuries
- Passive and active (i.e. active muscles) human body models for safety assessment with biofidelic kinematics and realistic injury, including child models
- Injury criteria for neurological deficits including injury criteria for elderly, children and vulnerable users

Expected impacts
Hospital data could be linked to treatment and cost data, giving the opportunity to establish costs of accidents. Such costs would (together with welfare economic based risk valuation for injuries)

be of great importance for decision-makers about financing transport safety measures, asset management and the development of treatment facilities.

Type of project
Large Scale Research Project or Small Scale Research Project

3.3.7 Data acquisition and activity-driven mobility systems for Smart Cities

Motivation
Recent advances in the ICT sector have resulted in an increased use and acceptance of personal devices, such as smartphones and tablets, which allow the interconnection between users, vehicles and other infrastructure elements. New paradigms like the "Internet of Things" and advances in the areas of embedded electronic systems, computing, and networking are leading to an environment composed of millions of heterogeneous devices able to collect additional information that promises the development of new mobility services. In parallel the growth of social media has created networks for information and activities-related exchange. The challenge is how to exploit information and data already existing, in order to enable sustainable and seamless mobility for travellers and to use big data both for planning and operations of urban mobility systems.

Research needs/aspects to consider
- Research on how can 'big data' be exploited for improved urban mobility, and how decision makers and planners use these new data sources (including availability and reliability issues)
- Assessment of readily available opportunities of the internet for improving urban mobility
- Research on effective implementation of two-way communication channels for data and information retrieval and provision (from and to users, devices, networks)
- Research on the active integration of daily activities and mobility needs of European citizens, and novel innovative methodologies needed for effectively handling this information
- Data acquisition research on big data from mobile devices, including the development of real-time information mobility systems (IMS), use of real-time IMS in hazardous situations (e.g. for emergency staff and the population, as well as fall-back solutions in case of interruptions of parts of mobile IMS, i.e. systems resilience)
- Novel technologies, new sensors, perception systems and seamless integration including data fusion algorithms for sensing, communicating and visualising
- More comprehensive transport simulation models covering all levels from global via national and local to the individual vehicle and traveller level

Expected impacts
This research topic will assess aspects regarding the optimal use of existing and new types, sources and forms of data related to personal mobility. Moreover, research will assess and demonstrate the capabilities and mobility benefits of the use of data, by taking into account the possibilities offered at the operational and planning level covering all modes of transport.

Type of project
Small Scale Research Project or Large Scale Research Project

3.4 Challenge 4: Achieving sustainable mobility (3 topics)

3.4.1 New concepts for vehicular systems to optimize energy consumption and efficiency

Motivation
The European Transport System is facing a series of challenges, related to sustainable mobility needs, policies and targets already set, together with social needs and technology improvements. Several research projects have provided significant results, covering both the urban and peri-urban environment, private and public transport, use of ICT, sustainable mobility planning and advances in the use of new energy sources. However, research is strongly needed on how these new concepts will be integrated in a multimodal system.

Research needs/aspects to consider
- Electro-mobility (for public transport, private vehicles, good delivery vehicles, electric bikes). This area includes:
  - User acceptance of new vehicles and range anxiety studies
  - Location of charging stations and smart grid as well as integration of electric vehicles into the existing transport system
  - Transitional phases of conventionally propelled vehicles up to fully electrically propelled fleets of vehicles in cities as well as incentives and mobility schemes for use of electric vehicles
  - Planning cities for adopting electro-mobility and adapting cities to electro-mobility
  - Consider private and public transport as well as cross-border traffic (e.g. compatibility and availability of charging infrastructures)
- Identify the benefits and real needs of the vehicles, in order to reduce unnecessary systems and optimize the energy consumption
- Study other modes such as tram, ropeway, etc. as alternatives to present urban transport modes
- Possible changes in regulations to, for example, enable combination of personal transport and freight as a way to optimize cost and energy consumption
- Bus rapid transit and integration into existing European public transport systems

Expected impacts
Proposals under this research topic will assess existing and new concepts and will contribute to integrated sustainable mobility planning at pan-European level by bringing the results of all research activities under one “umbrella”. It will provide a particular focus on advances related to integrated transport systems that will effectively utilize existing and new energy sources and contribute to a highly efficient European transport system.

Type of project
Large Scale Research Project

3.4.2 Analysing implementation challenges to more environmentally-friendly transportation systems

Motivation
New political goals regarding sustainable transport systems in Western Europe have resulted in a greater emphasis on building cities in a way that prevents transport needs from growing, or even arising. However, despite many practical initiatives, strategic, long term policy goals for sustainable transportation are still not being achieved adequately. Many of the short-term

political decisions that are taken concerning the physical development of cities undermine the ambition of achieving sustainable transport systems by adopting more incremental approaches. In practice we see coordination problems, tensions among different planning sectors, institutional constraints of routinized practices, with the result that local transport planning continues along the same old track. As a result, there is often a chasm between the aim of creating sustainable transport systems voiced in long-term plans and the actual decisions that are made in relation to concrete planning projects. Such behaviours reinforce path dependencies in travel behaviour. There is therefore a need to analyse how urban decision making and planning could be reoriented towards a more strategic and sustainable long-term vision.

Research needs/aspects to consider

- How can more integrated planning approaches that include multiple sectors - notably land use, environmental and infrastructure – be achieved?
- How can goal conflicts between social, economic, and ecological sustainability be handled successfully in politics and planning and how best can scientific information support and inform decision making?
- What intra organisational arrangements, strategies, routines, serve as mechanisms of change in sustainable direction in local authorities?
- What specific policy instruments could be developed to strengthen the urban planning practice in a way that promotes a more integrated environment, transport and growth policy?

