



Thematic Research Summary

Long-term perspectives

COMMUNICATING TRANSPORT RESEARCH AND INNOVATION

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Transport



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This publication was produced by the Transport Research and Innovation Portal (TRIP) consortium for the European Commission's Directorate-General for Mobility and Transport (DG MOVE). The brochure was compiled by Christian Meyer and Eckhard Szimba (KIT). The project team wishes to thank Helen West for reviewing the document.

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Preface

This Thematic Research Summary (TRS) has been produced as a part of the activities of the Transport Research and Innovation Portal (TRIP) project. The purpose of TRIP is to collect, structure, analyse and disseminate the results of EU-supported transport research and research financed nationally in the European Research Area (ERA), and selected global research programmes. The main dissemination tool used by TRIP is the public web portal www.transport-research.info.

The Thematic Research Summaries provide a structured guide to the results of research projects carried out mainly at EU level, either as part of a framework programme or as a study commissioned by the European Commission (EC). These summaries are intended for policy makers at European, national and local levels, stakeholders and researchers.

The Thematic Research Summary on long-term perspectives is one of 24 themes, which provides:

- an overview of research activities in a specific aspect of transport focusing on EU-funded projects;
- analysis and compilation of research findings and recommendations.

An overview of the Thematic Research Summaries is presented in Table 1.

Table 1: Transport themes used in TRIP

Domains	TRIP Themes
Sector	Passenger transport
	Freight transport
Mode	Air transport
	Rail transport
	Road transport
	Urban transport
	Water transport (sea and inland)
	Multimodal transport
Policy	Financing, pricing and taxation
	Regulation, competition and public services
	Infrastructure and TEN-T
	Land use and transport planning
	Climate policy and energy efficiency
	Security and safety
	International cooperation and EU Neighbourhood Policy
	Awareness, information and user rights
Technology	Intelligent transport systems
	Innovative technologies
	Transport management
Evaluation	Long-term perspectives
	Assessment and decision support methodologies
	Environmental impacts
	Economic and regional impacts
	Accessibility, social and equity impacts

1. Introduction

Transport in Europe faces a series of long-term challenges. In economic terms, the challenges are to provide competitive mobility services for freight and passengers while at the same time reducing emissions and the dependency on fossil fuels, reducing congestion, particularly in urban areas, and contributing to economic growth in all EU Member States (EC, 2011a). In environmental terms, the challenges are to reduce greenhouse gas emissions as well as air, ground, water and noise pollution. Social challenges include ensuring equal access to transport for all EU citizens, promoting quality jobs in the transport sector, improving working conditions, and enhancing transport safety. Furthermore, convincing solutions are needed to foster a European transport system which addresses the ever changing mobility needs of citizens and businesses and economic realities.

To tackle these challenges, the Transport White Paper (EC, 2011b) sets out EU transport policy for the coming years and outlines long-term objectives.

Technology innovation contributes to finding strategic solutions for transport challenges. New vehicle technology can lower emissions, reduce oil dependency and enhance quality and comfort of transport services (EC, 2009). As set out in the Framework Programme for Research and Innovation (EC, 2013), the EU strives to maintain the global leadership of its transport industry and supports innovative fuel and technology development and deployment.

Mobility and traffic management concepts and systems can reshape European transport. The development and implementation of visionary mobility concepts contribute to reducing the environmental impact of transport and to making transport more resource efficient (EC, 2013). Innovative traffic management concepts can optimise usage of the transport networks and infrastructure.

Long-term scenarios, analyses and impact assessment are key elements used in the development of transport policies and legislation in the European Union. Because of the long-term dimension of transport policy, long-term scenarios and modelling of future trends become essential elements in policy development. Assessment tools provide decision makers with analyses to identify the most advantageous policies, and support ex-ante assessment of specific policy proposals. Assessment tools are also used to facilitate understanding of long-term prospects and interrelationships between transport and other sectors.

Thus, EU-funded research supports the elaboration of long-term scenarios and the development of tools and methods to evaluate environmental and socio-economic impacts of transport policies.

Research roadmaps, consisting of research agendas and policy strategies, map the way forward and can be used to ensure efficiency in implementation and programming of the best use of resources. The Horizon 2020 European Framework Programme for Research and Innovation (EC, 2013) emphasises the importance of developing research roadmaps for a more efficient and focused research funding in Europe.

In the context of long-term perspectives, research projects are grouped in four sub-themes as follows:

- Fuel and vehicle technology development
- Innovative mobility and traffic management concepts
- Long-term scenarios, analyses and impact assessments
- Research roadmaps.

2. Sub-Theme: Fuel and vehicle technology development

Innovative fuel and vehicle technologies contribute to making the transport system more competitive and sustainable. EU-funded research is carried out to develop, test and implement new fuel and vehicle technologies.

