# TRANSPORT CHALLENGE IN HORIZON 2020

# ECTRI SUGGESTIONS FOR THE SECOND WORK PROGRAMME (2016-2017)
## *in the field of*
## "TRANSPORT SAFETY"

# November 2014

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 24 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.

# 1. Introduction

ECTRI launched its Thematic Groups in September 2007 as a means to facilitate exchanges among its researchers interested in similar research fields and in order to promote joint initiatives and positions. One of the groups is the Thematic Group on Transport Safety (TG-Safety). The main objectives of this group are to define research topics of interest for supporting EC policies and programmes, to increase successful participation in EU projects and to provide a platform for networking and scientific exchanges. The group consists of 25 experts from 15 Transport Research Institutes and Universities representing 15 European countries. Most of these institutes are working in the field of road safety, railway safety, nautical safety, safety management and safety culture and some are also involved in aviation safety. Members are: AIT, CDV, CERTH, DVS, Fraunhofer, LNEC, IFSTTAR, ITS, KTI, TØI, TRL, UPM, UVEG, VTI and VTT.

TG-SAFETY wants to play an active role in the development of validated and innovative knowledge of transport safety by bringing in their expertise on safety issues in different European countries, their scientific knowledge of integrated safety policies and research issues and their experience in safety research for the different transport modes: roads, waterways, railways and aviation. We acknowledge the work of other platforms such as ERTRAC, EARPA, and FERSI and also the PROS project regarding road safety research priorities, but believe that TG-SAFETY has an added value by addressing integrated transport safety policy issues and the development of cross modal evaluation tools and strategies.

TG-SAFETY has identified several research topics that are of general interest to the group and that we believe are highly relevant for the Horizon 2020 programmes. The topics are those where we believe we can gain new insights and knowledge by applying a cross modal perspective, i.e. to study how theories and methods on safety issues can be fruitfully exchanged between modalities. ECTRI thinks that given their importance, these aspects should be identified as research themes in future programme of "Horizon 2020". The suggested research topics are reflected in the form of research priorities, aiming to highlight their significance for inclusion in the upcoming calls of Horizon 2020. The proposed research topics are well related to the Challenge aiming to achieve "better mobility, less congestion, more safety and security". The overall aim of the seven research topics suggested by ECTRI TG Safety is to reduce accident rates and fatal causalities, and they also have a close connection to the five main areas of research for advancing an integrated transport system suggested by ECTRI: –Individual users' mobility behaviour; –Multimodal mobility systems and services; –Advanced logistic services; –Resilient and secure transport systems; –Research support for decision-making.

# 2. Suggested research topics

TG-SAFETY is proposing seven research topics based on the conviction that increased knowledge will be important for improving transport safety across all transport modes:
1. Response and adaptation to new transport technologies (p. 3)
2. Safety climate – work related safety (p. 5)
3. Fitness to operate and distraction (p. 6)
4. Evaluation of change/policy initiatives (p. 8)
5. Planning for the ageing society (p. 10)
6. Risk of whole travel chains by innovative use of big data to map exposure combined with hospital data to estimate risks (p. 11)
7. Transport infrastructure adaptation and development (p. 13)

It is acknowledged that the conditions in the diverse modes may be different to be tackled in one project, and therefore that parallel projects in different modes may have to be undertaken (according to the same approach) before comparisons and lessons can be drawn.

# 1

| Suggested title of the research topic | Response and adaptation to new transport technologies |
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| **Programme** | Transport |
| **Timing/Year Work Programme** | 2016/2017 |
| **Indication on "research area"** | |
| Road/rail | |
| **Specific challenge** | |

Research topics under this challenge are about how operators and users of the transport system utilize the new technologies available and the interplay between new and "old" technologies. This is important because there is a very rapid development and introduction of new transport technologies while at the same time the transport market in Europe is becoming more integrated with increased competition. There are numerous safety challenges associated with these developments. Safety may be harmed because new and old technologies are poorly integrated, because new technical assistance systems can lead to suboptimal behavioural adaptations or because safe and advanced safety transport systems face fierce competition from cheap transport suppliers with old and poor and unsafe equipment.  There is also a risk that some users chose not use the new technologies.