Expected impacts

Proposals under this research topic shall assess all the challenges mentioned and provide detailed results for improved decision making and planning towards more environmental friendly transport systems.

Type of project

Small Scale Research Project or Large Scale Research Project

3.4.3 Contribution of urban land use and its regulation to improving sustainability of transportation

Motivation

Land use influences the transport options made available, seen as a traffic system considering both the infrastructure side and the mobility side in terms of geography of trips, average number of trips, length (distance and duration), modal share and relationships between the modes (including multimodality). Reciprocally, land use is not independent from the different characteristics of the transport/traffic system, especially in terms of accessibility to the jobs, services and customers. The relationship between land use and transport have been analysed in past decades. However a challenge remains to understand how urban land use and its regulation can contribute to improving sustainability of transportation, under conditions of demographic change, a rising attractiveness of inner city living and continued suburbanization, as well as rising energy costs.

Research needs/aspects to consider

- Adaptation of cities to environmentally friendly mobility behaviour and climate change
  - How far does mobility related infrastructure (including e.g. charging stations for e-vehicles, parking facilities and services) need to be adjusted to support low carbon mobility behavior?
  - What are the social trade-offs of land use and transport interventions for low carbon mobility (displacement, social exclusion, social acceptability)?

  - What adaptation strategies can be developed for mobility related infrastructure and spatial structure, in order to adapt to climate change?
  - How can mobility/accessibility needs of all social and disadvantaged groups be ensured (improve accessibility to jobs, services, local supply) together with low carbon mobility behaviour?
  - How can land use and transport interaction policies ensure affordable housing, affordable mobility costs and environmentally friendly mobility behaviour by promoting sustainable land use and transport infrastructure?
  - What are the overall potential quantitative effects of mobility behavior (change in mode choice, trip lengths etc), on reduction in local and GHG emissions and energy consumption?
- Knowledge on residential location and residential mobility in relationship with more environmentally friendly mobility behaviour
  - What individual factors motivate residential location and residential mobility?
  - To what extent do people choose a location according to their mobility preference (residential self-selection)?
  - How do different dwelling types influence location choice? To what extent do people choose a location according to the dwelling characteristics and/or according to the spatial patterns?
  - How can knowledge on mobility related location characteristics influence location choice? How can information platforms/policies on mobility costs/accessibility influence location choice?
  - How far do location decisions and residential mobility present an opportunity for changing (daily) mobility routines and habits?
- What is the existing range of configurations that combine competencies (transport, land use, housing etc.) and territorial levels (municipal, metropolitan, regional etc.) dealing with land-use and transport in Europe, and what is their respective efficiency in supporting sustainable transport?

Expected impacts
This research contributes to a better understanding and assessment of the contribution of spatial structure and spatial policy to environmentally friendly mobility, particularly in urban areas. Research on the application of the knowledge through detailed results and synthetic presentation of findings will assist local government in adapting and developing their action towards more environmentally-friendly transport systems.

Type of project
Small Scale Research Project or Large Scale Research Project

3.5 Challenge 5: Fostering advanced logistic services (5 topics)

3.5.1 New concepts to enlarge the use of e-freight

Motivation
Seamless transport in multi-modal transport chains should be enabled to gain more energy efficiency for transport by higher load factors. E-freight is mainly based on the role of ICT to develop simple, paperless and harmonised procedures which can foster seamless transport and thus increase efficiency.

Research needs/aspects to consider
- The impacts of ICT for innovative and efficient solutions should be assessed: How could these innovations promote new service concepts? How could these innovations promote radical

changes in freight transport chains? The degree of information quality (at an early stage, in a complete and reliable way) influences the resource efficiency of logistics processes. This parameter has to be assessed: does higher information transparency towards one or multiple stakeholders pay off for the involved companies?

- A better knowledge of the innovation process is an important issue: very little is known about the preconditions for innovation in freight transportation as well as concerning the adoption process by logistics industry.
- Articulation between technological and organizational innovation should be developed. E-freight is often thought in terms of technological innovation only but the implementation of e-freight also means associated organizational innovation.
- A framework towards standardization in logistics industry can be identified. This framework could be based on business partners cooperating in chains operation for pursuing standardization in information exchange and interoperability of Systems (ICT) operated by "cooperating communities of actors". A bottom up approach for systems interoperability and new organizational schemes aiming to the creation of shared and trusted environments should be followed.
- Large Freight Transport Harmonization has to be considered, to come to the harmonization of obtaining the necessary permits for the transport of abnormally large loads in different European countries.

Expected impacts
Incentives to support the innovation process in freight transportation will be suggested. In the same time, organizational innovations should be developed in association with technological innovations for e-freight. Incentives, organizational schemes and processes reengineering are also expected to promote innovative communities of cooperating partners. The elements for an unique permission over Europe for large freight in Europe could be developed.

Type of project
Coordination/Support Action or Small Scale Research Project

3.5.2 Efficient green freight corridors

Motivation
The White Paper 2011 clearly differentiates freight into a hub and spoke model that split last mile and city logistics away from long haul freight (over 300 km), with a short haul between the two. With city logistics by only clean vehicles and a 50% modal shift for freight over 300 km to rail/sea/waterborne into green corridors a more sustainable logistic system is created. However, this raises the need of research to meet (and create) the huge increase in rail freight in these corridors, and also to address the co-modal challenges of the interfaces between the backbones, the short legs and the last mile city logistics.