EU transport policy places emphasis on innovative technology development as being essential for a more competitive, efficient and sustainable transport system (EC, 2011b). Developments in fuels and fuel technology are directed to more cost-efficient transport and to reducing environmental emissions. Research on vehicle technology is focused on new vehicles that can optimise travel time, improve the quality of passenger transport, and the efficiency of freight transport. Research also addresses new and improved materials to meet the requirements of new types of vehicles. As innovative fuel and vehicle technologies contribute to more sustainable and competitive transport, the EU supports research on innovative propulsion concepts, novel materials and new vehicle design concepts.

ATLLAS II (Aero-Thermodynamic Loads on Lightweight Advanced Structures II, FP7, 2011–2015) is investigating lightweight and high-temperature resistant materials for Mach 5–6 vehicles. Based on combined aero-thermal-structural experiments, a detailed layout is being developed for a high-speed aircraft to reduce sonic boom and emissions at high altitudes.

SPECTRUM (Solutions and Processes to Enhance the Competitiveness of Transport by Rail in Unexploited Markets, FP7, 2011–2015) is exploring new and innovative rail concepts for the transport of low density and high value goods. A design concept is being prepared for a high performance freight train that is lightweight and has driving performance characteristics that make it suitable for passenger services as well as transport freight container units. This concept is being developed for a rapid high-value service that enables greater flexibility and alleviates rail congestion.

FAST20XX (Future high-altitude high-speed transport 20XX, FP7, 2009–2012)

developed concepts for advanced hypersonic sub-orbital space planes in Europe, which now fall in a grey zone between aeronautics and space. The airplane launch concepts, developed as a foundation for future transport, are based on ballistic flight experience. The two-stage rocket space vehicles concepts are based on high-energy propulsion.

LAPCAT-II (Long-term Advanced Propulsion Concepts and Technologies II, FP7, 2008–2012)

addressed high-speed technology to reduce the duration of antipodal flights by two to four hours. Scenarios for flight time reduction using performance figures of a Mach 5 and a Mach 8 vehicle were investigated, and the key conclusions incorporated in a roadmap for the development of a future supersonic vehicle design.

SAFAR (Small Aircraft Future Avionics Architecture, FP7, 2008–2012)

introduced new and innovative technologies for small aircraft, with the development of future avionics architecture to reduce pilot workload and to increase safety in all flight phases. A fault tolerant fly-by-wire was validated that comprised computing resources, a human-machine interface, and a safety critical electric power supply.

ATLLAS (Aerodynamic and Thermal Load Interactions with Lightweight Advanced Materials for High-Speed Flight, FP6, 2006–2009)

identified and assessed advanced lightweight materials that can withstand ultra-high temperatures and heat fluxes to enable flight speeds above Mach 3. Materials and cooling techniques, and their interaction with aero-thermal loads, were investigated for airframe and propulsion components.

VISIONS (Visionary Concepts for Vessels and Floating Structures, FP6, 2005–2009)

involved major industry and science stakeholders in the European shipbuilding and maritime industry to strengthen technology capabilities to develop innovative concepts for products. New market segments providing a competitive advantage for European shipbuilders were explored and visionary concepts generated and assessed.

LAPCAT (Long-Term Advanced Propulsion Concepts and Technologies, FP6, 2005–2008)

examined concepts and technologies for engines fitted to a Mach 4–8 hypersonic aircraft. Various propulsion cycles and concepts for high-speed flights were evaluated in order to define technologies for integrated engine-aircraft performance, mass-efficient turbines and heat exchangers, high-pressure and supersonic combustion experiments and modelling. The results yielded the requirements and operational conditions for high-speed flight and confirmed that only Mach 5 and Mach 8 vehicles would fulfil these conditions. These results were further investigated in LAPCAT II.

Study on Clean Transport Systems (European Commission, DG MOVE, 2011)

explored the contribution of various fuel technology combinations to achieve the goal of 60% reduction in greenhouse gas emissions stated in the Transport White Paper. Scenarios analysed under two alternative regulatory options – tank-to-wheel CO₂ standards, and tank-to-wheel energy efficiency standards – concluded that alternative vehicle technologies and infrastructure for alternative energy carriers would need to be developed.

3. Sub-Theme: Innovative mobility and traffic management concepts

Innovative mobility and traffic management concepts are needed in developing a long-term response to the transport requirements of the European Union. EU-funded research investigates the technical, legal and economic feasibility as well as safety aspects of these concepts.

Many innovative mobility concepts are directed at reducing urban congestion and improving interoperability to reduce transport costs and enhance the quality of transport for European citizens. Innovative mobility concepts are also directed to improving the accessibility of peripheral areas and to overcoming the barriers to transport access. Furthermore, innovative traffic management concepts contribute to the efficient use of resources and a reduction of the negative environmental impacts.

