Travelling safely in Europe
by road, rail and water
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TRAVELLING SAFELY IN EUROPE BY ROAD, RAIL AND WATER

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Preface

Safety is at the core of EU transport policy with ambitious targets to reduce fatalities and injuries on land and sea throughout the European Union. With by far the highest number of accidents occurring on the road, the policy priority is to reduce road casualties, with a target of close to zero deaths by 2050. In meeting the target of saving thousands of lives in all transport modes, research plays a key role in developing and deploying advanced technologies to make vehicles and infrastructure safer, and to integrate vehicle, infrastructure and user in intelligent safety systems to reduce human error, which is a key factor in most traffic accidents involving fatalities and injuries.

As a significant area of EU transport policy, safer travel by land and sea has been selected for the TRIP series of policy brochures to highlight the contribution of EU-funded research to policy and the implications for future policy and research.

This series of policy brochures is an essential component of the comprehensive Transport Research and Innovation Portal (TRIP) that provides open access to the results of and best practices in research programmes and projects in the European Research Area (ERA). A central theme of research policy under the Treaty of Lisbon, the European Research Area has been identified to foster the free circulation of researchers, scientific knowledge, and technology.

TRIP serves policy makers and research managers involved in all aspects of the transport sector. The Portal is developed and maintained by the TRIP Project Consortium and funded by the European Commission Directorate-General for Mobility and Transport (DG MOVE) under the Seventh Framework Programme for Research and Innovation.

This policy brochure presents an overview of current and future policy on transport safety and EU-funded research to support development and implement of this policy.
1 INTRODUCTION

Challenges in making transport safer

The safety of surface transport is a worldwide challenge that is closely related to social, technical and economic issues. Substantial efforts to improve transport safety have reduced accident rates throughout the European Union. Yet in spite of these efforts, the social cost of transport accidents remains high and various challenges have still to be addressed.

The number of traffic fatalities and injuries has decreased greatly in the European Union in the last decade, falling by 37% between 1999 and 2010 in all transport modes (Eurostat, 2011). However, the social cost of accidents in surface transport remains high, and efforts need to be continued and strengthened to prevent transport casualties on land and sea in the European Union. Improved safety is vital to the overall performance of the transport system, and to meet the needs and expectations of citizens and companies in all countries.

Data show that traffic accident rates vary considerably between transport modes. Road is the most widely used mode with the highest risk and cost in terms of human life. Some 26,000 people were killed in road accidents in Europe in 2013, and 250,000 people are estimated to be seriously injured in road accidents every year (EC, 2014). Road accidents in 2009 were estimated to cost EUR 130 billion in medical care, police involvement and vehicle repair, as well as in compensation for loss of economic productivity due to fatalities and injuries (EC, 2010a).

Road safety varies considerably between Member States. The highest number of road fatalities per inhabitants in 2013 was in Romania, followed by Latvia and Lithuania, while the lowest road fatality rates were reported for Sweden, immediately followed by UK (EC, 2014). Safety issues vary systematically by region, reflecting differences in climate, culture and behaviour, level of transport development, and technology readiness.

Less frequent and causing fewer deaths than road accidents, rail and ferry disasters involve larger numbers of people, cause considerable environmental damage, and transport disruption, often with substantial commercial and financial consequences. In 2012, a total of 2,068 significant rail accidents resulted in 1,133 fatalities and 1,016 people seriously injured, at an overall cost of EUR 1.5 billion (ERA, 2014). Figures for the maritime sector are much lower in terms of loss of human life, with around 60 fatalities per year in and around EU waters. However, the risk of oil spills due to maritime accidents continues to be a major concern after the Erika (1999) and Prestige (2002) disasters because over 85% of crude oil imports to the EU are transported by sea, corresponding to 670 million tonnes annually (ASSET/NEEDS). Unlike a large part of road transport, rail and maritime transport are carried out by public or private entities and significant numbers of people are transported simultaneously, which increases the need to raise safety levels for passengers and also for goods.
Harmonised safety data collection and assessment

In defining effective strategies to reduce transport fatalities and injuries, accurate data are required for each Member State and for the EU as a whole. Accident statistics and data analysis are needed to identify trends and to assess the effectiveness of strategies and measures to reduce death and injury. In identifying priorities for future policies and efficient use of resources, the economic, environmental and social impacts of preventive measures need to be continually assessed.

Much has been done to harmonise data collection and procedures for monitoring transport fatalities throughout Europe. However, more data are urgently needed on the high number of transport-related injuries that result in life-long disability, with social and economic costs estimated at 2% of EU GDP annually (EC, 2013a). In 2013, a common definition of serious injury based on medical standards was established, and inclusion of transport injuries in official statistics was made mandatory. The challenge is now to harmonise data collection in Europe, which is required in evaluating injury prevention measures, and in analysing causal factors and effective remedial actions.

Fatalities and long-term disability resulting from all types of transport accidents are largely predictable and thus preventable. Effective action is urgently required but has to be based on accident investigations and procedures to assess various types of accidents. Comprehensive assessments need to cover not only the vehicles involved, but also vehicle and infrastructure interaction, and human behaviour with potential implications for traffic accidents. For these purposes, harmonised and standardised methodologies for in-depth accident investigations and reporting need to be developed and implemented by the Member States.

Safety standards for vehicles and infrastructure

To ensure that surface vehicles - cars, trains and vessels - comply with EU safety standards, inspections and crash test programmes are mandatory before safety certification is issued for the European market. In the road sector, the increase in alternative propulsion systems and the characteristics of these
vehicles can pose new potential safety threats. Further action to harmonise certification processes is required, especially for the market take up of new vehicle designs and technologies. Likewise, automated transport calls for independent certification to ensure such vehicles comply with required safety standards.

In the rail sector, the interoperability approval for new high speed and conventional trains is a long and cumbersome process because national regulations often require different types of homologation tests for cross-border trains. At present, assessment methods are not harmonised. According to the European Railways Agency (ERA), over 11,000 national regulations are applicable in the EU, with considerable differences in how national safety authorities carry out vehicle authorisation and safety certification. Under the proposed 4th railway package ERA would take on certification functions.

Recent developments in shipbuilding in the last decade and the use of materials other than steel have increased pressure on safety quality and risk management in the shipbuilding process and on monitoring by administrations, port authorities and classification societies. For passenger vessels engaged in international traffic, the rules established by International Conventions apply and are enforced by EU Member States through Flag State and Port State inspections.

Safety assessment of transport infrastructure is vital for safety and seamless travel of passengers. However, the safety performance of road networks varies between Member States, with some road sections noted for high accident rates. Harmonised audits in the design stage, regular safety inspections and network monitoring are required to ensure uniform safety levels on roads in Europe. The increasing number of high speed trains on the European rail network carrying more passengers and freight with heavier axle loads is putting considerable pressure on infrastructure and increasing demand for inspection and maintenance of rail assets.