Research needs/aspects to consider
Efficient green corridor should be implemented through integrated systems for freight.

- The conditions for fully integrated rail networks and services for passenger and freight (e.g. co-modality) should be analysed.
- The role of technological developments, as well as ITS should be assessed.
- Innovative rail freight services (e.g. transport of air cargo by rail) and radical new freight vehicle concepts (e.g. electrification of motorways) are also expected.

Expected impacts
The elements for fully integrated rail networks and services for passenger and freight (e.g. co-modality) will be provided. Among them, a number of innovative solutions are expected, such as: capacity enhancement e.g. Integrated optimisation of system capacity for passenger and freight networks (e.g. traffic volume, vehicle occupancy); reduction of emissions from diesel rolling stock (e.g. hybridisation of diesel power trains); technology transfer from automotive sector and systems integration. In addition, intelligent automated traffic management systems; information management (databases, customer access, etc.); integration of freight planning and execution between rail and other modes as well as innovative rail freight services addressing lost markets of higher value are expected. Radical new freight vehicle concepts that are either co-modal or blue distinctions in scheduling between passenger and freight should also be expected.

Type of project
Coordination/Support Action or Small Scale Research Project

3.5.3 Innovative solutions to optimize the last mile at the urban scale: propositions and assessment

Motivation
Urban logistics is a current subject in many cities across the world to become more sustainable. Besides, urban freight transport has to deal with many changes: mainly e-commerce and new strategies from retailers as well as from carriers. In response to this recent literature reports urban freight strategies such as low emission zones, urban consolidation centres and freight quality partnerships attempting to reduce social and environmental impacts. But classically defined integrated city logistics schemes have failed across Europe. To face the urban freight challenges, and taking into account the lessons from the previous experiments, new innovative solutions have to be developed.

Research needs/aspects to consider
- The different implemented solutions should be assessed. Even if many of the top-down solutions are flawed, some successes exist in niche applications, where top-down command works, such as airport franchises and some shopping centers. Lessons can also be drawn from the experiments of the use of non road modes for urban deliveries by the carriers and the shippers, or the different urban consolidation experiments. The lack of success in the area of urban freight also shows the need for a clear customer-supplier model of urban access and information concerning the market mechanisms to allocate the scarce resource of urban access. It is important to understand the interests and aims of different stakeholders involved in urban freight.
- Financial viability of proposed solutions has to be addressed and an understanding of the requirements for profitable operations is needed to study the potential for further roll-out of promising solutions. Business models and supportive measures should be analysed to estimate the potential impact of the new and innovative solutions.
- A better understanding is also needed of the impacts of the ongoing changes for urban freight: e-commerce, increase in the home delivery demand, and relocation of the points of sales or the urban hubs for the deliveries.
- The role of sustainable procurement in better defining the method of delivery and the role of operator recognition schemes in driving logistics to sustainable solutions should be explored.
- Simulation, planning and dynamic optimization could suggest developments for new hubs and vehicles/nodes/concepts for urban deliveries. An optimized planning also need consider the characteristics of new vehicle concepts (limited range of electric vehicles, etc…).

- The potential role of ITS for urban freight should be assessed: development of cooperative route optimization, distributed sensor networks and data management, new information systems to improve visibility and access to data in order to promote the generation and use of multimodal routes for goods transport, development of Internet of Things (IoT) and affirmation of Service Oriented Architectures (SOA). The use of technological and management procedures and techniques applied for sustainable mobility of passengers to sustainable mobility of goods should also be tested. A cost-benefit analysis of these solutions should be conducted, considering the related organizational changes needed.
- New concepts of vehicles, including automated driving, in order to optimize energy consumption and efficiency could provide innovative solutions. The benefits and real needs of the vehicles should identified in order to reduce unnecessary systems and optimize the energy consumption, as well as study other transports modes, tram, ropeway, etc., as alternative to the present urban transport. Alternative propulsion for LDV and HDV is another possibility to realize lower or zero emissions transport in several areas as well as the use of cargo-bicycles for distribution. The issue of efficient total costs of ownership needs to be addressed for new vehicle concepts.

Expected impacts
This should result in guidelines and recommendations for urban freight policies, in the context of urban planning. It could mean regulations to enable multimodal transports of people and goods, on the way to optimize costs and energy consumption. Alternative tools could also be developed such as a customer-supplier model of urban access, concepts for reverse logistics, demand driven delivery optimization tools, or urban traffic dynamic models for optimizing physical distribution. ITS solutions could be proposed and assessed, as well as organizational changes towards more cooperative practices by the stakeholders. The development of ITS solutions also needs innovative intermediate, decentralised structures enabling neutral exchange and bundling of route and planning data necessary for successful cooperation and consequent optimisation of capacity usage.

Type of project
Coordination/Support Action or Small Scale Research Project

3.5.4 Analyzing the key drivers for the location, design and management of efficient multimodal terminals

Motivation
Multimodal terminals are essential nodes of multimodal chains. Nodal points canalize the flows of international trade and are important for creating efficient corridors. Currently it remains open how efficient corridors can be created and transport supply chains that are using the corridors be operated more efficiently. Different types of terminals have to be taken into account: sea port terminals, dry port terminals, inland waterways, air cargo terminals and also logistics hubs. Regarding these terminals, many stakeholders have to be considered and coordinated: terminals managers, carriers, shippers, spatial planners, regional and national authorities, logistics service providers etc.