TRAMAN21 (Traffic Management for the 21st Century, FP7, 2013–2017) is developing fundamental concepts and tools to pave the way towards a new era in motorway traffic management research and practice. These concepts and tools will complement and exploit the evolving deployment of Vehicle Automation and Communication Systems (VACS). The project is expected to yield results that will contribute to generic principles of traffic management in VACS and advanced modelling of traffic flow at micro and macro level.

RECREATE (REsearch on a CRuiser Enabled Air Transport Environment, FP7, 2011–2015) is demonstrating preliminary cruiser-feeder operations for civil aircraft. The concept has been shown to reduce fuel burn and CO₂ emissions by 31% for a typical 6 000 nautical miles flight with a payload of 250 passengers. This pioneering concept complies with airworthiness requirements for civil aircraft.

2050AP (The 2050+ Airport, FP7, 2011–2014) is investigating new airport concepts for the future that evolve around three distinct rationales; increasing passenger time efficiency; climate neutrality; and cost reduction. A methodology is being developed to evaluate such airport concepts by identifying benefits of each approach and their implementation challenges. This should eventually aid airports in meeting future market and regulatory requirements.

FLACON (Future High-Altitude Flight – an Attractive Commercial Niche?, FP6, 2006–2012) identified and assessed the long-term potential of commercial high-altitude flights in Europe for selected mission requirements. Potential technical barriers, legal issues (restrictions on flying over land and inhabited areas) and costs were identified for a proposed air launch for sub-orbital flight and for other purposes. A tentative list of requirements for high-altitude flights was prepared, including altitude, ticket price, number of passengers, and predicted time to market.

PPLANE (Personal Plane: Assessment and Validation of Pioneering Concepts for Personal Air Transport Systems, FP7, 2009–2012) developed advanced concepts for the development and promotion of a Personal Air Transport System. The concepts were analysed with respect to guidelines for selection criteria, such as security and safety, automation and control, environment and human factors. Regulation and affordability were also considered and resulted in recommendations for implementation across Europe. Implementation recommendations were closely related to future exploitation of remote areas for employment and remote residential areas.

FUSETRA (Future Seaplane Traffic – Transport Technologies for the Future, FP7, 2009–2011) tackled seaplane and amphibian aircraft transport in Europe. The research was multi-fold and included notably: technical and mission requirements including cost considerations; identification and analysis of requirements for operational improvement; a new seaport concept of sea parks to improve accessibility of regions, including tourist areas. The research evidenced the approval of air and water operations by regulatory authorities, such as navy, police and local authorities as a key stumbling block for the establishment of an airline together with profitability considerations arising from competition from passenger water transport, such as ferries. Other open issues included the current deficit of qualified pilots and examiners in Europe, and the potential negative environmental impact that might be generated by the new sea parks.

PROCEED (Principles of Successful High Quality Public Transport Operation and Development, FP6, 2006–2010) produced guidelines to support planning, developing and implementing public bus transport in small and medium-sized cities of between 25 000 and 200 000 inhabitants in Europe. The guidelines included methods for analysing the market; developing and upgrading networks and infrastructure; financing improvements; and marketing strategies for specific target groups. The project increased expertise and extended the knowledge base for future analysis of transport infrastructure.

NICHES (New and Innovative Concepts for Helping European Transport Sustainability, FP6, 2004–2007) supported the development and adoption of innovative technology and policy-based urban transport concepts to make urban transport more efficient and sustainable. The project provided coordination and encouraged a wide debate between stakeholders. Innovative urban transport concepts and guidelines were published to support the development, transferability potential and adoption of innovative technology and policy-based urban transport concepts.

4. Sub-Theme: Long-term scenarios, analyses and impact assessments

Since EU transport policy has long-ranging effects, decision making needs to be well informed and well founded. EU-funded research supports these requirements by elaborating long-term scenarios and developing advanced impact assessment tools and methodologies.

As transport policy has long-term implications for society, environment and economy, decisions also need to be backed by a quantitative assessment of the potential impacts. Long-term scenarios and assessment instruments support policy makers in identifying optimal policy measures and in evaluating the long-term socio-economic and environmental impacts of policy options. Long-term scenarios also contribute to gaining understanding of complex trends, thus providing a basis for forward-looking policy making.

HIGH-TOOL (Strategic high-level transport model, FP7, 2013–2016) is developing an accessible and user friendly, high-level strategic transport model to assess economic, social and environmental impacts of transport policy options by the EC. The HIGH-TOOL model is being developed as an open source tool.