Reduce human error

The human factor is one of the main causes of accidents in all transport modes. For instance, in the road sector, about 95% of accidents involve some level of human error, while 75% are caused by human error alone (Cars 21 High Level Group, 2012). Likewise, some 80% of collisions, groundings and fire of ships and vessels are routinely attributed to human error (TransNav, 2013). The challenge in reducing driver error is to gain understanding of the contributing causes and their potential effects. Studies indicate that 80 to 90% of driver-related risk factors are linked to health, such as stress, fatigue, and consumption of alcohol, medicine and illegal drugs. Another factor related to driver error could be age, ranging from young, inexperienced drivers to older drivers with slower reactions. In the road sector, other factors could include distraction due to the use of mobile phones, not wearing seat belts, and excessive speed especially at night (EU OSHA, 2010).

Intelligent Transport Systems can play a key role in reducing human error. Vehicle and infrastructure design, and advanced technology need to be integrated into a safety system that takes account of human error and inappropriate behaviour to prevent and limit the consequences of potential failure. Technology advances in automation in all transport modes have the potential to reduce the risk of accident and to limit the effects of human error, but also bring new safety challenges. Thus in launching these technologies, consideration must be given to potential negative impacts, such as
overconfidence in technology, distraction, cognitive overload and technology reliability.

Road user awareness of safety is a priority not always reflected in the behaviour of drivers, passengers, and other users. The challenge is to influence road users to adopt safer attitudes while raising awareness of the consequences of unsafe behaviour. In this respect, education, information and awareness raising campaigns as well as enforcement measures can play a major role.

**Vulnerable road users**

A key issue in road safety is the protection of vulnerable road users, such as cyclists, motorcyclists and pedestrians, who suffer more severe injuries than car occupants. In 2012, vulnerable users accounted for almost half of all road fatalities, with 21% of accidents involving pedestrians, 7% involving cyclists and 18% involving motorcyclists (EC, 2013c). In the EU Member states, pedestrian and cyclist deaths decreased by 34% between 2001 and 2009 compared to 39% decrease in car driver deaths (ETSC, 2011). More recently, users of alternative transport modes, such as roller skaters, skateboarders, and Segway users, have been identified as vulnerable road users because they are not protected by the vehicle structure.

Powered two-wheelers (PTWs) are increasing in popularity, largely because of road congestion, limited parking and the high cost of car ownership. In 2008, PTWs accounted for 17% of all road fatalities but only 2% of road users (ETSC, 2011). There are currently far fewer active safety devices for PTWs than for cars, and passive safety is almost entirely limited to personal equipment for the rider.

Cycling, including the use of eBikes and pedelecs, has almost doubled in many capital cities in the last decade, and the number of cyclists is expected to increase as urban areas continue to expand. This trend calls for urgent action to protect cyclists. Measures are needed to improve the safety of dedicated cycle tracks, cyclist equipment, as well as improvements to motor vehicles because the speed, weight and design of cars and trucks are key factors in cyclist fatalities and injuries.

An ageing population and growing demand for safe and accessible transport for people with disabilities are challenges for transport policy and for innovation in technology and traffic management. Age-related factors are important in safety because 40% of pedestrians involved in fatal accidents are over the age of 65. Currently, 16% of the European population is over 65 and 4% is over 80, and these percentages are expected to increase in 2040 to 25% and 8%, respectively (Eurostat).

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**Figure 2: Proportion of vulnerable roads in road fatalities in 2013**

*Road Safety Vademecum, 2013.*
Policy and research on transport safety

The EU has set ambitious safety targets in a continuing effort to make the transport system safer. EU policy is directed to implementing safety measures for road, rail and sea transport, improving the safety of vehicles and infrastructure, and enhancing user behaviour with the overall aim of reducing fatalities and injuries in all transport modes.

EU Transport Safety Policy

The EU strives to make Europe a world leader in safety in all transport modes. The Transport White Paper Roadmap (EC, 2011) sets out a bold safety objective of saving thousands of lives. This ambitious goal requires coordinated effort at all levels of government and harmonisation of policies, regulations and targets in all Member States. The role of the EU is to establish a reference framework, to set common safety standards and a uniform approach to monitor their application in achieving the highest level of transport safety throughout the EU.

Safety has always been at the core of EU transport policy. Priority is given to road safety because of the high number of road fatalities compared with fatalities in rail and sea accidents. For the two latter modes, the EU has set up dedicated agencies to support Member States in implementing EU legislation and in harmonising national regulations and technical standards, a major factor in increasing traffic safety in the EU. These agencies provide technical assistance to the Commission, support development of legislation, monitor implementation, and evaluate the effectiveness of measures.

Road safety

Since the first Road Safety Action Plan in 2001, statistics show substantial progress in preventing accidents and reducing fatalities. Between 2001 and 2010, fatalities on EU roads decreased by 43%, and by a further 17% between 2010 and 2013 (EC, 2014). EU road safety policy up to 2020 (EC, 2010a) continues and strengthens efforts to reduce road deaths and injuries even further with the ambition
of cutting by half road deaths in Europe by 2020 and moving close to zero fatalities by 2050.

With a ‘zero vision’, the EU Road Safety Programme 2011–2020 focuses on road user behaviour and measures to prevent human error and inappropriate conduct. Road user training and enforcement of safety measures, together with intelligent technologies in vehicles and infrastructure, are priority measures to protect drivers and to reduce road fatalities and injuries. A key objective in this policy framework is to improve the safety of vulnerable road users, particularly motorcyclists. The current programme also focuses on monitoring and assessing severe injuries in order to develop a dedicated strategy and appropriate targets in 2015 (EC, 2010a).

EU legislation and regulations have been enacted to enhance road safety. In addition to legislation on driving licenses and working conditions for professional drivers, major initiatives have been set up to ensure high safety standards for vehicles, infrastructure and road user behaviour.

For vehicles, the EU is at the forefront of the work promoted by the United Nations Economic Commission for Europe (UNECE) on international technical harmonisation in the motor vehicle sector. Compliance of car manufacturers with legislation and regulations on vehicle type approval is mandatory for safety features, such as seatbelts, airbags, anti-locking brake systems, and electronic stability control. All cars produced in or imported into the EU have to meet minimum standards based on ex-ante compliance verification (EU Regulation No 214/2014) and are subject to periodic testing (Directive 2009/40/EC). In 2012, the Commission presented a proposal to update legislation on periodic roadworthiness testing in order to raise the minimum test standard, to create more equal conditions on the internal market, and to improve vehicle safety. The roadworthiness package was adopted by the European Parliament in March 2014.