Research needs/aspects to consider
- The location of the multimodal terminal is a major issue. For instance it needs to be better understood what the best location of the terminal within the road and rail network or near an airport will be, considering all the stakeholders: carriers, shippers, customers, policy makers, residents in surrounding areas.

- The design of the terminal, in terms of size and expandability, is an important element of its efficiency. The parameters of an efficient terminal and their dependency to size need to be known. These parameters are different for each stakeholder and have to be coordinated.
- The management of the terminal, and its human and technical resources, have to be optimized. It means optimizing the different operations at the terminals, as well as the process transparency and the "external" processes management and control. Multimodal terminals represent complex systems with highly dynamic interactions among the various processes taking place inside them, which affect the efficiency and productivity of the overall multimodal chains they serve. As such, optimizing the operations inside the terminals, besides improving terminal productivity, may improve the overall productivity and efficiency of the supply chains. The collaborative use of the terminal should also be facilitated. The potential role of ITS for an efficient management of the terminal should be assessed. An essential issue would also be on automated or semi-automated loading and un-loading to/from vehicles and between different transport modes. The effects of the sensorisation of cargo, vehicles and infrastructure, to ensure a seamless and transparent flow of goods have to be analyzed. Further there exists a strong link to e-freight to organize a seamless information flow between the different stakeholders.

Expected impacts
The knowledge regarding the location of the multimodal terminals considering all the stakeholders would be helpful to develop an integrated planning or the relevant legal facilitation schemes. The final objective could be an "Efficiency Labeling" initiative for intermodal corridors and terminals that serve the needs of all actors, or a certification scheme. The design of the terminals could be improved using tools that coordinate the different parameters of efficiency, for all the stakeholders. Optimization algorithms during operation could be proposed to promote a better management of the terminal, as well as ICT solutions for the process transparency (automatic localization and identification (process) and the "external" processes management and control. Capacity shared models for terminals operation could also make the collaborative use of the terminal easier.

Type of project
Coordination/Support Action or Small Scale Research Project

3.5.5 Governance, efficiency and networks of small and medium-sized ports and airports

Motivation
One effect of the globalization of trade is a reorganization of the maritime and port system as well as of aviation. In port networks small and medium sized ports play important roles in linking local and regional economies to the global economy through feeder traffic serving hub ports. Effective and efficient small and medium sized ports are necessary for example if Short Sea Shipping is going to be an alternative to road transport, and to secure the efficiency in the hub ports. This role can even be observed at medium sized airports feeding the major hub airports. Port congestion contributes to inefficient cargo handling, and hence, the hub ports are dependent upon well-functioning feeder traffic between the hub-port and the regions. The aim is to assess and demonstrate logistic efficiency in small and medium sized ports to better manage freight flows and to reduce the environmental impacts from freight flows between regional ports and between regional ports and hub-ports. Focus will be on different solutions of governance, competition and cooperation between small and medium sized ports and hub-ports.

Research needs/aspects to consider

- Development and use of KPI's, benchmarking of efficiency in freight handling in small and medium sized ports in coherence with the level and type of services offered, use of load carrying units, handling equipment, etc.
- Knowledge concerning the level of competition and cooperation between the ports and between these ports and the hub ports, identifying potential for cooperation and competition between operators and small and medium sized ports
- Knowledge concerning the connections and cooperation with land based transport and intermodal and co-modal transport solutions
- Assessment of the role of ownership, governance and financing of investments and operating of port infrastructure including terminals in efficacy and efficiency
- Prototypes of business models in studied ports and targeted "best practice"; Identification of key determinants
- Identification of the most cost efficient handling equipment in small and medium sized ports.
- Comparison between the level and type of efficacy of governance offered in studied ports
- Assessment of regional differences across Europe

Expected impacts

Impacts will be targeted "best practice" solutions on business models, hinterland transport arrangements, port governance, competition and cooperation models promoting efficacy and efficiency etc. between operators, small and medium sized ports and between these and hub-ports. Other impacts will be: increased performance of supply chains involving Short Sea Shipping, small and medium sized ports and improvement of network and spatial planning integrating European and regional transport networks with focus on intermodal and sea transport. The results will support government planners, port authorities and market players in planning of port infrastructure and superstructure.

Type of project

Coordination/Support Action Small Scale Research Project

3.6 Challenge 6: Ensuring resilient and secure transport systems (5 topics)

3.6.1 Establishment of multi-modal risk management

Motivation

With respect to climate change, sustainability and with the negative effects of increasing road congestion, multimodal transport is seen as an important element to solve many problems encountered by transport stakeholders today. On the one hand multi modal transport chains may allow reducing risks in transport, as alternative transport solutions are perceived in every day planning. On the other hand, multi modal transports lead to increasing risks and uncertainties in daily operation as the number of interfaces is increasing. This leads to the awareness of alternatives and (if alternative are not only stand by solutions) also to the availableness.

Research needs/ aspects to consider

Risk management is already well elaborated for single transport modes, especially concerning safety. Looking at air transport, the focus on safety led to an enormous performance increase. Also other modes of transport developed measures, assistance systems and training processes. Approaches are often different due to different legislative issues and of course the consequences of failures (plane crash vs. stop of a car on the emergency lane). Levels of safety (and resulting causalities and fatalities) are still very different. The same is true for security. In some of the transportation modes, security levels are very high while this is not the case in others. Although

this has certain concrete reasons (terrorism with its affinity to air transport) the differences may lead to higher but avoidable uncertainties. Intermodal risk management leads to learning from each other and adaption of methods if reasonable, necessary and applicable. In case of multi-modal transport chains the intermodal approach of risk management leads to a constant level of security and reliability even in multimodal transport chains with its rising uncertainty due to interfaces and can lead to more attractiveness of modal shift actions. Additionally, the constant reliability also eases the shift to other modes of transport in case of interruptions. With regards to transport infrastructure, multi-modal transport hubs (such as airports with a railway as well as highway connection) are a key element to the transport network in Europe. In this respect, a multimodal risk management approach would lead to a significant increase in the security of the former, while enabling stakeholders to assess and protect their infrastructure in a more holistic manner.