ECO2 (Sub-seabed CO₂ Storage: Impact on Marine Ecosystems, FP7, 2011–2015) is assessing the risks associated with CO₂ storage below the seabed. The investigation predicts the likelihood of a leakage from sub-seabed storage sites, the potential effect of leakage to marine ecosystems and the risks associated with such storage. These investigations are providing a comprehensive monitoring strategy, and guidelines for best environmental practices for the implementation and management of sub-seabed storage sites.

LIVINGRAIL (Living in a sustainable world focused on electrified rail, FP7, 2012–2015) is elaborating prospective and normative scenarios on reducing the environmental impacts of transport as well as increasing and maintaining quality of life. A rail map of alternative pathways to a vision for 2050 is being developed.

RACE2050 (Responsible innovation Agenda for Competitive European transport industries up to 2050, FP7, 2012–2015) is identifying key success factors for sustainable growth of the transport industry, and policies to strengthen its long-term perspective (up to 2050). To this end, scenarios for transport of the future in Europe are being developed using available foresight intelligence, comparative synopses, and discussion of results with experts in the field.

EUNOIA (Evolutive User-centric Networks for Intraurban Accessibility, FP7, 2012–2014) is investigating urban mobility patterns by analysing interactions between social networks and travel behaviour, such as the effect of social networks on planning joint trips. Visual assessment tools are being developed to enable stakeholders, such as city officials, to assess mobility policies, particularly new services emerging around the concept of shared access to resources, such as car sharing.

FUTRE (Future prospects on TRansport evolution and innovation challenges for the competitiveness of Europe, FP7, 2012–2014) is highlighting future challenges and demand drivers that can have a considerable impact on the global demand patterns in passenger and freight transport. Aspects considered include global demand patterns in these sectors as well as the effect on the competitiveness of related industries and service providers.

ASSIST (Assessing the Social and Economic Impacts of Past and Future Sustainable Transport, FP7, 2011–2013) developed an assessment model for the EU with policy advice on possible direct and indirect social and economic impacts of future sustainable transport policies that could potentially contribute to EU strategic objectives. The model supports impact assessments required in preparing policy proposals.

OPTIMISM (Optimising Passenger Transport Information to Materialize Insights for Sustainable Mobility, FP7, 2011–2013) analysed future changes in passenger mobility that would lead to more sustainable transport. Strategies, recommendations, and policy measures were proposed for the integration and optimisation of transport systems. These are based on scientific analysis of social behaviour, mobility patterns, and business models and on an impact assessment of co-modality and Information and Communication Technology (ICT) solutions for transport.

ORIGAMI (Optimal Regulation and Infrastructure for Ground, Air and Maritime Interfaces, FP7, 2011–2013) investigated improvements to long-distance, door-to-door passenger transport chains by enhancing co-modality and intermodality. Barriers to be overcome were investigated as well as behaviour and attitudes likely to influence future trends in travel behaviour. The potential for improved efficiency and reduced environmental impact of passenger transport was addressed through stimulation of integration, cooperation and, where appropriate, competition in provision of local connections.

TRANS-TOOLS 3 (Research and Development of the European Transport Network Model Transtools Version 3, FP7, 2011–2013) upgraded and further developed the TRANS-TOOLS model to improve evaluation of policy options for EU transport networks. The data foundation in the existing TRANS-TOOLS model was validated, known deficiencies were dealt with, and the software was improved in terms of speed and efficiency. Attention was given to user needs and to improving model documentation.

U4IA (Emerging Urban Futures the Opportune Repertoires of Individual Adaptation, FP7, 2009–2013) worked on gaining better understanding and an integrated framework and simulation model to assess the effects of various types of policies on sustainable urban environments in terms of indicators, such as mobility, accessibility, and energy use, and to understand how the effectiveness of such policies could be improved.

ECCONET (Effects of Climate Change On the inland waterway and other transport NETWORKS, FP7, 2010–2012) gathered expertise in meteorology, hydrology, infrastructure operation, transport and economics to assess the effect of climate change on the transport network, taking the inland waterway network as a case study. Policy guidelines and a development plan for inland waterway transport were established, which provided targeted input for an infrastructure development plan in Europe, and essential information for decision makers and guidelines for future research on climate change and inland waterway transport.

EWENT (Extreme Weather impacts on European Networks of Transport, FP7, 2009–2012) estimated and calculated the costs disruptive effects of extreme weather events have on the operation and performance of transport in the EU. The efficiency, applicability and financial requirements for measures to mitigate the cost of weather impacts were evaluated. This was done by identifying weather hazards, their probability and consequences, and by assessing the expected economic losses caused by extreme weather events on the transport system. The study took account of current and expected future quality of weather forecasting and warning services in Europe.

TEAM_PLAY (Tool Suite for Environmental and Economic Aviation Modelling for Policy Analysis, FP7, 2010–2012) developed a modelling tool suite to combine and advance modelling capabilities to support the European perspective in the international policy arena. A common infrastructure was designed to enable connection of existing models that deal with interdependencies and trade-offs between noise, gas emissions, and environmental and economic impacts of air transport.