This research topic is relevant under the first main area of research identified by the ECTRI position paper on the second work programme: "Individual users' mobility behaviour". The understanding of how individuals respond and adapt to the new technologies will also be an important issue in area (IV) "Resilient and secure transport system" and (V) "Research support for decision-making".

**Scope**

**Motivation:** Behavioural adaptation (BA) has been a key issue in road safety research for many years. It implies that drivers tend to take advantage of new safety measures in other ways than just to increase safety. Typically drivers increase speed or reduce vigilance and hence reduce the potential safety impact of the measure. This is particularly the case for measures such as those that improve road friction, sight, stopping distance and so on, and not so much for passive safety measures like seat belts, air bags etc.  Although the term "behavioural adaptation" is typically used to denote road users' tendency to "compensate" for road safety measures, the mechanisms at work are general and also identified in other transport modes as "lack of situation awareness" or "complacency" (aviation), "ATC-behaviour" (rail), "radar-assisted accidents" (sea).

The rapid development and introduction of new advanced technological driver assist systems can be victim to behavioural adaptation in the classic sense but perhaps mostly manifested as reduced vigilance. In addition, with advanced driver assistance systems an alternative BA may be an increased use of communication devices. Another important safety challenge concerns the adaptation and interplay of new and old technologies; navigation systems may guide drivers of heavy vehicles onto unsafe roads; modern cars and drivers with automated responses may act differently than for example older drivers in traditional cars etc.

There is a need to understand the mechanisms of BA to new and old technologies and the associated interplay challenges between the modern and traditional drivers and vehicles.

Research needs are:
a)  Identify mechanisms and examples of adaptation to technological changes in all transport modes and identify any common characters. Understand differences in relation to both technological levels and differences between subgroups such as older/younger drivers, males/females, etc.
b)  Investigate what determines user's attitudes to new technical systems and automated vehicles to understand why some road users tend not to adapt to the new technology.

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| c) | BA of vulnerable road users (VRUs) in relation to infrastructure changes. BA 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, smart phones etc. |
| d) | Naturalistic driving/riding observation studies with the aim to increase knowledge about BA in situations where the vehicles have several support systems and there is a risk for overload of information compared to a situation-related process of information. |

**Expected impacts**

Better understanding of how road users adapt to and utilize new transport technologies will provide the authorities, the motor vehicle industry etc. with vital knowledge about what instruments and safety measures that actually will work as intended (correct prediction of human responses) and those that will be victim of behavioural adaptation and thus not to the same extent be able to contribute to increased safety. Furthermore, better knowledge in this area can help authorities and industry with guidance about how new technologies ought to be introduced in order to avoid safety critical mismatch with existing technologies and undesirable behavioural adaptations.

# 2

| Suggested title of the research topic | Safety climate – work related safety |
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| **Programme** | Transport |
| **Timing/year Work Programme** | 2016/2017 |
| **Indication on "research area"** | |
| Road/rail/air/sea | |
| **Specific challenge** | |

Research topics under this challenge are about how to ensure that operators and users of the transport system give safety considerations sufficient priority. This is important because the transport market in Europe is becoming more integrated with the increased competition where safety considerations may be harmed and because new technical assistance systems can provide suboptimal adaptations.

This research topic is relevant under the second main area of research identified by the ECTRI position paper on the second work programme: "Multimodal mobility systems and services" where the possibility to transfer lessons learned from transport mode to another is highlighted.