The EU regulates safety management of road infrastructure, and sets minimum standards for road safety impact assessments, audits, and inspections by the Member States (Directive 2008/96/EC). EU legislation applies to motorways that are part of the TEN-T network, and Member States adopt the same principles to secondary road networks on a voluntary basis. A Directive also sets out minimum safety requirements for tunnels in the Trans-European Road Network (Directive 2004/54/EC).
To enforce safer driver behaviour, the European Commission made recommendations (EC, 2004) to align and strengthen Member States enforcement, particularly speed control with fixed and mobile radar systems, and checks on alcohol, drug and seat belt use. The directive (Directive 2011/82/EU) is contributing to cross border enforcement of penalties for traffic offences by enabling Member States to exchange information on road traffic offenders.

**Safety in rail transport**

Rail safety in the EU is among the highest in the world, and EU policy is to maintain these safety levels while establishing the Single European Railway Area. In developing a common approach to rail safety in all Member States, the EU strives for interoperability and harmonised safety standards for trains and rail tracks, as set out in the Transport White Paper (EC, 2011) and in three legislative railway packages since 2001.

The Railway Safety Directive 2004/49/EC brings together legislation on safety in the Single European Railway Area. It establishes a legal framework for harmonising safety certification of railway undertakings, safety authorisation of infrastructure managers, certification of entities responsible for freight wagon maintenance, the tasks and responsibilities of safety authorities, and accident investigation. This legal framework is based on the principle that railway undertakings and infrastructure managers are responsible for assessing safe risks in train operation, for establishing a safety management system and for monitoring its effectiveness according to common principles.

The safety management system is evaluated by the national safety authority (NSA) when issuing safety certificates and safety authorisations (Regulations (EU) 1158/2010 and 1169/2010, respectively). During the validity period, the NSA is responsible for safety supervision of railway undertakings and infrastructure managers according to Regulation (EU) 1077/2012.

Operational in 2006, the European Railway Agency (ERA) assesses compliance with the Common Safety Targets in accordance with Commission Decision 2009/460/EC. ERA also assists the Commission in developing technical specifications and procedures for rail safety, monitoring rail safety in the EU, and fostering cooperation and exchange of best practices between national safety authorities and national investigation bodies.

Under the extended mandate proposed in fourth Railway package, ERA will be responsible for safety certification of railway undertakings and authorisation...
of vehicles, and for issuing authorisations for European Rail Traffic Management System (ERTMS) that harmonises railway signalling and speed control. A key component of ERTMS is the European Train Control System (ETCS), which is a common rail standard to ensure safe border crossings.

Maritime safety

Since 1990s, the European Commission has progressively developed safety policies in response to major shipping accidents, and currently plays a leading role together with EU Member States in formulating international safety standards set by the International Maritime Organisation (IMO).

EU maritime safety policy aims to protect passengers, crews and cargo by ensuring a high, uniform and effective level of maritime safety, and by monitoring safety standards in European waters. Various maritime regulatory and administration authorities and bodies contribute to maintaining safety at sea, including Flag States, Port State Control Authorities and Classification Societies. Measures are in place to strengthen cooperation, to harmonise procedures, to enhance ship design, to improve performance of marine equipment, and to facilitate tools for information exchange, such as SafeSeaNet, which is the traffic monitoring platform for Member States. These safety policies contribute to making maritime transport in Europe among the safest in world, carrying some 400 million passengers per year in EU 28.

To further align maritime safety with IMO regulations and Maritime Safety Conventions, the EU adopted the Third Maritime Safety Package in 2009. These regulations and directives are directed to improving the effectiveness of accident prevention measures and managing the consequences of accidents. Fundamental safety measures range from vessel certification, and monitoring vessels on compliance with international standards, to standardised accident inspection procedures and reporting methods.

The Third Maritime Safety Package builds on EU legislation in place for more than a decade. The Third Package comprises eight legislative texts covering seven different but interlinked areas. The areas include Flag State requirements, Port State Control, vessel traffic monitoring, common rules and standards for ship inspection and survey organisations, accident investigation, liability of passenger carriers, and insurance of shipowners.

Enacted in 2011, Directive 2009/18/EC established the fundamental principles governing accident investigation in maritime transport. The directive makes it mandatory for Member States to have safety investigation systems in place and a common structure for investigation reports for the European Marine Casualty Information Database (EMCIP).
Maritime safety policies rely on the technical assistance of the European Maritime Safety Agency (EMSA), which was set up in 2002 in response to the Erika and Prestige disasters and now covers all facets of maritime safety. Heavy oil spills resulting from these incidents led to extensive environmental pollution along the European coast that has had major political, social and economic implications. The Agency was established to ensure a high, uniform and effective level of maritime safety and security, as well as prevention of and response to environmental pollution caused by shipping in the EU.

The Agency supports the EU in monitoring the operational application and implementation of the EU maritime safety acquis, and in evaluating the effectiveness of measures in the Member States. At operational level, EMSA monitors and supports authorities involved in maritime affairs. Together with the Member States, the agency has technical responsibility for the Union Maritime Information and Exchange System and manages the EU database on maritime accident investigation information, improving standards in accident reporting.

Research in support to policy and technology development

Surface transport safety is a key priority for EU-funded research and over EUR 550 million has been invested since 1994 in road safety. Projects co-funded under the EU Framework Programmes for Research and Technological Development (RTD) have resulted in major improvements in the safety of vehicles and infrastructure, and in accident prevention. Research has also provided the science basis for safety policies.

EU-funded research on transport safety covers development and application of new technologies and intelligent systems to protect vulnerable persons, such as drivers, passengers, crew, and pedestrians. Research also includes advanced engineering systems and risk analysis methodologies for the design and operation of road and rail vehicles, vessels and infrastructure. Another research focus is the development of monitoring systems for rescue and crisis management, including harmonising accident inspections, analysis of the contributing factors, and reporting procedures. The EU has also funded studies to support policy decision-making, and awareness campaigns on EU guidelines to increase road safety throughout the EU.

Under Horizon 2020, the EU Framework Programme for Research and Innovation, the Commission is continuing to support research on transport safety and on the use of new technologies for infrastructure and vehicles to benefit transport users, particularly vulnerable users. Future focus will be on innovative solutions anticipating new challenges posed by developments in vehicle technologies, such as growing use of alternative fuels and automation in all transport modes.
Towards an harmonised transport safety system

Progressive harmonisation of national practices for accident prevention and mitigation is at the core of EU transport policy. EU research provides the scientific basis for developing safety policies and supports stakeholders with consistent methodologies and tools to achieve common safety standards in the European Union.