WEATHER (Weather Extremes: Assessment of Impacts on Transport Systems and Hazards for European Regions, FP7, 2009–2012) analysed the economic costs of frequent and extreme weather events on transport and on the economy, and explored cost-benefits of adaptation and emergency management strategies. A cost assessment was made of extreme weather events per transport mode, stakeholders involved, and type of extreme event. Options were identified to implement the recommended measures and to demonstrate the competitive potential of a European led market for adaptation and emergency management technologies and policies.

GHG-TRANSPORD (Reducing Greenhouse-gas Emissions of Transport Beyond 2020: Linking R&D, Transport Policies and Reduction Targets, FP7, 2009–2011) examined the potential of the transport sector to reduce greenhouse gas emissions by more than 60% by 2050 compared with 1990 levels. The results showed that conventional measures, such as austere pricing and implementation of advanced technologies would be insufficient to meet the target, especially in road and air transport. Radical solutions were identified, such as a ban on the sale of fossil fuelled vehicles after 2035, and a freight modal shift from road to rail and shipping.

MONITOR (Monitoring System on the Development of Global Air Transport, FP7, 2009–2011) developed a monitoring system for global air transport. Data was collected on all aspects including economics, environment, demography and technology. The system was designed to continuously monitor external and internal factors of strategic importance to aviation stakeholders, for reporting and as an early warning system. It also served as a discussion platform for stakeholders, regulators and scientists.

TOSCA (Technology Opportunities and Strategies towards Climate-friendly Transport, FP7, 2009–2011) demonstrated that technologies could be available in 2020 to reduce energy use by 30 to 50% in most transport modes and that natural fleet turnover would lead to these new vehicle-based reductions in the entire fleet by mid-century. The efficiency gains were exploited through reduced driving or flight resistance in combination with a radical change in propulsion systems. These reductions in CO₂ emissions could be complemented by second generation biofuels and electricity from low carbon sources. It also found that a transport system that is more reliant on electricity could offer ancillary benefits in terms of reduced dependency on energy imports.

FREIGHTVISION (Freight Transport FORESIGHT 2050, FP7, 2008–2010) developed a long-term vision and action plan for sustainable long-distance freight transport, based on an analysis of transport policy measures, technology development trends, and mega trends in long-distance freight transport.

PLUREL (Peri-urban Land Use Relationships – Strategies and Sustainability Assessment Tools for Urban – Rural Linkages, FP6, 2007–2010) developed new strategies and forecasting tools for sustainable rural-urban land use relationships. Six regions in the EU participated as case studies, such as Montpellier and Manchester. An urban region in China was also involved as a reference case.

iTREN-2030 (Integrated TRansport and ENergy Baseline until 2030, FP6, 2007–2009) created an interlinked and consistent toolbox for four transport models to facilitate integrated and detailed analysis of policy measures. The toolbox was applied to scenarios on energy use in transport for the coming 20 years. Various transport policies were assessed including conventional policies (e.g., pricing, taxation and infrastructure), technology policies (e.g., emission standards, fuel efficiency standards and alternative engine technologies) and energy policies (e.g., introduction of alternative fuels, such as biofuels of hydrogen and emissions certificates).

NEW OPERA (New European Wish: Operation Project for European RAIil network, FP6, 2005–2008) investigated changes needed to achieve a long-term 2020 scenario for a core rail network, predominantly for freight. Recommendations were made that impact railway management in Europe such as: the introduction of longer and heavier trains; double stack option for new rail lines and tunnels; standardised maintenance approach; adoption of the software technologies in cross-border traffic management; use of intelligent tools for cross-border freight movement; and decision support systems for dispatchers, infrastructure managers and railway undertakings and their customers.

STEPS (Scenarios for the Transport System and Energy Supply and their Potential Effects, FP6, 2004–2006) developed, compared and assessed scenarios for the transport system and energy supply in the future. A simulation of scenarios provided indications of the long-term development of variables, such as transport demand, economy growth, energy consumption and emissions. Policy recommendations were prepared to meet future challenges in energy supply in the transport sector.

Assessment of the implementation of a European alternative fuels strategy and possible supportive proposals (European Commission, DG MOVE, 2012) analysed policy options to promote alternative fuels in the EU. Consultations with various stakeholders provided evidence that impact assessment of new legislation is necessary to achieve a shift to alternative fuels.

5. Sub-theme: Research roadmaps

Future challenges in research need to be identified in order to achieve a competitive and sustainable transport system in the EU. The EU supports the elaboration and definition of long-term research agendas and policy strategies.