**Scope**

**Motivation:** Safety climate and safety culture are concepts adopted within organizational settings to denote the level of safety awareness in the organization. Safety climate/culture has been a key issue in order to maintain safety as a top priority in particular within complex and dangerous production activities, like oil drilling, nuclear power plants etc. Safety climate/culture has also been focused in aviation and rail, whereas in road transport such a focus is largely absent. Thus there would be ample opportunities to improve safety in road transport modalities by implementing safety climate/culture principles from other areas/transport modes.

Such opportunities seem obvious for professional car and truck drivers, often being within an organizational setting, but less so for the vast majority of private drivers. Nevertheless, it would be interesting and potentially fruitful to investigate into the possibilities of adopting safety climate/culture principles also to private actors in transport, such as private car drivers.

Research needs are :
   a) Investigation of possible relationship between safety climate, safety culture and accidents. Although safety culture is increasingly focussed also in safety management in the transport industry, the relationship with accidents is not very well documented.
   b) Defining methods for implementing available knowledge and develop companies CRS's (Corporate Social Responsibility) including safety culture.
   c) Implementation of and research about effects of the new international standard for road safety, ISO39001. ISO39001 specifies requirements for a road traffic safety (RTS) management system to enable an organization that interacts with the road traffic system to reduce death and serious injuries related to road traffic crashes which it can influence.
   d) Investigation of the possibilities of adopting safety climate/culture principles from aviation and rail to professional drivers on the road, like bus companies, haulage companies etc.
   e) Also the possibility to applying the principles of safety climate/culture to private actors in transport, such as private car drivers ought to be investigated.

**Expected impacts**

A growing number of publications document a positive association between safety climate/culture and actual safety both in general but also 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. There is thus a huge safety potential of the application of safety climate/culture principles to road transport.

# 3

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| **Suggested title of the research topic** | Fitness to operate and distraction |
| **Programme** | Transport |
| **Timing/year Work Programme** | 2016/2017 |
| **Indication on "research area"** | |
| Road/rail/air/sea | |
| **Specific challenge** | |

Research topics in this challenge will be about how to design the transportation system to take into account all forms of human limitations, both physical and cognitive etc. This will be particularly relevant in the future with increasing elderly population and with an increasing number of people with disabilities participating in normal life.

This research topic is relevant under the first main area of research identified by the ECTRI position paper on the second work programme: "Individual users' mobility behaviour". The understanding of how individuals respond and adapt to the new technologies will also be an important issue in area (V) "Research support for decision-making".

**Scope**

**Motivation:** Fitness to drive or operate in the transport system can be viewed in both long-term and short-term perspectives. In a long-term perspective fitness is a result of training and education providing the system participants the necessary qualifications to operate safely. In a short-term perspective, fitness to operate is concerned with daily fitness, which may be impaired by lack of sleep, sickness, stress, ageing, disabilities, fatigue or intoxication.

In the long-term perspective fitness to operate is a natural concern in all transport modalities with specific requirements of the type and amount of training and skills necessary to perform adequately. In the short-term perspective lack of fitness to operate is also a major concern in all transport modes, and the problem seems to be increasing. Accidents due to drivers and transport operators falling asleep are an important risk factor. Research shows that operators often lack the knowledge of when their reduced vigilance state becomes dangerous. Among professional drivers sleepiness is a major problem and there are numerous examples of incidents and accidents where pilots, train, bus and truck drivers have severe sleepiness or have fallen asleep. Such problems have many different causes, related both to how work hours and schedules are organised and to the operators' free time, amount and quality of their sleep. In addition, sleepiness and fatigue may result from cognitive underload, resulting from the increasing automatization of the tasks involved.

Fatigue management programmes have been adopted in order to help solve the problems. The contents and effects of these programmes vary, and the ways such problems are met differ between transport modes. For example, there seems to be better opportunities for airplane pilots to claim 'not fit for flight', than for professional drivers in road transport. The possibility of mutual learning between transport modes about fatigue management should be investigated taking as a base all existing related statistics. In line with a holistic approach it is important to both have the possibility to detect and to inform/warn on an operational, tactical and strategic level.