Expected impacts
Since risk management is already well elaborated for single transport modes, the expected impact would be a common European view about multimodal risk management which will allow increasing significantly all transport modes security in a coordinated way being able to shift to other modes of transport in case of interruptions.

Type of project
Coordination/Support Action or Small Scale Research Project

3.6.2 Holistic hazard analysis

Motivation
Security in transport covers a multiple number of threats, such as terrorism, (organised) crime, vandalism and violence, extreme weather events or natural hazards among others. Up to date, Risk Management in the transport sector has dealt with single threats, focusing on the effects of specific hazards / attacks on the transport sector. In this respect, much research has already been conducted. Hence, a detailed and clear picture on the effects of different threats for transport in Europe is available.

Research needs/aspects to consider
However, the combination of threats has so far not been adequately addressed. Hence, there is an apparent need for the investigation of multiple threats and the effects and consequences.

- Example: Physical and physical (Weather: Flooding plus Storm; Terror: Cyber Attack plus Conventional Attack)
- Combination of “Low Frequency, High Consequence” events

Additionally, a holistic hazard analysis must include a system approach. Some specific subjects included in this topic could be:

- Interdependencies with other sectors, such as energy or communication
- Analyses of the effects of hazards on these inter-linkages
- Identification of interfaces between transport and other sectors

Expected impacts
Since nowadays risk Management in the transport sector has dealt with single threats, focusing on the effects of specific hazards / attacks, a Holistic analysis gathering all European particularities would able a common strategy to deal those critical situations in a coordinated way and adding the link among Transport and the rest of affected parties.

Type of project
Coordination/Support Action or Small Scale Research Project

3.6.3 Enhancing the resilience of transport systems

Motivation
European cohesion, economic growth, welfare and the achievement of equal life quality is depending on functioning and efficient transport chains. In case of hazards the quick and efficient supply of basic goods and services (food, medicine, money, fuel, energy and information among others) is even more necessary. On the other hand transport is more and more affected by a rising number and extent of threats and hazards. Resilience of international and inter-continental supply chains is a prerequisite for the EU competitiveness and economic growth given that 40% of the intra-EU trade consist in intermediaries (such as parts, components, sub-systems and modules) which are processed at several European industrial locations and then brought to original producers as readymade merchandize suitable for retailer distribution. Further, a large part of European industrial manufacturing depends on inputs from extra-European locations which are brought to Europe either as row materials and/or sub-systems for assembling and/or final aggregation, branding and consumer marketing. These simple facts underscore the immense importance of supply chain's ability to deliver goods in right conditions, to right locations and on-time. However, the recent high frequency of natural and man-made hazards combined with long-term climate change impacts affect both the physical and the virtual transport infrastructure and pose considerable threats of disruptions and breakdowns of international supply chains.

Research needs/aspects to consider
Concerning transport chains, the main goal is to protect these from hazards and keep the most important goods flowing in case of hazards.

- This leads to the need for detailed analyses of threats for the supply chains and the affected transport modes.
- Following these analysis, the best measures for supply chain performance have to be identified. After having analysed and categorised the effects, measures can efficiently be developed which in turn increase the supply chain resilience by using the positive effects of multi-modality.
- An integrated approach which covers technical, organisational and personal measures and examines the core vulnerabilities in the different transport modes is needed.
- Additionally, an important aspect is to develop flexible information and decision systems concerning the current capacities' and performances of the different transport modes in real time and in the near future.

In the particular case of Freight transport, it must be analyzed the disruptive impacts of climate change, and natural and man-made hazards on reliability of supply chains, particularly those cutting across several countries, several climatic zones and continents.

- These developments require a lot of new knowledge on how to build the capacity for preemption and managing the short-term disruptions and traffic stops, and also how to effectively use resources for long-term operational resilience.
- In particular, safety and security of cargo going through terminals is a number one priority: the cargo system is a complex network that handles a vast amount of freight and is therefore vulnerable to several security threats (explosives, illegal shipments of hazardous materials and criminal activities).

Expected impacts
An integrated approach which covers technical, organisational and personal measures and examines the core vulnerabilities in the different transport modes would be developed as well as a flexible information and decision systems concerning the current capacities' and performances of the different transport modes in real time and in the near future. Enhancing resiliency of the freight transport system would allow it to "absorb" small scale disruptions and quickly recover from major ones. The scope is to minimize the impact of disruption to the system and the required for the system to recover.

Type of project
Coordination/Support Action or Small Scale Research Project

3.6.4 Crisis Management and Communication

Motivation
Dealing with crises and hazards differs very much from culture to culture. On the one hand, one can find situation where people act directly without any request or reinsurance of supervisors. On the opposite, in some cultures (companies, countries etc.), any action which differs from normal processes, leads to questions for permission to supervisors. Both approaches have advantages and disadvantages but each approach may have certain reasons and advantages with special incidences. Mental and legislation analyses of the behaviours in crisis management and the results of the different approaches can lead to new knowledge and leanings from each other. This could help to face future crises with additional knowledge of experiences from other cultures in a better way. Particular focus should be made to the public, focusing on improvements of the possibilities for self rescue as well as increasing the resilience.