Radical new ideas need to be developed to transform the transport system in the long term. To maximise the added value of research initiatives, the Transport White Paper emphasises the need to defragment research and to elaborate research agendas that summarise research priorities and give guidance to the research community (EC, 2011b). The starting point in developing long-term research agendas and roadmaps is to bring together stakeholders to facilitate the identification of research needs. EU-funded research supports the identification of future research initiatives and the development of policy strategies that reconcile future transport needs, social demands and sustainability goals as set out in the Transport White Paper.

DECOMOBIL (Support action to contribute to the preparation of future community research programme in user centred Design for ECO-multimodal MOBILity, FP7, 2011–2014) is contributing to the acceptability and usability of ICT for cleaner and safer mobility. Key issues are being identified for future research and innovation in clean and efficient multimodal mobility in Europe. This is done by identifying, discussing and disseminating knowledge and knowhow on Human-Machine Interface (HMI) and Human Centred Design areas for the Intelligent Transport Systems (ITS) at European and international level.

PROS (Priorities for Road Safety Research in Europe, FP7, 2012–2014) is establishing a pan-European network to develop commonly agreed priorities in road safety research and to overcome current fragmentation of stakeholder groups. This network follows an integrated approach covering human, vehicle and infrastructure aspects, and all phases from preventive to post-crash safety.

NEARS (New European Aviation Research Strategy, FP7, 2011–2012) supported the development of a strategic research agenda for aviation in Europe for 2030 and beyond. The process involved wide consultation with key stakeholders who actively participated in developing the agenda.

AGAPE (ACARE Goals Progress Evaluation, FP7, 2008–2010) implemented a methodology to evaluate progress made by European Research & Technology (R&T) in 2008/09 towards the Vision 2020 goals defined in 2000. Current and planned R&T activities were assessed in achieving the objective in line with the Strategic Research and Innovation Agenda (SRIA), which is the strategic roadmap for aviation research developed by the Advisory Council for Aeronautics Research in Europe (ACARE). Some 150 experts were mobilised to analyse and review research projects undertaken since 2000.

ASTERA 3 (Aeronautical Stakeholders' Tools for the European Research Agenda 3, FP6, 2007–2008) provided secretarial support to ACARE, monitored SRIA implementation and organised workshops to develop innovative ways to transform the air transport system in the long term.

CAPOEIRA (Co-ordination Action of Ports for Integration of Efficient Innovations and Development of Adequate Research, Development and Innovation Activities, FP6, 2006–2008) resulted in recommendations for maximising the opportunities for Research, Development and Innovation (RDI) in freight transport in ports (handling, ICT, inland networks' access). Critical factors for success were identified and recommendations for future RDI projects were made.

NR2C (New Road Construction Concept, FP6, 2003–2007) provided a long-term vision of road infrastructure to reconcile future transport needs, types of expected users and social demands, and sustainability goals. In addition, NR2C developed innovations in urban infrastructure, interurban infrastructure and bridges. The focus was on generating future-oriented initiatives to address accessibility problems and issues related to road infrastructure. Pilot studies were conducted and research recommendations made for the development of long-term perspectives synergistic with short-term actions.

6. Future Challenges for Research Policy

Fuel and vehicle technology development

Alternative fuels provide the potential to reduce emissions and decrease dependency on oil and other fossil fuels. While EU research projects have focused on developing promising innovative fuel technologies, the challenge for the coming decades is to implement these new fuel technologies on a wider scale, for instance, through electrification of road transport. Research now needs to focus on enhancing battery storage capacity and developing new materials and technologies for mass production. Moreover, the European transport industry is facing growing competition worldwide in technology development in vehicle components, infrastructure, logistics, and traffic management. It is also a political challenge to provide a financial basis to continue research on breakthrough innovations to maintain the competitiveness of the European transport industry in the global market.

Innovative mobility and traffic management concepts

EU-funded research on innovative mobility and traffic management concepts has focused on developing new vehicles, mobility strategies, and more efficient traffic management concepts. New mobility concepts offer alternatives to increase efficiency and sustainability, and to improve the quality of transport. Further research is needed to implement and promote mobility and traffic management concepts in the next decades. The political challenge is to provide an appropriate legal framework that incorporates safety, security and environmental aspects.

Long-term scenarios, analyses and impact assessments

Research on long-term scenarios, analyses and assessments need to provide a sound basis for decision making. Further research is required to increase the flexibility of assessment tools and methodologies and to extend their application to future policies and technology innovations. To maximise the exploitation potential of assessment tools developed with EU funding, the focus on open source solutions needs to be maintained. In the development of long-term scenarios, more emphasis could be attached to methods that are less inclined to extrapolate the future based on the past and the present.