Research needs are:
  a) Investigate the possibility of mutual learning between transport modes about fatigue management (see above).
  b) Research on similarities and differences in driver education between transport modes, and the possibility to adopting well documented learning models from one mode to another.
  c) Research about the user of the transport system as an active participant. Issues like motivation and conscious choices based on the user's expertise, experience, attitudes and risk awareness in conjunction with the standards and norms that exist in society and in the

immediate social group.

d) Research about how driver vigilance is affected in situations with autonomous driving. How to make sure that the driver has the ability to take back control when required.

e) Further research is needed to estimate the risk conferred by different distracting activities and the circumstances during which activities pose greatest risk.

**Expected impacts**

Distracting activities while operating a vehicle are common for the transport modes and can result in errors. Distraction is an important cause of crashes and the expected impact of an increased knowledge of these issues is that it results in fever distracted transport operators. Solutions to reduce the prevalence of driving and operating under sleepiness will save lives and severe injuries. Advanced technical solutions to detect, warn and help drivers and operators to avoid critical situations due to sleepiness needs to be innovative and based on unobtrusive techniques were the transport industry but also small companies expertise is needed. The impact of this will in the long run be improved technical knowledge based on sensor development and human monitoring. Concepts for Fatigue management combining new technology with education and control may improve the companies situation taking into account learning between transport modes is important and contribute to a healthier situation for especially the professional drivers. In the future systems that support automated driving will contribute to a safer journey, save fuel, contribute to less crashes and to a more effective way of using the time.

# 4

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| **Suggested title of the research topic** | Evaluation of change/policy initiatives |
| **Programme** | Transport |
| **Timing/year Work Programme** | 2016/2017 |
| **Indication on "research area"** | |
| Road/rail/air/sea | |
| **Specific challenge** | |

Research topics under this challenge are about how to ensure that the transportation system is coordinated and works efficiently. This means, for example, to avoid different levels of security requirements and infrastructures provides suboptimal traffic distribution or allocation of risk.

This research topic is relevant under the second main area of research identified by the ECTRI position paper on the second work programme: "Mobility systems and services". It is also an important issue in the fourth research area: "Resilient and secure transport systems". An integrated approach to protect the transport system is identified as a challenge and accordingly how we organize and administer the system are key issues.

**Scope**

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 the 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.

Increased automation in all transport modes, including road, also contributes to bringing the different transport modes together and becoming more similar to each other. This development is relevant not only for authorities, but also technical companies.

Traditionally different transport modes have had separated standards and such reorganisations and developments may facilitate mutual learning between transport modes and a more common perspective on safety issues. 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 problems, safety management principles and safety measures may become common in a joint organisational setting. However, there is also the risk that such merging processes are both time and energy consuming (including all previous technical processes such as the creation of a common database or data exchange among different entities) so that the actual safety work is lacking.

Research needs are:
  a) Identification of specific safety policy initiatives and safety outcomes of the different ways the transport sector is organised in different countries. A particular interesting point for investigation could be whether and to what extent a more cross-modal approach in safety management is revealed in countries where the different transport sectors have been reorganised into a common transport body.
  b) Research and evaluation methods should be developed and research focused on isolating the effects of policy initiatives
  c) Investigation of possible risk migration (from a mode to another mode) due to cross modal policy in Europe.

| Expected impacts |
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| A cross-modal safety policy involving the coordinated development of safety measures and common evaluation tools can benefit the transport sector and help reduce those 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 (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 of safety and security. |

# 5

| Suggested title of the research topic | Planning for the ageing society |
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| **Programme** | Transport |
| **Timing/year Work Programme** | 2016/2017 |
| **Indication on "research area"** | |
| Road/rail/air/sea | |
| **Specific challenge** | |

Research topics in this challenge will be about how to design the transportation system to take into account all forms of human limitations, both physical and cognitive etc. This will be particularly relevant in the near future with increasing elderly population.