Safety and accident registers

Adequate data on transport accidents and injuries in the EU are essential for evaluation, selection and implementation of safety measures. The EU coordinates initiatives and research on standardisation of casualty registration systems and provides guidance to Member States on harmonised data collection methods, assessment processes and protocols. This has resulted in the registration of the number and type of transport fatalities in the EU, categorised by transport mode, type of vehicle, and the gender and age of the people involved (SAFETYNET, DaCoTA).

Investigation of the causes of accidents enables lessons to be drawn from preventive measures. Key EU Directives have established the fundamental principles governing the investigation and notification of accidents in road, rail and maritime transport. The Directives take into account the results of major EU research on technical analysis, and on the causes and factors contributing to accidents (TRACE, DaCoTA, see box).

CARE: COMMUNITY DATABASE ON ACCIDENTS ON THE ROADS IN EUROPE

CARE is the EU road accident database with information on accidents resulting in death and injury. The legal basis for CARE is Council Decision 93/704/EC and the database provides information to enable:

- identification and quantification of road safety issues
- evaluation of the efficiency of road safety measures
- determination of the relevance of EU actions
- facilitation of exchange of experience.

The main difference between CARE and other international databases is the high level of disaggregation, because CARE contains data on individual accidents collected by the Member States.

Safety requirements for transport infrastructure

Efficient management of road infrastructure is a fundamental component of road safety. EU legislation on harmonising procedures for safety impact assessments, audits, network safety management and inspections (Directive 2008/96/EC) for the pan-European road network and EU tunnels is based on cost-benefit analysis funded by the EU in 2005 (ROSEBUD). The harmonised approach proposed demonstrated the value of lives saved in Europe. Further studies were carried out to increase the knowledge and skills of governments and road authorities in the EU on the audits and inspection procedures required by the Directive and to support compliance with legislation.

Practical products generated from EU-funded research on safety management of road infrastructure are detailed guidelines (RIPCORD-ISEREST) and a training scheme (Pilot4Safety) to ensure that road safety audits and inspections of road networks in the Member States are carried out to a consistently high quality by qualified and experienced auditors. Research has also contributed to developing assessment programmes that map accident hazard sites in the European road network, to defining common methodologies and procedures to analyse road safety conditions and for risk assessment, and to establishing road safety ratings (EURORAP box). Exchange of knowledge and practice by EU Member States has led to harmonisation of road signs and road markings from a safety perspective.

Rail accidents are largely due to track failure. To support national authorities in complying with safety conditions required by EU standards (Directive 2008/110/EC), research has been carried out to develop and implement innovative systems for fast and reliable inspection of rail tracks, and thus to minimise the risk of axle failure (EURAXLES, INTERAIL). The ACEM-RAIL project dealt with the automation and optimisation of railway infrastructure maintenance.

Motor vehicle safety standards

EU legislation and regulations on motor vehicles set stringent safety standards for vehicles and individual components. Effective vehicle safety requires research and development to understand the source and mechanisms of injury protection under crash conditions, regular monitoring of performance, and certification that vehicle design complies with the safety standards of competent authorities. Research has made major advances in assessing the performance of new cars and equipment in crash tests (predictive systems), and cars on the road based on crash data (retrospective systems).

National authorities and certification bodies have to comply with the Railway Safety Directive to deliver...
safety certification of high speed and conventional trains operating in the EU. Research is contributing to identifying inconsistencies and gaps in acceptance criteria for safety certification for rolling stock in the Member States and to making national assessment methods more compatible (DYNOTRAIN, EATS).

In the maritime sector, accidents are frequently attributed to failure of structures and machinery. Research is supporting maritime authorities to maximise the efficiency and effectiveness of monitoring and inspection operations for safety certification according to EU standards (Directive 2010/36/EC). Another area of research is the development of advanced tools for data collection, and for risk analysis and management (INCASS).

Research is also contributing to common certification frameworks for safety of embedded systems and components in all transport modes. Research is identifying common procedures to facilitate the certification and assurance process and the potential to re-use assets across and between transport domains, thus saving time and costs (OPENCOSS, EXCROSS).

Assessment of policy measures

In setting transport safety policies and strategies, decision makers rely on data analysis and policy options that take into account the economic, environmental and social impacts of safety measures. EU research has provided policy makers with tools and methodologies for cost-benefit and cost-effectiveness analyses. Cost-benefit analysis provides a monetary measure of the net balance between investment to prevent accidents and the social burden to society, while cost-effectiveness analysis estimates the costs of preventing an effect, such as a casualty. Social cost-benefit analyses systematically account for accident externalities, including indirect costs, such as productivity losses.
DaCoTA

Road safety data collection, transfer and analysis

Data on road safety have been consolidated and standardised in a comprehensive database to provide evidence-based information for policy makers in Europe. Data gaps and information needed to improve road safety measures have been identified, including a protocol on data collection for in-depth analysis of accidents and injuries causation.

BACKGROUND

Funded by DG MOVE, DaCoTA developed further the content and outreach of the European Road Safety Observatory (ERSO) that was initiated by the SafetyNet project in 2004. DaCoTA consolidated and standardised data on road safety from all available sources to provide data and tools for evidence-based policy making on road safety. Data on the magnitude, nature and context of road accidents are essential in assessing the key factors leading to road accidents and the role of infrastructure, vehicles and road users in developing new policies on improving road safety. The project participants included representatives of national and local government, infrastructure operators, vehicle regulators, traffic enforcement agencies, training organisations, and others experts involved in road safety.

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Status: Completed
Total cost: EUR 7 310 655
EU contribution: EUR 5 500 000
Coordinator: Loughborough University, United Kingdom
Website: www.dacota-project.eu
RESULTS

Analysis of road safety data systematically collected from 14 Member States showed that there is no single good practice model for road safety management. Over 500 road safety stakeholders completed a web-based questionnaire on the types of safety data needed to improve road safety measures. More than half of respondents gave priority to the following data requirements:

- factors causing road crashes
- road user behaviour and attitudes
- a common definition of road fatality
- costs and benefits of road safety measures
- number of serious injuries in addition to fatalities
- common methods to evaluate road safety measures
- safety impact of a combination of measures.

Based on data collected and stored in the Road Safety Knowledge system integrated in the DG MOVE website and consultation with and evaluation of policymakers requirements, a range of tools were developed to support policy making on road safety issues. These decision support tools included thematic fact sheets, national forecasts and a composite road safety index. Based on advanced statistical procedures, forecasts of traffic fatalities are now available for each EU Member State for the period up to 2020.

Reviews of key road safety topics were prepared by experts and subjected to peer review. Country overviews on road safety in each of the 27 Member States were prepared which include structure and culture, safety measures and programmes, safety performance indicators, outcomes of measures and social costs.