For instance, a wider focus on backcasting approaches could facilitate creative thinking to identify the requirements to achieve long-term political goals. Further harmonisation of impact assessments and long-term scenarios at EU and Member States level remains a challenge for research.

Research roadmaps

A key challenge is to enhance the scientific and technological knowledge base of EU transport research. EU-funded research has facilitated exchange of research results and supported the establishment of scientific networks. The challenge is to strengthen institutional frameworks that coordinate and manage research networks in the EU and potentially internationally, to create synergies between the scientific communities and other stakeholders.

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Glossary

ACARE	Advisory Council for Aeronautics Research in Europe
DG MOVE	Directorate-General for Mobility and Transport
EC	European Commission
ERA	European Research Area
ERRAC	European Rail Research Advisory Council
ERTRAC	European Road Transport Research Advisory Council
EU	European Union
FP6	Sixth Framework Programme
FP7	Seventh Framework Programme
HMI	Human-Machine Interface
ICT	Information and Communication Technology
ITS	Intelligent Transport Systems
R&T	Research and Technology
RDI	Research, Development and Innovation
SRIA	Strategic Research and Innovation Agenda
TRIP	Transport Research and Innovation Portal
TRS	Thematic Research Summary
VACS	Vehicle Automation and Communication Systems

ANNEX: Projects by Sub-Theme

Sub-Theme: Fuel and vehicle technology development				
Acronym	Title	Funding Programme	Project Website	Duration
ATLLAS II	Aero-Thermodynamic Loads on Lightweight Advanced Structures II	FP7	http://www.esa.int/Our_Activities/Space_Engineering/ATLLAS_II - Project summary	2011–2015
SPECTRUM	Solutions and Processes to Enhance the Competitiveness of Transport by Rail in Unexploited Markets	FP7	http://www.spectrumrail.info	2011–2015
FAST20XX	Future high-altitude high-speed transport 20XX	FP7	http://www.esa.int/Our_Activities/Space_Engineering/FAST20XX_Future_High-Altitude_High-Speed_Transport_20XX	2009–2012
LAPCAT-II	Long-term Advanced Propulsion Concepts and Technologies II	FP7	http://www.esa.int/Our_Activities/Space_Engineering/LAPCAT_II	2008–2012
SAFAR	Small Aircraft Future Avionics Architecture	FP7	http://www.transport-research.info/web/projects/project_details.cfm?id=37381	2008–2012
ATLLAS	Aerodynamic and Thermal Load Interactions with Lightweight Advanced Materials for High-Speed Flight	FP6	http://www.esa.int/Our_Activities/Space_Engineering/Overview	2006–2009
VISIONS	Visionary Concepts for Vessels and Floating Structures	FP6	http://www.maritime-visions.eu	2005–2009

LAPCAT	Long-Term Advanced Propulsion Concepts and Technologies	FP6	http://www.esa.int/Our_Activities/Space_Engineering/Achievements_obtained_within_the_European_LAPCAT_program	2005–2008
	Study: Study on Clean Transport Systems	DG MOVE	http://ec.europa.eu/transport/themes/urban/studies/doc/2011-11-clean-transport-systems.pdf	2011

Sub-Theme: Innovative mobility and traffic management concepts				
Acronym	Title	Funding Programme	Project Website	Duration
TRAMAN21	Traffic Management for the 21 st Century	FP7	http://www.traman21.tuc.gr	2013–2017
RECREATE	REsearch on a CRuiser Enabled Air Transport Environment	FP7	http://www.cruiser-feeder.eu	2011–2015
2050AP	The 2050+ Airport	FP7	http://www.2050airport.ineco.eu/2050airport	2011–2014
FLACON	Future High-Altitude Flight – an Attractive Commercial Niche?	FP6	http://www.esa.int/Our_Activities/Space_Engineering/FLACON2	2006–2012
PPLANE	Personal Plane: Assessment and Validation of Pioneering Concepts for Personal Air Transport Systems	FP7	http://www.pplane-project.org	2009–2012
FUSETRA	Future Seaplane Traffic – Transport Technologies for the Future	FP7	http://fusetra.eu	2009–2011
PROCEED	Principles of Successful High Quality Public Transport Operation and Development	FP6	http://www.proceedproject.eu	2006–2010
NICHES	New and Innovative Concepts for Helping European Transport Sustainability	FP6	http://www.niches-transport.org	2004–2007