Research needs/aspects to consider
Innovative solutions needs be developed which support the prevention, management and mitigation of major disasters and complex large-scale operations, which include often multiple actors from emergency services, police, fire brigades and authorities for traffic management. Interoperable systems which create immediately a common operational picture and provide decision support tools are essential for effective and efficient crises management. In major emergency situations, fast communication with respective actors is highly necessary to ensure quick and timely response. Hence, it is necessary to effectively support the emergency services during major disasters. This should include organizational as well as technical support measures in order to enable a holistic situational awareness. Furthermore, communication between the actors and towards the public should be reassessed, including an interdisciplinary approach with scholars from various fields. Relevant subjects in this topic are:

- Analyses of crises and hazards and approaches of crises management (advantages, disadvantages, problems, failures, best practise)
- Identifying the frames for the special crises management with respect to culture
- Providing best practises and frames to copy these practises
- Providing new assistance tools for crises with cultural background
- Cross-linked and ad-hoc interoperable situational decision support systems with smart algorithms for effective and efficient crises management
- Achieve a holistic and common operational pictures across the organisations involved in crises management (thereby considering all aspects of data protection and user roles)
- Utilisation of data acquired from various sources (fixed and mobile sensors, sensor networks, social media etc.) for optimal decision making
- Simulations of major disasters to support strategic and operational decision making (up to real-time simulation capabilities)

- Linking public and private actors in overcoming major disasters
- Crisis Communication between emergency services and organisations involved in crisis management

Expected impacts
The added value would be a pan-European innovative system to support the prevention, management and mitigation of major disasters and complex large-scale operations with a cross-linked and ad-hoc interoperable situational decision support systems with smart algorithms for effective and efficient crises management allowing a crisis Communication between emergency services and organisations involved in crisis management across all Europe.

Type of project
Coordination/Support Action or Small Scale Research Project

3.6.5 Relation between transport infrastructure and safety

Motivation
Transport infrastructure is the backbone for the mobility of people and goods and for a country's economic growth and competitiveness. Hence, planning and coordinating transport infrastructure developments has major consequences for the provision of transport and the modal split. As it is today, the quality of the infrastructure, overall transport costs and different regulations in many countries often produce a suboptimal modal split. For instance, strict regulations concerning the transport of dangerous goods on ferries have the detrimental effect that such goods are usually transported over long distances by trucks, increasing the overall risk to society. Safety and security regulations with an intra-modal focus, while intended to prevent accidents and harmful incidents, may simply result in a migration of risk factors and traffic demand to other transport modes. Inadequate infrastructure may have similar effects.

Research needs/aspects to consider
- Research on the relationship of infrastructure and safety with special consideration on interdependencies with other transport modes
- Influence of urban planning on road safety. Development of a road safety impact assessment (RIA) and other tools from directive 2008/96 ES
- Development of science-based evaluation tools to tackle the need for safety evaluations set in the road infrastructure safety directive
- Analysis of differences in safety levels of road infrastructure in EU countries (the differences are important not only for investment, application directive 2008/96 ES, user safety)
- Improve driving behaviour micro simulation, to reliably integrate risk indicators and comparative safety assessments in simulation aided design tools. Current micro simulation models on road user interaction (especially as regards pedestrians and cyclists) are too simple for safety analysis of alternative design layouts.

Expected impacts
Transport infrastructure has a major impact on the modal split. With the help of modern evaluation tools and traffic planners, stake holders will be able to assess not only the inherent risk of specific transport systems but also make informed decisions on adverse effects and safety potentials for other transport modes. Directive 2008/96/EC introduced a comprehensive system of road infrastructure safety management. Inclusion of interdependencies with other transport modes would incorporate additional information on safety related consequences and provide a more realistic 'picture' concerning the status of traffic safety.

Type of project
Large Scale Research Project or Small Scale Research Project

3.7 Challenge 7: Developing effective socio-economic policy measures (8 topics)

3.7.1 Public priorities for achieving a significant reduction of emissions whilst minimizing the negative social and economic consequences

Motivation
Transport brings enormous benefits to society through increased accessibility and mobility but it also has associated environmental and social costs due to its contribution to climate change, air pollution and noise. Essentially there are three different types of strategies to reduce emissions in the transport sector: reduce demand for transport -e.g. through strategies on land-use planning, integration of public transport; use of modes with lower emissions - e.g. public transport, walking, cycling; and increased efficiency of current transport modes, both technological or operational - e.g. low carbon vehicles. Understanding the relative effectiveness of the three types of strategies and prioritizing them is essential for public authorities if their investments are to be effective, efficient and sustained. Research is needed to bring evidence on useful and cost-effective solutions for urban/regional mobility and to investigate the most suitable practices in policy measures.

Research needs/aspects to consider
Which measures/group of policy measures are the most effective in terms of reduction of emissions, what is their acceptability and what is their compatibility with social and economic sustainability?

- Investing in ITS to influence behaviour (e.g. more efficient and seamless trips, multimodal trips)
- Changing land-use (especially urban structure), e.g. transit-oriented development
- Promoting ICT (telework, telecentres) as a way to reduce the need for mobility
- Encouraging new mobility services (car-sharing, bike sharing integrated mobility and ICT, etc.), new emerging technologies (electric vehicles, electrification of buses and taxis), a new generation of transport (seamless, multimodal, integrated)
- Improving the accessibility to public transport - especially for the elderly without increasing the cost of public transport
- Internalizing the externalities of transport and changing the balance of costs of mobility
- Encouraging Companies' Travel Plans and employees' Mobility Management
- Promoting a full integration of transport provision (a systems approach to transport)
- Adapting Sustainable Urban Mobility Plans (SUMPs) to changing mobility environment, according to travellers' needs and cities'/regions' policy priorities and objectives

Expected impacts
Activities under this research priority should provide understanding for public authorities regarding the relative effectiveness of different types of strategies to reduce emissions in the transport sector and minimize the negative social and economic consequences. The work will also provide information on the acceptability of different kind of strategies by the population and the economic actors.