To address the shortage of in-depth data on the causes of accidents and injuries, DaCoTA delivered a validated protocol on data collection that includes data specifications, case sampling and crash investigation methods, and definitions of more than 1,500 variables for a road accident. The protocol is presented in the DaCoTA investigation manual and in a wiki-based glossary. In addition, a network in 19 Member States was trained to carry out accident investigations, and where necessary, to implement the local infrastructure for accident analysis.
Boosting technology-driven safety solutions

Technology innovation is an effective means to achieve transport safety targets. EU policy promotes the use of intelligent transport systems to enhance safety of vehicles and infrastructure in an integrated system. Advanced technologies are being developed to detect hazards and emergencies, and to provide timely response strategies, thus increasing the safety of transport networks in Europe.

Use of information and communication technologies to improve transport safety and to reduce accident fatalities has been at the core of many European Commission actions since the launch of the eSafety Initiative in 2002. This initiative promotes and implements recommendations on development, deployment and use of eSafety systems. The ITS Action Plan (EC, 2008) followed by the ITS Directive (Directive 2010/40/EU) have strengthened the contribution of information technologies to road safety.

Considerably more than in the road sector, rail and maritime transport rely on ICT in daily operations, rescue management and information exchange.

In-vehicles safety technologies

Many in-vehicle devices now compulsory under EU and national legislation result from EU-funded research, such as airbags, anti-lock braking systems (ABS) and electronic stability control (ESC). Other advanced driver assistance systems (ADAS) and
in-vehicle information systems (IVIS) have now reached the deployment phase in road vehicles. Devices, such as seat belt reminders, speed limit control, blind spot systems, and other warning devices, provide additional safety for drivers and other road users, particularly vulnerable road users.

Mandatory crashworthiness tests for licensing vehicles on EU roads require car manufacturers to comply with high safety standards for vehicles and components. Biomechanics research on human reactions and injury risks in road accidents supports the EU in the continuous revision of mandatory vehicle safety standards, and car manufacturers in the design of safe vehicles. Research has developed sophisticated crash test dummies and digital human body models (DHBMs) that take account of differences in the size, weight and physical shape of vehicle occupants. These models also take account of differences in characteristics and physical movements, such as children (CASPER), the elderly, and women (APROSY). Physical and virtual crash tests using dummies contribute to the development and further improvement of on-board protection and restrain systems, and to the survival of vehicle occupants in a crash.

Research on passive safety devices, such as seatbelts and airbags, has led to the protection of car drivers and passengers, and resulted in modifications to car frontal structures that reduce the severity of collisions with pedestrians and cyclists. EU-funded research is studying the design and performance of vehicles with alternative propulsion systems to increase safety in line with traditional vehicles and to meet EU crashworthiness standards.

Research is underway to adapt car technology to mopeds and motorcycles, by developing safety devices to warn riders, to avoid accidents and to mitigate accidents impacts. Various advanced safety devices for motorcyclists have now reached the deployment phase, such as speed alert, curve speed and frontal collision warning, and route guidance and black spot warnings. Improved crash helmets and garments now enhance protection against brain and spine damage (PISA, Sim, SAFERIDER).

Similar safety devices are now available for bicycles. Research on cycling safety focuses on risk factors, such as the speed and weight of motorised vehicles and the lack of protection for cyclists, as well as safety issues, such as lack of visibility and of vehicle control. Innovative safety solutions derived from ICT include ‘light lane bike’ that projects a cycle lane behind the bicycle thus improving visibility of the cycle, and ‘hind sight’ that displays on the handlebars images from a rear camera (SAFECYCLE).
To meet the requirements of legislation on vessel safety, research is dedicated to developing effective methods, tools and procedures to facilitate safe vessel design by using ICT devices to increase operational safety. Research has developed acoustic emission technology to monitor and detect fatigue cracks and active corrosion in ships and vessels (CORFAT). Research has led to the transfer of resilience engineering principles applied in the aircraft industry to the maritime sector to limit human error in a system (SEAHORSE).

**ITS for safer infrastructure in emergencies**

Intelligent Transport Systems (ITS) are being employed to improve safety on roads, rail tracks and waterways, and to manage traffic and accident emergencies. EU policy on road transport promotes the concept of ‘self-explaining’ and ‘forgiving’ infrastructure in order to minimise road user error, to reduce fatalities and injuries, and to mitigate consequences of accidents. Equipped with advanced furniture and signalling, infrastructure could communicate with in-vehicle sensing systems and nearby vehicles, thus creating a ‘cooperative system’ with a higher pro-active role in providing rapid response strategies and contributing to safer and more efficient use of transport networks. Safety applications of cooperative systems that have resulted from EU-funded research include road intersection safety, lane change assistance, frontal collision prevention, real-time hazard and incident warning, and safety margin for assistance and emergency vehicles. These technologies are now available on the market (Coopers, CVIS, Safespot, COMeSafety, EuroFOT).

The first operative result of research on a cooperative system is the eCall service. Since 2007, the EU has stimulated the development of an eCall system for rapid assistance to motorists involved in a collision anywhere in Europe. In the event of an accident, the eCall automatically dials 112, Europe’s single emergency number, to connect with the nearest emergency centre. Co-legislators aim at having the system fully operational by March 2018. The system is being tested for powered two wheelers by integrating the eCall device into motorcycles and even into a rider’s helmet and garments.

Although accidents at level crossings are limited in number (up to 2% of road fatalities), they account for some 30% of railway fatalities. EU-funded research is investigating level crossings in Europe and analysing the major causes of accidents at these critical points. A continuous effort is being made to identify smarter solutions to limit the risk of accident, to assess operational and safety impacts of new technologies, and to develop new sensors and signalling systems to alert transport users (SELCAT).

Adverse weather conditions are becoming a factor in the safety of the transport system, particularly in the light of climate change adaptation strategies. Authorities and transport users need to anticipate natural disasters and extreme weather phenomena, and to mitigate the impact on the performance of the transport system (WEATHER, EWENT, MOWE-IT). Weather Information Systems are now an integral part of traffic management, and have been developed to provide real time information about prevailing local weather, and road, rail and sea conditions. In the maritime sector, which is the most exposed to adverse weather especially in the winter, research is being conducted to enhance the design of vessel structures (EXTREME SEA), and to develop on-board decision support systems for ship handling in extreme weather conditions (HANDLING WAVES).
Satellite communication can empower intelligent transport systems to deliver information in real time to a large number of road users. SAFETRIP used this innovative communication technology to connect infrastructure, vehicle and driver in an integrated safety system to improve safety and assist in navigation.

BACKGROUND

Funded under FP7, SafeTRIP contributed to the EU goal of cutting road fatalities by improving communication between vehicle and infrastructure, and road transport users, mainly drivers, infrastructure managers and emergency operators, and thus optimising the alert chain in event of accident. Satellite-based communication technology (S-band) was employed to enhance exchange of real-time information. SAFETRIP was carried out by 20 partners in seven EU Member States, representing road operators, telecom operators, research centres, transport operators, insurance companies, equipment manufacturers and research organisations.