This research topic is particularly relevant under the first main area of research identified by the ECTRI position paper on the second work programme: "Individual users' mobility behaviour".

The topic is also highly relevant under the second main area of research identified by the ECTRI position paper on the second work programme: "Multimodal mobility systems and services" that emphasizes the challenge of designing a multimodal transport system that can cope with diverse mobility patterns.

**Scope**

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 are:
a) 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?
b) Development of models providing a better understanding of 'the whole journey' from end to end, and of the public environment
c) Countermeasures to allow for continued driving in safety (including Advanced Driver Assistance Systems)
d) 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?
e) 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 and 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.

# 6

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| **Suggested title of the research topic** | Risk of whole travel chains by innovative use of big data to map exposure combined with hospital data to estimate risks |
| **Programme** | Transport |
| **Timing/year Work Programme** | 2016/2017 |
| **Indication on "research area"** | |
| Road/rail/sea | |
| **Specific challenge** | |

Research topics under this challenge are about providing tools to monitor whether the transportation system is well coordinated and safe. To maintain and improve transport safety levels is particularly challenging as new "soft mode" travel patterns in city areas are encouraged throughout Europe. The risk levels of cycling and walking are often poorly covered due to both lack of sufficient accident and injury reporting and to insufficient exposure data. The promotion of cross-modal travel particularly in urban areas e.g. combining bicycling with public transport, poses additional challenges with respect to mapping the risks and injury costs involved.

New technologies, e.g. apps can map whole travel chains and provide good estimates of travel distances by different modes, and may be a valuable tool for providing exposure data. The integration of hospital data of road accidents and injuries with traditional police records, like the Swedish STRADA-register, can provide more complete accident and injury figures. Thus the combined utilization of new technologies to map exposure with new procedures to register accidents and injuries, can provide better and more complete risk figures and thereby also accident and injury cost estimates for different road user groups and for whole travel chains.

This research topic is relevant under the first main area of research identified by the ECTRI position paper on the second work programme: "Individual users' mobility behaviour". Mobility behaviour in and across transport modes is partly determined by what people consider to be safe. This research topic is also relevant under the second main area of research identified by the ECTRI position paper on the second work programme: "Multimodal mobility systems and services".

| **Scope** |
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Traditionally, accident data and information on the consequences (fatalities, slight/severe injuries, property damage only) are collected separately and evaluated differently for different transport modes by country and year and published by EuroStat. In road safety research there have been only a few studies looking into the risks of whole travel chains and investigating the safety effects of transferring traffic between road user groups.

The potential to use hospital data to acquire good injury data regardless of where the accidents happened has for many years been looked upon as a promising possibility. In recent years, several European countries have established accident databases for collecting such hospital data. Such databases provide a more detailed insight into e.g. the number of pedestrian and bicycle accidents, which are largely underreported in official road accident statistics, but also admits the possibility to evaluate and study the risks for permanent medical impairment. Additional accident and injury data will also provide an opportunity to study the risks involved in transport chains including the accidents on board a transport carrier as well as accidents and injuries between carriers at bus stops, pavements and so on. New app technologies provide promising tools to map traffic exposure.

Research needs / aspects to consider
  a) Insurance data / hospital data/ police data: Methods on how to merge different data sources in order to obtain an improved source of information on a European level should be investigated. Different bodies/agencies collect most of the times the same data with different definitions for the same accident. Establishing a common methodology for accident investigation and data collection is of main interest (SafetyNet and DaCoTA project).