Type of project
Coordination/Support Action

3.7.2 Pathways and transition models for internalizing transport externalities across modes (case studies involving a representative sample of European countries)

Motivation

In the mid 90's the commission presented a green paper on internalisation, Towards fair an efficient pricing in transport (COM(95)691). The ideas put forward were strongly rejected by many stakeholders. 15 years later the legislation for charging heavy goods vehicles (Dir/2011/76/EU) includes many of the issues raised in the green paper and advanced schemes has been introduced in London and Stockholm in line with the early ideas. Individual Member States are also taking the policy further. Knowledge on how this change has been achieved should be utilised and the policy developed. It should be seen as a global advantage that Europe already has taken and learned some of these policy steps but to keep the lead further research and innovation is necessary.

Research needs/aspects to consider

- Prospective research should be developed on the functioning of the transport system (multimodal perspective), policy innovation and transition models for the full internalisation of transport externalities
- Theoretical and practical framework of analysis of transport externalities and their assessment by Member States
- Applied behavioural economics experiments (stated-choice valuation, integration of socio-economic data, attitudinal data, etc.) for deriving marginal cost values as perceived by the population
- Demonstration experiments (for example: charging for the use of infrastructure to internalise local externalities such as congestion, noise and air pollution)
- Analysis of cost-effective measures for internalising external costs of transport, using experiments that could demonstrate the value added to the community of users and other parties
- Governance models for the full application of transition models for internalizing transport externalities

Expected impacts

Effective transition models in Member States to the internalization of transport externalities, along with the establishment of the proper theoretical and practical framework aiming to contribute to the behavioral assessment of externalities, elimination of tax distortions and unfair competition between transport modes.

Type of project

Large Scale Research Project

3.7.3 Charges and costs models for low-carbon transport systems in an inclusive European society

Motivation

Low carbon transport systems, including the use of new technological solutions, are likely to be associated to different (internal and external) costs structures, with different impacts on users, operators, infrastructure managers, equipment providers, governments and the society at large. This topic should explore these potential changes, their social impact and the acceptability of different measures by various social groups.

Research needs/aspects to consider

- Research on models and methodologies from social and political sciences for accounting to the social acceptability of internalization measures aiming to prevent social inequalities and social exclusion
- Socio-economic impact assessment of future cumulative impacts (e.g. of both internalization measures for local externalities such as road taxes and charges and global externalities such as climate change costs)
- Socio-economic requirements, cross-cultural variations between countries and accessibility indicators' framework evaluation for most vulnerable user groups
- Perceived social marginal values for transport externalities, which may include demonstration cases in cities
- Ex ante assessment of internalization measures (alternatives), aiming to prevent social inequalities and definition of requirements (legal/legislative, regulation, etc.)

Expected impacts

This research contributes to build a reinforced socio-economic responsible agenda regarding internalization of transport externalities in Europe.

Type of project

Small Scale Research Project or Coordination/Support Action

3.7.4 Harmonization of valuation methods for estimating transport externalities

Motivation

Knowledge on external cost have been developed in previous EU financed projects (UNITE, GRACE, ExternE, HEATCO) and lately been compiled for policy use (IMPACT) and incorporated in legislation (Dir/2011/76/EU). It is tempting to leave it like this for policy makers and their administrations. However, the results used today originate from basic research in the 80's and applied research in the 90's and early 21th century. Science has advanced and improved knowledge is necessary for an efficient development of a sustainable transport system. Better, modern and harmonized methods are needed.

Research needs/aspects to consider

- Research on methods and models used for valuing/estimating monetary values for local and global transport externalities, involving the cooperation of policy makers, operators, small and medium enterprises, research community and the stakeholders of each member state
- In-depth studies on transport infrastructure accounts at Member States are required due to the lack of data on infrastructure costs and use of revenues. This is a barrier to the aim of getting prices right and reduce distortions between modes
- Comparison of pricing instruments (taxes, charges, etc) across passenger ad freight transport modes

Expected impacts

The inventory of valuation methods and practices across Member States will allow setting guidelines on harmonization procedures. Since it is recognised that the lack of data on infrastructure costs and use of revenues is an essential problem, research through in-depth studies on transport infrastructure accounts will add key data inputs to pricing policies. This is a requirement aligned with the EC policy objective of getting the prices right and reduce distortions between modes.

Type of project
Coordination/Support Action

3.7.5 Green taxation models for a low carbon, healthier and more resource efficient transport

Motivation
Taxation is an important policy tool in transportation and it will be needed as an instrument globally to achieve sustainable transport. Europe has well functioning taxation systems and high taxation. This is a global advantage that should further be refined in a development of a greener taxation system. Research on how this development can be achieved for financial, taxation and transport efficiency is important for the European economy.