RESULTS

An innovative ICT platform was developed to connect vehicle and infrastructure with the driver, using the S-band communication channel available via the Eutelsat 10A satellite. Optimised for services that require broadcast (one-to-many) and two-way data communication via small mobile units, SAFETRIP demonstrated how the S-band channel for vehicle applications can improve safety and assist in navigation.
SAFETRIP defined an on-board unit for vehicles, and developed guidelines on the functionalities required. Prototypes have been developed and field-tested with users in daily operations. Tests demonstrated the added safety including driver alerts to potential hazardous situations and collaborative road alerts conveying information from other drivers on potential road incidents. The ‘patrol with eyes’ enables communication between road maintenance vehicles and the control centre via voice calls, video transmission, sensor data transmission (temperature and humidity), and messaging.

Interoperable with the new European Commission eCall service, an automatic emergency alert system was developed that connects with either a roadside assistance services or a local garage in the event of an accident or breakdown. The system includes video in an emergency call, which enables roadside assistance to assess the urgency of the situation, and to provide breakdown assistance, or remote support.

The SAFETRIP system uses satellite and ground networks in a fully interoperable and integrated system so that a vehicle can communicate anywhere in Europe regardless of communication channel. In isolated regions with little or no infrastructure, satellite telecommunication with S-band is the solution for communicating with vehicles in the move.
Towards safer behaviour of transport users

Transport safety policies put citizens at the heart of their action. People must be encouraged to take responsibility for their safety and the safety of others, particularly vulnerable road users. EU research is devoted to the human factor as a leading cause of accidents, and to finding ways to promote safety in transport user behaviour.

The human factor

With human error a leading cause of traffic accidents, drivers and crews are target groups for many transport safety initiatives promoted by the EU. The Road Safety Orientations 2010-2020 put the road user at the centre of road safety policy, encourage training and education, promote safety equipment, and enforcement of safety measures. The IMO Assembly also adopted a resolution on the need to increase the focus on human-related activities in the safe operation of ships, and to achieve and maintain high standards of safety and environmental protection to significantly reduce maritime casualties (Resolution A.947(23), 2004).

In support of EU policy on protecting road users, research is carried out on driver behaviour under real conditions and under specific influences to detect and assess factors contributing to traffic accidents and to identify ways to change drive behaviour (PROLOGUE, UDrive, see box). To prevent impaired driving due to consumption of psychoactive substances, such as alcohol, drugs and special medicines, EU-funded research has investigated how mind-altering drugs affect driving skills and the impact on road safety, which has contributed to defining risk thresholds. Prevention, penalties and rehabilitation strategies have been tested with regard to the influence on offenders and on change in behaviour (DRUID).

Human factors in maritime accidents have been analysed (BERTRANC, MTCP). EU-funded research is investigating relationships between the human factor, risk-based ship design and operational life cycle (FAROS, CYCLADES). Another focus is the human interaction with the bridge and integrating the entire bridge system of machines and humans into a single co-operative unit (CASCADE).

New research is exploring ways to improve safety in occupational driving. Linked to transport and social policies, occupational driving safety relates to journeys during working time by employees who are not professional drivers. Innovative approaches are being analysed to encourage companies to embrace the Work-Related Road Risk Management (WRRRM) programme, which provides employers with tools and methodologies for journey management of their employees (PRAISE).

Another aspect of the human element is railway suicide and the factors influencing the occurrence and consequences of such events, including hotspots and high-risk access points, such as level crossings, station platform ends and bridges. Technical and soft counter measures are being assessed as a basis for new approaches to reducing suicides, preventing trespasses and mitigating the consequences for rail operations (RESTRAIL).

Training, education and awareness campaigns

EU legislation sets provisions for drivers’ licences, certification and training in all modes of transport. In the road sector, the EU supports research on effective
training for drivers, particularly professional drivers, who are required under EU legislation to undergo additional and ongoing training. Training has also been developed for specific target groups, such as young people and elderly, and for driving instructors on advances in car technologies (TRAIN-ALL).

Train drivers work directly at the human-machine interface and are specifically affected by technical developments and the increasing number of cross-border operations. To further harmonise railway operations and to meet EU standards, training content and methods need to be continually updated. EU research has tackled harmonisation and coordination of training for train drivers on driving and operational skills, and on crisis management (2TRAIN).

Complementing research and studies, awareness campaigns are conducted on EU guidelines to increase road safety throughout the EU. The campaigns target groups most at risk, making them aware of the consequences of inappropriate behaviour for themselves and for other road users. Although difficult to measure, the effectiveness of awareness campaigns has been assessed in studies funded by the Commission to support planners in designing and implementing mass media campaigns and evaluating their effectiveness in reducing traffic accidents (CAST).

In preventing drink driving, the EURO-BOB campaign has proved to be particularly effective. Launched in 2001, the campaign is based on the principle that on a night out, one person is designated as the driver and does not drink alcohol in order to drive the rest of the group home safely. To enhance the use of seatbelts, the public awareness campaign EUCHIRES was conducted for a four-year period (2004 to 2008), when the legislation first came into force. The EU has funded initiatives to prepare guidelines on road safety practices based on best practices collected throughout Europe, such as the EU good practice guide on road safety education that targets children and teenagers.

Supported by the EU and open to the general public, the sixth annual European Road Safety Day held in 2014 brought together road safety organisations, NGOs, policy makers, victim organisations and the automotive industry to exchange views and find common solutions to road safety in Europe. Launched in 2008, the European Maritime Day is an annual platform for the maritime community to debate and exchange best practices. The 2014 event discussed how to improve maritime safety through research and innovation, taking stock of research results to date.

**Enforcement measures**

Enforcement of traffic regulations is a key area of EU policy to reduce road deaths due to driver behaviour, which are mainly related to speeding, drink driving and misuse of seatbelts. EU-funded research has been conducted to enhance the effectiveness and efficiency of enforcement of road traffic regulations. Various aspects of enforcement have been assessed including detection of infringements, administrative and legal handling of infringements, enforcement methods and tools, and the effects on road-user behaviour and accidents.

Research has also contributed to enhancing communication between competent authorities in the Member States, and to increasing cooperation in sharing information about infringements, especially cross-border offences. Based on analysis of traffic enforcement, and enhancing exchange between Member States, best practice guidelines have been prepared, including a manual on the demerit point system with recommendations to maximise the effectiveness in national systems (SCAPE, PEPPER, BestPoint, SUPREME). Further projects have developed and tested innovative equipment for automatic detection of infringements (ASSET ROAD) and to support police with enforcement (DRUID).
A new research method in road safety has been introduced in Europe. Originating in the United States, the naturalistic driving method has demonstrated potential to gain insight into driver behaviour and driver reactions in the event of an accident or potential accident. PROLOGUE demonstrated the feasibility of this method in investigating driver behaviour and made recommendations for a large-scale Naturalistic Driving scheme in Europe.