Sub-Theme: Long-term scenarios, analysis and impact assessments				
Acronym	Title	Funding Programme	Project Website	Duration
HIGH-TOOL	Strategic high-level transport model	FP7	http://www.high-tool.eu	2013–2016
ECO2	Sub-seabed CO ₂ Storage: Impact on Marine Ecosystems	FP7	http://www.eco2-project.eu	2011–2015
LIVINGRAIL	Living in a sustainable world focused on electrified rail	FP7	http://www.livingrail.eu	2012–2015
RACE2050	Responsible innovation Agenda for Competitive European transport industries up to 2050	FP7	http://www.race2050.org	2012–2015
EUNOIA	Evolutionary User-centric Networks for Intraurban Accessibility	FP7	http://eunoia-project.eu	2012–2014
FUTRE	FUTURE prospects on TRANSPORT evolution and innovation challenges for the competitiveness of Europe	FP7	http://www.futre.eu	2012–2014
ASSIST	Assessing the Social and Economic Impacts of Past and Future Sustainable Transport	FP7	http://www.assist-project.eu/assist-project-en/index.php	2011–2013
OPTIMISM	Optimising Passenger Transport Information to Materialize Insights for Sustainable Mobility	FP7	http://www.optimismtransport.eu	2011–2013

ORIGAMI	Optimal Regulation and Infrastructure for Ground, Air and Maritime Interfaces	FP7	http://www.origami-project.eu	2011–2013
TRANS-TOOLS 3	Research and Development of the European Transport Network Model Transtools Version 3	FP7	http://www.transportmodel.eu	2011–2013
U4IA	Emerging Urban Futures the Opportune Repertoires of Individual Adaptation	FP7	http://www.transport-research.info/web/projects/project_details.cfm?id=46241	2009–2013
ECCONET	Effects of Climate Change On the inland waterway and other transport NETWORKS	FP7	http://www.econet-project.eu	2010–2012
EWENT	Extreme Weather impacts on European Networks of Transport	FP7	http://www.weather-project.eu/weather/inhalte/research-network/ewent.php	2009–2012
TEAM_PLAY	Tool Suite for Environmental and Economic Aviation Modelling for Policy Analysis	FP7	http://www.teamplay-project.eu	2010–2012
WEATHER	Weather Extremes: Assessment of Impacts on Transport Systems and Hazards for European Regions	FP7	http://www.weather-project.eu/weather/inhalte/project.php	2009–2012
GHG-TRANSPORD	Reducing Greenhouse-gas Emissions of Transport Beyond 2020: Linking R&D, Transport Policies and Reduction Targets	FP7	http://www.ghg-transpord.eu/ghg-transpord/index.php	2009–2011
MONITOR	Monitoring System on the Development of Global Air Transport	FP7	http://www.monitor-project.eu	2009–2011

TOSCA	Technology Opportunities and Strategies towards Climate-friendly Transport	FP7	http://www.transport-research.info/web/projects/project_details.cfm?id=37987	2009–2011
FREIGHTVISION	Freight Transport FORESIGHT 2050	FP7	http://www.transport-research.info/web/projects/project_details.cfm?id=36661	2008–2010
PLUREL	Peri-urban Land Use Relationships – Strategies and Sustainability Assessment Tools for Urban – Rural Linkages	FP6	http://www.plurel.net	2007–2010
iTREN-2030	Integrated TRansport and ENergy Baseline until 2030	FP6	http://isi-projekt.de/wissprojekt-de/itren-2030/	2007–2009
NEW OPERA	New European Wish: Operation Project for European RAil network	FP6	http://www.newopera.org	2005–2008
STEPS	Scenarios for the Transport System and Energy Supply and their Potential Effects	FP6	http://www.steps-eu.com	2004–2006
	Study: Assessment of the implementation of a European alternative fuels strategy and possible supportive proposals	DG MOVE	http://ec.europa.eu/transport/themes/urban/studies/doc/2012-08-cts-implementation-study.pdf	2012

Sub-Theme: Research roadmaps				
Acronym	Title	Funding Programme	Project Website	Duration
DECOMOBIL	Support action to contribute to the preparation of future community research programme in user centered Design for ECO-multimodal MOBILity	FP7	http://decomobil.humanist-vce.eu	2011–2014
PROS	Priorities for Road Safety Research in Europe	FP7	http://www.pros-project.eu	2012–2014
NEARS	New European Aviation Research Strategy	FP7	http://www.transport-research.info/web/projects/project_details.cfm?id=41469	2011–2012
AGAPE	ACARE Goals Progress Evaluation	FP7	http://www.transport-research.info/web/projects/project_details.cfm?ID=37069	2008–2010
ASTERA 3	Aeronautical Stakeholders' Tools for the European Research Agenda 3	FP6	http://www.transport-research.info/web/projects/project_details.cfm?id=36220	2007–2008
CAPOEIRA	Co-ordination Action of Ports for Integration of Efficient Innovations and Development of Adequate Research, Development and Innovation Activities	FP6	http://www.transport-research.info/web/projects/project_details.cfm?id=36311	2006–2008
NR2C	New Road Construction Concept	FP6	http://www.transport-research.info/web/projects/project_details.cfm?id=28333	2003–2007