However this methodology is under development and most importantly needs real-life testing on a large scale before a Europe wide application

b) If MAIS3+ is adopted as a common definition of serious injuries within Europe, research about these injuries are required to identify areas with large potential to reduce the number of seriously injured to reach the EU-goal for 2020. In a cross-modal setting it should be important to compare the distribution of seriously injured according to MAIS3+ for different transport modes.

c) Research on single-pedestrian-accidents and relevant exposure data is necessary to obtain a high safety level from a "door-to-door" perspective.

d) Develop methodologies to use newly developed techniques such as Drice Cam, mobile devices and navigation systems to explore accident and exposure data, through statistical methods that enhance in-depth accident investigation results combining data so obtained with macroscopic data. In-depth data collection should complement macroscopic data by means of thematic focus data gathering (e.g. pedestrian, bicyclist accidents etc.) depending on the topics that should be addressed and considered as high priority per time period. Large-scale thematic data collection will assure large samples that can provide statistically powerful results representing the whole of Europe.

e) Develop improved accident prediction models for enhanced quantitative predictive safety analysis.

f) Develop (common) EU In depth accident investigation methodology

## Expected impacts

The utilization of hospital data will improve our knowledge of the consequences of accidents and provide better opportunities to select effective safety measures to achieve the EU's 2020 target for serious injuries. The utilization of hospital data combined with more complete exposure data can reveal the true risks involved of whole travel chains in addition to the risks for single road user groups. Furthermore, the utilization of hospital data could also be linked to treatment and cost data, giving the opportunity to obtain better basis to calculate real public costs of accidents. Such costs would be of great importance for the authorities in decisions about financing transport safety measures, asset management and the development of treatment facilities.

# 7

| Suggested title of the research topic | Transport infrastructure adaptation and development |
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| **Programme** | Transport |
| **Timing/year Work Programme** | 2016/2017 |
| **Indication on "research area"** | |
| Road/rail | |

| **Specific challenge** |
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| Research topics under this challenge are about how to ensure that the transportation system is coordinated and works efficiently. This means, for example, to adapt the infrastructure to the new transport demands developing in European cities.<br><br>This research topic is relevant under the first main area of research identified by the ECTRI position paper on the second work programme: "Individual users' mobility behaviour" and under the second main area of research identified by the ECTRI position paper on the second work programme: "Multimodal mobility systems and services". It is also relevant under the areas "Advanced logistic services" and "Research support for decision-making". |

| **Scope** |
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| European cities grow, partly due to planned population increase in urban areas. The transport infrastructure and the transport system in urban areas face serious challenges of how to provide safe and high-quality transport in urban areas with limited space and increasing populations.<br><br>An important challenge for city planners and authorities relates to how to adapt or reuse present infrastructure to meet the new transport demands characterized by more use of "soft modes" and public transport. Can existing road infrastructure be utilized to suit pedestrians and cyclists, like e.g. the old Spanish railways being transformed to cycle ways? Copenhagen have built a new cycle "highway" above street level to facilitate the increasing number of cyclists, which is an example of "radical" infrastructure design that can serve as example for other cities.<br><br>The facilitation of soft modes/public transport with restrictions on motorized traffic and parking is often not welcomed by business and trade, as they believe they lose customers. Hence, to adopt and develop sufficient transport infrastructure to accommodate the planned growth in bicycling, walking and public transport, also poses political challenges in addition to those related to traditional use and limited space. Another important challenge is related to the integration of goods delivery in city areas when parking and motorized traffic is restricted.<br><br>Research needs / aspects to consider:<br>  a) Research on the relationship of infrastructure, safety and mobility with special consideration on integrating safety and mobility for pedestrians and cyclists in city areas.<br>  b) Consider how urban planning and city authorities can accommodate the change in urban transport that is politically wished for, i.e. to adopt and develop infrastructure and environmentally friendly transport policies in delicate ways to minimize resistance from important stakeholders.<br>  c) Learn from successful lessons from other cities/areas. |

| **Expected impacts** |
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| Transport infrastructure has a major impact on the modal split. The proposed research will provide important knowledge of how to develop and adapt transport infrastructure to meet the new transport demands in urban areas with increasing populations. |

## Contact

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