BACKGROUND

Funded under FP7, PROLOGUE aimed to contribute to reducing road casualties in Europe by testing the naturalistic observation methodology developed in the United States. This method enables inconspicuous observation of drivers by equipping a car with a continuous monitoring device that records driver behaviour and reactions, vehicle movements and interaction with the traffic environment, which cannot be obtained by conventional research methods.

Five field trials were carried out in Austria, The Netherlands, Spain, Greece and Israel, using different technology and types of vehicles, and collecting and analysing different types of data. To obtain feedback on the naturalistic observation method, a User Forum was set up of representatives of road authorities, automotive industry, insurance companies, road transport operators, road user organisations, and knowledge and research institutes. A series of workshops was conducted with stakeholders, as well as online consultations.
RESULTS

The field trials confirmed the potential value of the naturalistic driving approach in gaining information on driver behaviour and road safety. The technical requirements for the in-vehicle monitoring devices were specified, and the many technical options for data acquisition system (DAS) and data handling were considered to ensure reliable outputs. Methodology and legal conditions were also defined to carry out a scientifically sound naturalistic driving study.

PROLOGUE resulted in a set of recommendations for further use of this method, and its application in a large-scale study. The follow-up FP7 project UDrive is currently collecting information on 470 vehicles, 240 passenger cars, 150 trucks, and 80 powered two-wheelers. All data, including video data showing the driver’s forward view and the view of the driver, and also GIS data, are collected continuously to gain insight into driver behaviour and performance and specifically risk-taking, pre-crash behaviour and crash avoidance behaviour. Technology developments in data collection, data storage capacities, data mining and image processing now enable the creation of inventories of cases and drivers attitudes.
Future research on transport safety will need to consider the continually changing characteristics of transport resulting from various factors, such as the recent economic crisis and the rapid growth in technology. The challenge is to anticipate these changes and to assess their potential impacts on transport safety. For instance, vehicle innovations such as automated cars may entail significant behaviour changes in transport users.

Social changes in mobility need to be considered. Greater social awareness of safety, environmental concerns and new life styles are rapidly changing mobility patterns especially in urban areas. As a result, increasing use is being made of alternatively fuelled vehicles, bicycles and shared services, and land use is changing for instance, with the use of shared spaces. These changes need to be analysed in terms of the consequences for transport safety.

The ageing of population has consequences for transport safety. Elderly people have specific transport and mobility requirements to enable them to access activities and services that contribute to their safety, health and well-being, and so enhance their quality of life. Research will need to consider the demographic, psychological, sociological and medical aspects of ageing, including behavioural adaptations and physical vulnerability.

The gender component of transport touches on a number of issues for analysis. Research has shown that men and women have different transport needs, travel behaviour and levels of access to services and infrastructure. Women are more sensitive to safety concerns and tend to limit their movement and activities because of their perceptions of risk. They are overrepresented in social groups with specific transport needs and greater transport disadvantage. For these reasons, a number of gender-specific issues need to be tackled, such as the relationship between vehicle design (crashworthiness) and injury patterns in women, and the ergonomics of vehicles, including models to investigate crash and injury risk.

The contribution of technology to improving transport safety will continue to pervade research and policy actions. Rapid advances in technology call for actions to prevent unexpected consequences of their implementation and impacts on transport user behaviour. For instance, potential risks are related to excessive confidence or distraction in automated vehicles, and management of Cloud Services for Big Data and Open Data management, especially in road accidents.

Future research and policies need to build on progresses made and on results achieved. Key factors include adapting best practices from all transport modes and disseminating good practices throughout the European Union and beyond to mitigate regional differences. All of these aspects need to be dealt with systematically to integrate solutions and interventions, and to foster the development of safe intermodality.
EU-funded research projects referred to in this publication

- 2TRAIN: Training of Train Drivers in safety relevant issues with validated and integrated computer-based technology
  http://www.2train.uni-wuerzburg.de
- ACEM-RAIL: Automated and cost effective railway infrastructure maintenance
  http://www.acem-rail.eu
- APROSYS: Advanced protection systems
  http://www.aprosys.com
- ASSET: Assessing Sensitiveness to Transport
  http://cordis.europa.eu/project/rcn/85708_en.html
- ASSET ROAD: Advanced Safety and Driver Support for Essential Road Transport
  http://www.project-asset.com
- BERTRANC: Methodology of safety in marine operations
- BestPoint: Criteria for BEST Practice Demerit POINT Systems
  http://www.bestpoint-project.eu
- CASCADe: Model-based Cooperative and Adaptive Ship-based Context Aware Design
- CASPER: Child advanced safety project for European roads
  http://www.casper-project.eu
- CAST: Campaigns and Awareness-raising Strategies in Traffic Safety
  http://www.cast-eu.org
- COMeSafety: Communication for Safety
  http://www.comesafety.org
- Coopers - CO-OPerative SystEms for Intelligent Road Safety
  http://www.coopers-ip.eu
- CORFAT: Cost effective corrosion and fatigue monitoring for transport products
  http://www.corfat.eu
- CVIS: Cooperative vehicle-infrastructure systems
  http://www.cvisproject.org
- CYCLADES: Crew-centred Design and Operations of ships and ship systems
  http://www.cyclades-project.euCyClaDes/index.xhtml
- DACOTA: Road safety data collection, transfer and analysis
  http://www.dacota-project.eu
- DRUID: Driving under the Influence of Drugs, Alcohol and Medicines
  http://www.druid-project.eu
- DYNOTRAIN: Railway Vehicle Dynamics and Track Interactions Total Regulatory Acceptance for the Interoperable Network
  http://www.triotrain.eu/DYNO_description.htm
- EATS ETCS: Advanced Testing and Smart Train Positioning System
  http://www.eats-eu.org
- EUCHIRES: EUrope CHIld REstraint System
  http://euchires.sipsivi.org
- EURAXLES - Minimizing the risk of fatigue failure of railway axles
  http://www.euraxles.eu
- EuroFOT: European Field Operational Test
  http://www.eurofot-ip.eu
- EWENT: Extreme Weather impacts on European Networks of Transport
  http://ewent.vtt.fi
- EXCROSS: Exploiting safety results aCROSS transportation modes
  http://www.excross.eu
- EXTREME SEAS: Design for Ship Safety in Extreme Seas
  http://cordis.europa.eu/project/rcn/93940_en.html
- FAROS: Human Factors in Risk-Based Design Methodology
  http://www.faros-project.eu
• HANDLING WAVES: Decision-Support System for Ship Operation in Rough Weather  
  http://www.mar.ist.utl.pt/handlingwaves/members