Research needs/aspects to consider
- Research on integrated socio-economic models for green taxation to a healthier society and more resource efficient transport use
- Inventory of "pure pollution taxes" and other related taxes across countries and transport modes along with environmental tax revenues
- Evaluation of future potential health improvements through the application of taxes and systems to limit carbon dioxide emissions (e.g. cap-and-trade) along with assessing their impact to address EC policy goals such as reduction of Greenhouse Gas Emissions
- Health benefits valuation (along with other environmental benefits) of non-motorized road transport (walking and cycling) along with innovative transport concepts in cities (demonstration studies)

Expected impacts
Overall, the research aims to contribute to the future environmental tax reform where a shift of burden of taxes can be envisaged (example: from labour to the unsustainable use of road transport infrastructure in urban areas). On the other hand, by making policy makers and users aware of the health (and environmental) benefits of non-motorized transport in cities (as alternative uses for road infrastructures), a more sustainable mobility is envisaged.

Type of project
Coordination/Support Action

3.7.6 Improved policy tools to support smart pricing and social innovation in urban areas

Motivation
Impact analysis and cost-benefit studies for future transport scenarios until 2020 and beyond are vital. Transport policy support tools and advanced methods will be the key to support both the "critical path" (program of critical actions to be implemented) and the "convergence path" towards the EC Transport White Paper goals. Appropriate ex ante and ex post performance indicators to support the whole life-cycle of policy making and implementation are also required. Improved appraisal methods are envisaged to support transport policy in a regular basis, and this will require further integration of transport economics theory and social sciences methods (and their validation through experiments involving cities, transport operators, users and the relevant stakeholders). Currently, the policy support tools do not adequately take into account the complexity of the operating environment, its dynamics, rapid change and rebound effects. Although the various transport system actors are often aware of these challenges, policy support

tools are yet based on fragmented information and indicators on the operating environment and wider societal impacts.

Research needs/aspects to consider

- Research on social innovation to support the appropriate ecosystem for smart pricing measures
- Development of a prospective framework for earmarking revenues from transport for the development of smart pricing in congested urban areas in Europe
- Develop pilot studies with the community of social innovators and users
- Policy guidelines for operators to address key issues such as those related to vehicle taxation as a function of vehicle characteristics and its socio-economic impacts (social costs of congestion, noise, local air pollution, etc.)

Expected impacts

Social innovations are expected to drive future changes towards the implementation of goals targeting the EC goals. Smart pricing in urban areas will contribute to more sustainable mobility and efficiency in the use of resources.

Type of project

Coordination/Support Action

3.7.7 Policy packages for efficient, smart, low-carbon transport governance and policies in urban areas

Motivation

Urban areas are likely to be the prime beneficiaries from the transition of the transport system towards the low-carbon paradigm. It seems necessary to identify new methodologies for putting together optimal policy packages which combine the implementation of new technological developments, the reform of legislative and institutional frameworks and management of transport systems (including the decision-making level).

Research needs/aspects to consider

- Research on the measures in operation and under planning by Member States that are aligned with the EC Transport White Paper goals; impact analysis and development of cost-effectiveness indicators based on existing and best available evidence
- Integrated assessment of cumulative impacts of future transport measures aiming at efficiency (example: more efficient use of road infrastructures in urban areas; energy efficiency, etc), smart transport and decarbonisation of both passenger and logistics urban transport (ex ante and ex post analysis through case studies)
- Development of an assessment framework of indicators for transport policy makers and transport operators

Expected impacts

This action is expected to contribute to a more efficient policy making, supported by an assessment framework of indicators, which can act as key policy tools to measure locally the progress towards set objectives. Further knowledge on the cumulative impacts of measures can be shared between Member States, aiming to derive alternative policy packages to match socio-economic challenges.

Type of project

Coordination/Support Action

3.7.8 Evaluation of change/policy initiatives

Motivation

There is a growing tendency in Europe for countries to reorganise their transport sectors and to bring together the different transport bodies into large general organisations. For example, in The Netherlands, Sweden and Finland different transport bodies (road, rail, sea, air) have been reorganised into a common transport body. Also the accident investigation boards have become intermodal in many European countries. The organisation also includes direct links with safety/security bodies such as police, fire service, and civil safety.

Research needs/aspects to consider

- Identification of specific policy initiatives and outcomes of the different ways the transport sector is organized across countries (e.g. a particular point for research is whether and to what extent a cross-modal approach in safety management is revealed in countries where different transport sectors have been reorganized into a common transport body)
- Development of research and evaluation methods for isolating the effects of policy initiatives
- Analysis of differences between countries and factors to increase the knowledgebase of main characteristics – such as total number of person-km, modal split of person-km, accident risks on different road categories, environmental performance of the vehicle fleet, share of vehicle-km among those road categories as well as severity of accidents (fatalities per injury accidents) –, which promises to be highly beneficial while evaluating the safety potential related to policy initiatives
- Investigation of possible risk and emission migration (from one mode to another) due to cross modal policy in Europe
- Analysis of the effectiveness of existing enforcement strategies and policies as well as new legislation to influence traffic participants' behaviour (drivers, cyclists, other vulnerable road users), including the forthcoming drug driving legislation

Expected impacts

A cross-modal policy involving the coordinated development of safety measures and common evaluation tools can benefit the transport sector and help reduce unforeseen consequences inherent in traditional sector focused policies. Safety (and security) measures developed with an intra-modal focus, while intended to prevent accidents and potential incidents, may merely result in the migration of both risk factors and traffic to other modes for example (e.g. prohibiting dangerous goods on boats might increase road transport, that has higher risks). Vulnerability to new and old risks, cross-modal dependencies, and the challenges associated with New Public Management are further arguments for the cross-modal management.

Type of project

Large Scale Research Project or Small Scale Research Project