• INCASS: INspection CApabilities for Enhanced Ship Safety  
  http://www.incass.eu

• INTERAIL: Development of a novel integrated inspection system for the accurate evaluation of the structural integrity of rail tracks  
  http://www.interailproject.eu

• MOWE-IT: Management of weather events in transport system  
  http://www.mowe-it.eu

• MTCP: Maritime Transport Co-ordination Platform  
  http://www.maritime-transport.net

• OPENCOSS: Open Platform for EvolutioNary Certification of Safety-critical Systems  
  http://www.opencoss-project.eu

• PEPPER: Police Enforcement Policy and Programmes on European Roads  
  http://www.vtt.fi/sites/pepper

• Pilot4Safety: Pilot project for common EU Curriculum for Road Safety experts: training and application on Secondary Roads  
  http://pilot4safety.fehrl.org

• PISA: Powered Two Wheeler Integrated Safety  
  http://www.pisa-project.eu

• PRAISE: Preventing Road Accidents and Injuries for the Safety of Employees  
  http://etsc.eu/projects/praise

• PROLOGUE: Promoting real life observations gaining understanding of road user behaviour  
  http://www.prologue-eu.eu

• RESTRAIL: Reduction of Suicides and Trespasses on RAILway property  
  http://www.restrail.eu

• RIPCORD ISEREST: Road Infrastructure Safety Protection - Core Research and Development for Road Safety in Europe  
  http://ripcord.bast.de

• ROSEBUD: Road Safety and Environmental Benefit-Cost and Cost-Effectiveness Analysis for Use in Decision-Making  
  http://partnet.vtt.fi/rosebud

• SAFECYCLE: ICT applications for safe cycling in Europe  
  http://www.safecycle.eu

• SAFERIDER: Advanced Telematics for enhancing the safety and comfort of motorcycle riders  
  http://www.saferider-eu.org

• Safespot: Cooperative systems for road safety  
  http://cordis.europa.eu/project/rcn/80569_en.html

• SafeTRIP: Satellite application for emergency handling, traffic alerts, road safety and incident prevention  
  http://www.safetrip.eu

• SAFETYNET: Integrated Project to build the framework of a European Road Safety Observatory  
  http://ec.europa.eu/transport/wcm/road_safety/erso/safetynet/content/safetynet.htm

• SCAPE: Scalable Preservation Environments  
  http://www.scape-project.eu

• SEAHORSE: Safety Enhancements in transport by Achieving Human Orientated Resilient Shipping Environment  
  http://www.seahorseproject.eu

• SELCAT: Safer European Level Crossing Appraisal and Technology  
  http://cordis.europa.eu/project/rcn/81521_en.html

• SIM: Safety In Motion  

• SUPREME: SUmmary and publication of best Practices in Road safety in the Eu MEmber States  
  http://www.kfv.at/supreme

• TRACE: Traffic Accident Causation in Europe  
  http://www.trace-project.org

• TRAIN-ALL: Integrated System for driver Training and Assessment using Interactive education tools and New training curricula for All modes of road transport  
  http://cordis.europa.eu/project/rcn/79988_en.html

• UDrive: European Naturalistic Driving Study  
  http://www.udrive.eu

• WEATHER: Weather Extremes: Impacts on Transport Systems and Hazards for European Regions  
  http://www.weather-project.eu
Bibliography

## Glossary

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<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ABS</td>
<td>Anti-lock Braking Systems</td>
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<td>ADAS</td>
<td>Advanced Driver Assistance Systems</td>
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<td>CARE</td>
<td>Community Road Accident Database</td>
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<td>DAS</td>
<td>Data Acquisition System</td>
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<td>DG MOVE</td>
<td>Directorate-General for Mobility and Transport</td>
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<td>DHBMs</td>
<td>Digital Human Body Models</td>
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<td>EC</td>
<td>European Commission</td>
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<td>ECCAIRS</td>
<td>European Coordination Centre for Accident and Incident Reporting Systems</td>
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<td>EMCIP</td>
<td>European Marine Casualty Information Database</td>
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<td>EMSA</td>
<td>European Maritime Safety Agency</td>
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<td>ERA</td>
<td>European Research Area</td>
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<td>ERTMS</td>
<td>European Rail Traffic Management System</td>
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<td>ESC</td>
<td>Electronic Stability Control</td>
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<td>ETCS</td>
<td>European Train Control System</td>
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<td>ETSC</td>
<td>European Transport Safety Council</td>
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<td>EU</td>
<td>European Union</td>
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<td>Euro NCAP</td>
<td>European New Car Assessment Programme</td>
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<td>EuroRAP</td>
<td>European Road Assessment Programme</td>
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<td>FP7</td>
<td>Seventh Framework Programme</td>
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<td>GDP</td>
<td>Gross domestic product</td>
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<td>GIS</td>
<td>Geographic Information Systems</td>
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<td>ICT</td>
<td>Information and Communications Technology</td>
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<td>IMO</td>
<td>International Maritime Organisation</td>
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<td>ITS</td>
<td>Intelligent Transport Systems</td>
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<tr>
<td>IVIS</td>
<td>In-Vehicle Information Systems</td>
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<tr>
<td>NGOs</td>
<td>Non-governmental organisations</td>
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<tr>
<td>NSA</td>
<td>National Safety Authority</td>
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<tr>
<td>PTWs</td>
<td>Powered two-wheelers</td>
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<tr>
<td>RTD</td>
<td>Research and Technological Development</td>
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<tr>
<td>SOLAS</td>
<td>Safety of Life at Sea</td>
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<tr>
<td>TEN-T</td>
<td>Trans-European Networks - Transport</td>
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<td>TRIP</td>
<td>Transport Research and Innovation Portal</td>
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<tr>
<td>UNECE</td>
<td>United Nations Economic Commission for Europe</td>
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<tr>
<td>WRRRM</td>
<td>Work-Related Road Risk Management</td>
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Even though traffic fatalities and injuries have been substantially reduced in the European Union in the last decade, the social and economic costs of accidents on land and sea remain high. EU policy supported by research strives to make Europe a world leader in transport safety, with the ambitious goal to save thousands of lives. Achieving this vision involves implementing and enforcing uniformly high safety standards throughout the European Union. It requires concerted action to develop and deploy advanced technology to enhance the safety of vehicles and infrastructure, and to integrate them into a safety system to protect drivers and transport users. With human error a key element in many transport accidents, ways and means are needed to engender greater safety attitudes and behaviour in transport users. This Policy Brochure is a component of the Transport Research and Innovation Portal (TRIP) that provides access to the achievements and best practices of transport research carried out in the European Research Area.